

STRIDES in DEVELOPMENT of MEDICAL EDUCATION



Kerman University
of Medical Sciences



Volume **20** | Issue **1** | Autumn **2023**

Online ISSN: 2645-3452



Kerman University of
Medical Sciences

Strides in Development of Medical Education

VOLUME 20, ISSUE 1, 2023

JOURNAL INFORMATION

▶ AIM AND SCOPE

The Strides in Development of Medical Education Journal (SDME) is an Online Open Access, a free of charge and double-blind peer-reviewed with a continuous publication model journal. The aim of publishing the SDME is to promote the quality of education and inform via publishing research in all topics related to medical and health professions education. The SDME adopts a Platinum Open Access model, which entails no publication fees for the authors and also readers. Manuscripts are reviewed by at least 2 reviewers and the Editor-in-Chief. This journal provides reports of innovation and research such topics may include:

- Curriculum development and evaluation
- Designing educational courses
- Teaching and learning issues
- Social accountability

- Faculty development
 - E-Learning
 - Management and leadership
 - Assessment and evaluation
 - Educational research methodologies
 - and other related issue in medical and health professions education.
- However, the SDME welcomes any subjects causing communication between the health professions experts, faculty member and policy makers

▶ CONTENT COVERAGE

This journal publishes original, review, editorial, letter to the editor, short communication articles, all related to the journal goals.

Full Journal Title	Strides in Development of Medical Education
Abbreviation Title	Strides Dev Med Educ
Category	Medical Education
P-ISSN	1735-4242
E-ISSN	2008-272X
Language	English
Journal Country/Territory	IR Iran
Frequency	Continuous
Online Submission	www.sdme.kmu.ac.ir • E-mail: medcj@kmu.ac.ir
Distribution	Online: Open Access;
Price	Scopus, IMEMR, Index Copernicus, EBSCO, MagIran, IranMedex ,SID, ISC, Google Scholar
Indexing Sources	
Editorial Board	▶ Postal Address: Educational Development Center, Haft Bagh Blvd., No 8 Building, Kerman, Iran; Tel: +98-34-31325332; Fax: +98-34-31325347
Publisher	Kerman University of Medical Education ▶ Postal Address: • Kerman University of Medical Sciences, Medical University Campus, Haft-Bagh Highway, Kerman, Iran; Tell: 009834 31325829 Fax : 009834 31325830 ▶ Electronic Address: Website: www.Kmu.ac.ir

BOARDS & COMMITTEES

▶ CHAIRPERSON

•**Seyed Hasan Eftekhari-Vaghefi**, Kerman University of Medical Sciences, Kerman, IR Iran

▶ EDITORS-IN-CHIEF

•**Payam Khazaeli**, Kerman University of Medical Sciences, Kerman, IR Iran

▶ Deputy Editor

•**Sara Shafian**, Kerman University of Medical Sciences, Kerman, IR Iran

▶ MANAGING EDITOR

•**Mahmod Reza Dehghani**, Kerman University of Medical Sciences, Kerman, IR Iran

▶ EDITORIAL BOARD (A-Z)

•**Abbaszadeh A.**, Ph.D. (Professor, Shahid Beheshti Medical University, Tehran, Iran) aabbaszadeh@hotmail.com

•**Ahmadipour H.**, Ph.D. (Department of Community Medicine, School of Medicine, Kerman University of Medical Sciences, Kerman, Iran) ahmadipour@kmu.ac.ir

•**Ali-Tariq A.**, Ph.D. (Associate Professor of Dermatology, University of Kerbala, Kerbala, Iraq.) ali.tariq@uokerbala.edu.iq

•**Bazargan A.**, Ph.D. (Professor, Tehran University, Tehran, Iran) abazarga@ut.ac.ir

•**Beigzadeh A.**, Ph.D. (Assistant Professor of Medical Education, Education Development Center, Sirjan School of Medical Sciences, Sirjan, Iran.) a.beigzadeh@kmu.ac.ir

•**Eftekhari Vaghefi S.H.**, Ph.D. (Professor, Kerman University of Medical Sciences, Kerman, Iran) sheftekharivaghefi@kmu.ac.ir

•**Fasihi-Harandi M.**, Ph.D. (Professor, Kerman University of Medical Sciences, Kerman, Iran) fasihi@kmu.ac.ir

•**Fekri AR.**, MD. (Professor, Kerman University of Medical Sciences, Kerman, Iran) fekri@kmu.ac.ir

•**Faisal M.**, MPH. (Department of Public Health, Daffodil International University, Dhaka, Bangladesh.) fokkanya@yahoo.com

•**Garrusi B.**, MD. (Professor, Kerman University of Medical Sciences, Kerman, Iran) bgarusi@kmu.ac.ir

•**Gülcan O.**, Ph.D. (Assistant Professor, Eastern Mediterranean University, Cyprus) ozan.gulcan@emu.edu.tr

•**Hocaoglu M.**, MD. (Assistant Professor, Eastern Mediterranean University, Cyprus) mevhibe.hocaoglu@emu.edu.tr

•**Haghdoust AA.**, MD., Ph.D. (Professor, Kerman University of Medical Sciences, Kerman, Iran) ahaghaoost@kmu.ac.ir

•**Jalili Z.**, Ph.D. (Associate Professor of Health Education, Islamic Azad University, Tehran, Iran.) zjalili@kmu.ac.ir

•**Khaksari-Haddad M.**, Ph.D. (Professor of Physiology, Department of Physiology and Pharmacology, Kerman University of Medical Sciences, Kerman, Iran.) mkhaksari@kmu.ac.ir

•**Malekan-Rad A.**, MD. (Associate Professor, Tehran University of Medical Sciences, Tehran, Iran) emalakanrad@gmail.com

•**Malkoc M.**, Ph.D. (Professor Eastern Mediterranean University, Cyprus) mehtap.malkoc@emu.edu.tr

•**Mousapour N.**, Ph.D. (Assistant Professor, Shahid Bahonar University, Kerman, Iran) n_mosapour@uk.ac.ir

•**Momtazmanesh N.**, MD., MPH. (Assistant Professor, Shahid Beheshti University, Tehran, Iran) nmomtazmanesh@yahoo.com

•**Nakhaee N.**, MD., MPH. (Professor, Kerman University of Medical Sciences, Kerman, Iran) nakhaeen@kmu.ac.ir

•**Nouhi E.**, Ph.D. (Assistant Professor, Kerman University of Medical Sciences, Kerman, Iran) e_nuhi@kmu.ac.ir

•**Rastegar A.**, MD. (Professor, Yale University of Medical Sciences, Yale, USA) asghar.rastegar@yale.edu

•**Okhovati M.**, Ph.D. (Associate professor of Medical Library & Information Science, Medical Informatics Research Center, Institute for Futures Studies in Health, Kerman University of Medical Sciences, Kerman, Iran.) mokhovati@kmu.ac.ir

•**Rassouli A.**, Ph.D. (English Language Teaching Department, Eastern Mediterranean University, Cyprus) aman.rassouli@emu.edu.tr

•**Sabzevari S.**, Ph.D. (Assistant Professor, Kerman University of Medical Sciences, Kerman, Iran) s_sabzevari@kmu.ac.ir

•**Safizadeh H.**, MD., MPH. (Associate Professor, Kerman University of Medical Sciences, Kerman, Iran) h.safizadeh@kmu.ac.ir

•**Sachedina AA.**, Ph.D. (Professor, University of Virginia, Virginia, USA) abdulaziz.sachedina@theglobalexerts.org

•**Shakibi MR.**, MD. (Associate Professor, Kerman University of Medical Sciences, Kerman, Iran) mr_shakibi@kmu.ac.ir

•**Yazdani S.**, MD. (Associate Professor, Shahid Beheshti Medical University, Tehran, Iran) shahram.yazdani@yahoo.com

•**Yildiz S.**, MD. (Department of Pediatrics, Dicle University, Turkey.) yeditepe.tip34@gmail.com

▶ OFFICIAL CONTACT

•**Zahra Geranmaye**, Kerman University of Medical Sciences, Kerman, IR Iran

•**Farzaneh Mohammadi**, Kerman University of Medical Sciences, Kerman, IR Iran

Guide FOR AUTHORS

- **Before Submission**
 - **These items must be provided**
 - **Ensuring uploading the necessary items**
 - **Further considerations**
 - **Ethical Considerations**
 - **Financial support**
 - **Informed consent**
 - **Submission declaration and verification**
 - **Inclusive language**
 - **Role of the funding source**
 - **Instruction**
 - **Essential title page information**
 - **Proof Reading**
 - **Abbreviations and symbols**
 - **Journal abbreviations source**
 - **Appendices**
 - **The Final Checklist**
 - **Covering Letter**
 - **When submitting**
 - **Submit your article**
 - **Referees**
 - **Assignment of Authorship Responsibilities**
 - **Article charges**
 - **Scientific and Initial Screening**
 - **Peer review process**
 - **Criteria for Authorship**
 - **Conflict of Interest**
 - **Plagiarism**
 - **Data Fabrication/Falsification**
 - **Image Manipulation**
 - **After Submitting**
 - **Requirements for Different Types of Articles**
 - **Proofs**
 - **Correction of Errata**
-

Strides in Development of Medical Education

VOLUME 20, ISSUE 1, Autumn 2023

Table of Contents

Editor's Note

Indexing the Strides in Development of Medical Education Journal in Scopus Database in 2022

Payam Khazaeli

Articles

A Practical Investigation of Brain-based Teaching Approach: Teaching English Speaking Skill to Nursing Students

Farzaneh Iranmanesh, Mehry Haddad Narafshan, Mohammad Golshan

Developing and Validating an Assessment Blueprint for Clinical Skill Competencies in General Surgery for the Medical Undergraduates

Neetha Kundoor, Faiz Hussain, Sridhar Lingam, Venkat Narsimha Reddy, Rekha Arcot, Harshita Bondugula, Srilatha Bashetti

Systematic Observatory in Various Fields of Medical Sciences: The Necessity of the Future Complicated World

Reza Dehnavieh, Sara Zare, Parisa Dehghanian

ExPhilosophy of Education to Make Health Professions Education (HPE) a Success

Sohrab Nosrati, Zahra Nouri Khaneghah, Elham Ramezanpor, Eshagh Moradi, Elham Karimi, Shoaleh Bigdeli

Challenges Faced by University Teachers in Virtual Education During Coronavirus Disease 2019 (COVID-19) Pandemic: A Systematic Review

Fatemeh Ameri, Meisam Dastani, Abazar Gholami, Maedeh Heidary

How to give feedback on professionalism in clinical education: A narrative review

Shiva Khayyati Motlagh Bonab, Aeen Mohammadi, Sevda Fazlizade, Elnaz Hashemzadeh, Reyhaneh Golbaf, Hojjat Torkmandi, Mohammad Abdi

PsError Assessment of Artificial Intelligence Results: What We Need to Do in Medical Education

Mahdi Zarei, Maryam Zarei

A Critical Review of Civil Liability of Medical Science Researchers in Iran

Ali Arefi Maskouni

EvExplanation of A Framework for the Effective Implementation of E-Learning at Universities of Medical Sciences: A Mixed Exploratory Method

Zohrehasadat Mirmoghtadaie, Zeinab Shakiba, Sara Shafian, Soleiman Ahmady

AIIdentification of Residents' Stressors: A Review Study

Alireza Mirzaei, Sepideh Jamshidian, Fariba Haghani

The Evaluation of the Clinical Learning Environment (CLE) Using the Postgraduate Hospital Educational Environment Measure (PHEEM) in Viewpoint of Dental Residents: A Multicenter Study in Iran

Zahra Salari, Azadeh Horri, Amin Tahmasbi, Raziye Shojayepour, Fatemeh Jahanimoghadam

ThDefining the Roles of the Indicators of Collaborative Management in Implementing Health Care policy: The Grounded Theory

Mahtab Ghanbarnejad, Zahra Shokoh, Mohsen Zayanderoodi, Amin Nikpour, Saeed Sayadi

Integration of Collaborative Learning with Patient Care in Home-Based Settings

Leili Yekfallah, Fatemeh Samiee, Abbas Allami, Afsaneh Yakhforoshha

A Comparative Study of Geriatric Nursing Curriculum in Iran and Rory Meyers College of Nursing, United States of America

Maryam Houshmand, Leslie-Faith Morrirt Taub, Fon Sim Ong, Ameneh Yaghoobzadeh

Association Between Mindfulness and Work-Life Balance in Medical Faculty: Sleep Quality as a Mediator

Kobra Akhoundzadeh, Zahra Abedini, Hoda Ahmari Tehran, Ashraf Khorrami Rad

Is Using Blended Learning of Lab Skills by a Modest Augmented Reality-Based Educational Booklet Beneficial to Pharmacy Students

Zohrehsadat Mirmoghataie, Tahereh Hosseinabadi, Fatemeh Tavakoli, Maryam Tabarzad

Exploring Lived Experiences of Students Studying at Master's Degree of Online Medical Education Regarding Hidden Curriculum

Shoaleh Bigdeli, Mahboubeh Rastgou Salami, Afsaneh Dehmad, Atefeh Zabihi Zazoly, Zohreh Sohrabi, Zahra Nahardani, John Sandars

Requirements, Criteria, Challenges, and Solutions for the Internationalization of Medical Education in Iran: A Qualitative Study

Salman Bashzar, Vahid Yazdi Feyzabadi, Atefeh Ahmadi, Fatemeh Karami Robot, Masoomeh Shahsavari, Ali Akbar Haghdoost, Bagher Amirheidari

Socialization Training Courses for Medical Sciences Students: Bridging the Gap Between Theoretical and Clinical Education

Mohamad Hossein Mehroolhassani, Rohaneh Rahimisadegh

Design, Implementation and Evaluation of a Systematic Review Course for Medical Students

Mehrnoosh Khoshnoodifar, Moein Zangiabadian, Mehran Ilaghi

Artificial Intelligence, A Great Revolution in Student Support Services in E-Learning

Ehsan Toofaninejad, Soleiman Ahmady, Zohre Khoshgoftar, Somaye Sohrabi

Role of the Educational Atmosphere on Self-Efficacy Among Dental Students

Fatemeh Farshad, Masoomeh Kheirkhah, Jorma Virtanen, Hossein Hessari

Acceptance of Online Education by Undergraduate Students During the Covid-19 Pandemic: A Case Study from Kerman, Iran

FarMilad Ahmadi Gohari, Abedin Iranpour, Salahodin Rakhshani Rad, Moghaddameh Mirzaee, Ali Akbar Haghdoost

Psychometric Properties of the Context, Input, Process, and Product (CIPP) Model for the Evaluation of Medical Ethics Education

Habibeh Ahmadipour, Amirhossein Alirezaie, Mina Mobasher

Investigating the Effectiveness of Blended Learning as a New Strategy for Teaching Anatomy to Medical Students: A Systematic Review

Zahra Karbasi, Parisa Eslami, Maryam Zahmatkeshan, Sadrieh Hajesmaeel Gohari

Medical Specialty Choice and Effective Factors: A Cross-Sectional Survey of Last-Year Medical Students

Ghazal Mansouri, Zeinab Sadat Rooholamini, Fatemeh Karami Robati

Challenges, Opportunities and Future Directions of Dental Education in COVID-19 Pandemic: A Qualitative Study

Arghavan Etebarian, Leila Sadati, Somayeh Khoramian Tusi, Kamran Farjad

Design and Evaluation of the Effectiveness of the Writing Workshop on Promoting the Research Skills of Basic and Clinical Students based on Kirkpatrick's Model

Ensieh Lotfali, Hossein Tayebi, Zohre Khoshgoftar

Leveraging the Pygmalion Effect to Unlock Student Potential in Medical Education

Ramin Homayouni-Zand, Masomeh Kalantarion

Effect of Communication Skills Virtual Module Based on the Calgary-Cambridge Model on the Attitude and Performance of Medical Students

Ghobad Ramezani, Khadijeh Khoshsokhan, Eshagh Moradi, Kamran Soltani Arabshahi, Davood Rasouli

The Applicability of Interactive Educational Applications Tailored to the Type, Nature, and Characteristics of Continuing Education Courses for General Practitioners

Mehrnoosh Khoshnoodifar, Navaz Emadi, Azam Noori, Hosnieh Raoufian

Indexing the Strides in Development of Medical Education Journal in Scopus Database in 2022

Payam Khazaeli¹ 

¹Editor in Chief Strides in Development of Medical Education Journal

*Corresponding author: Pharmaceutics Research Center, Institute of Neuropharmacology, Kerman University of Medical Sciences, Kerman, Iran.
Email: pkhazaeli@kmu.ac.ir

Citation: Khazaeli P. Indexing the Strides in Development of Medical Education Journal in Scopus Database in 2022. Strides Dev Med Educ. 2023 February; 20(1):1-2. doi: 10.22062/sdme.2023.92125.

Keywords: Strides in Development of Medical Education Journal (SDME)

Editor's Note

The first issue of this journal was published in the Scopus database in 2022. The Strides in Development of Medical Education Journal is one of scientific-research journals in Iran, having published articles in the field of medical education since 2004 and has been published in full text in English in recent years. After nearly 18 years since the publication of this journal, what seemed necessary was taking adequate measures to index this journal in valid international indices; the necessity of appropriate planning for its implementation initially seemed more necessary than ever. In order to formulate a coherent, accurate, and applicable program for this course, the journal's colleagues proceeded to make practical plans; the procedure steps were determined and implemented as follows:

1. Analyzing the indexing status of the Strides in Development of Medical Education Journal.
2. Reviewing the activities performed.
3. Preparing the frame of the subject's dimensions scientifically, technically, and executively.
4. Assessing necessary influencing factors and various executive challenges.
5. Categorizing and prioritizing subjects in terms of necessity, applicability, and importance.
6. Formulating a protocol for implementing the plans made.
7. Evaluating from the perspective of experts in the field of publishing.
8. Adopting an appropriate implementation strategy.

The first step in this regard was forming a coherent and efficient team consisting of the editor, deputy editor, respected editorial board members, and journal experts

as the main team trying hard in this field. The journal's context analysis was then performed through SWOT analysis. The road map was then made to index the journal. After formulating the road map, the considered activities were implemented coherently and regularly, and all the programs required for indexing the journal in valid indices were formulated. The journal's status was analyzed as follows:

Strengths

1. The presence of experienced faculty members familiar with educational and research issues.
2. The journal's long-term history.
3. The presence of experienced and prominent professors in the field of medical education.
4. Assisting the vice-chancellor of the university in speeding up affairs related to the journal.
5. The existence of a climate of influential cooperation among the colleagues of the journal.

Opportunities

1. The high quality of published articles considering the citations.
2. Publishing the journal in English.
3. The journal's indexing in COPE and DOAJ databases.
4. The journal's validity and reputation among researchers in the field of medical education.
5. The possibility of recruiting new faculty members who graduated from medical education.

Weaknesses

1. Lack of cooperation with specialized international events in the field of medical education.
2. The success of a small percentage of international researchers in submitting articles to the journal.
3. The defects of advertising and introducing the journal in the national and international scenes.

Threats

1. The existence of competing journals with a similar scope.
2. Lack of assigning privileges to publish articles in scientific-research journals for faculty members.
3. Lack of experts in the field of publishing.
4. Lack of journal acceptance by valid international indices.

Based on the context analysis, the measures determined for indexing the journal were taken in two

aspects, including face validity and content validity, on the journal's website. In order to make plans for indexing, the relevant road map was formulated and administered step by step and specifically monitored by experts in the field of publishing at each step. One of the very effective outcomes of this process has been the increased visibility of the journal's website and the enhanced citations of the journal's articles in valid index letters, having certainly an influential role in indexing the journal. As a result of all these efforts, this journal has been indexed in the valid Scopus database since August 2022. The journal's colleagues will do their best in this regard to index this journal in other valid databases.

Supplementary Material(s): is available here [To read supplementary materials, please refer to the journal website and open [PDF/HTML](#)].

A Practical Investigation of Brain-based Teaching Approach: Teaching English Speaking Skill to Nursing Students

Farzaneh Iranmanesh¹, Mehry Haddad Narafshan², Mohammad Golshan¹

¹English Department, Maybod Branch, Islamic Azad University, Maybod, Iran.

²Department of Foreign Languages, Kerman Branch, Islamic Azad University, Kerman, Iran.

Received: 2022 November 15

Revised: 2023 February 05

Accepted: 2023 February 19

Published online: 2023 February 19

***Corresponding author:**

Department of Foreign Languages,
Kerman Branch, Islamic Azad
University, Kerman, Iran.

Email: mehri.narafshan@yahoo.com

Citation:

Iranmanesh F, Haddad Narafshan M,
Golshan M. A Practical Investigation
of Brain-based Teaching Approach:
Teaching English Speaking Skill to
Nursing Students. *Strides Dev Med
Educ.* 2023 February; 20(1):3-7.
doi:10.22062/sdme.2023.197960.1127

Abstract

Background: Brain-based teaching approach as one of the outcomes of the recent trend in neuroeducation employs brain-based learning insights and strategies to induce efficient and accelerated learning.

Objectives: This study aimed to investigate the effects of a brain-based language instruction model on nursing students' English-speaking skill.

Methods: In this quantitative study with quasi-experimental design and pre-test/post-test format, a model of brain-based instruction for 64 students of Nursing (50 females and 14 males) was incorporated into a required general English course at Islamic Azad University of Kerman, Iran during the academic year 2021-2022.

Results: Analysis of the independent sample t-tests and one-way ANCOVA indicated that the experimental group with intervention program of brain-based teaching approach considerably outperformed the control group in the pre-test and the posttest regarding speaking skill ($P < 0.01$).

Conclusion: Tracing the natural learning process in the brain, adopting compatible teaching methods, and assigning pedagogical tasks greatly facilitated understanding of the learners, learning materials, and teaching methods as well as improved the educational outcomes.

Keywords: Brain-based Instruction, English Language Learning, Nursing Students, Speaking Skill

Background

Neuroeducation, one of the new trends in education, deals with how the brain naturally learns and maximizes the instruction and learning qualities. Over the last two decades, brain research field has undergone a shift in paradigm from focusing on the regional function and mental processing of the distinct brain regions to focusing on the interrelationship among brain areas known as network connectivity. Thus, a holistic view that even a simple task is the outcome of the activation of overlapping sets of brain areas has been taken by scholars and neurologists such as Ganis, Thompson (1), Sporns, Tononi (2), and Friston (3). Similarly, connectome theory – the theoretical framework of this study – initiated by Sporns, Tononi (2) and, later, by the National Institute of Health (2016) attempts to explain the existing relationship among human cognitive activities based on the brain's neural, anatomical, and functional connections.

Another brain-based learning (BBL) theory is Adaptability which focuses on how the brain undergoes change and re-organization caused by learning new abilities, skills, and experiences as well as other

environmental factors. Learning second language (L2) skills is no exception. Recent studies on second language acquisition have suggested that L2 experiences can change the brain structures and functional networks (4-6), and that language is governed by the coordinated activity of a variety of brain regions (7).

As globalization accelerates, it becomes more critical for nursing students to communicate with speakers of other languages. English as a foreign language (EFL) has been widely used over the past decades and, as the result, the learners' communicative competence has become the focus of linguistic pedagogical interest worldwide (8). Presently, English is an international language of medicine. It is also expanding as an international communication and educational tool. The literature highlights the importance of communication skills among nursing practitioners, since an effective nurse-patient communication is a crucial aspect of quality patient care (9). In this respect, neuroeducation as an incipient trend in the history of education has not received sufficient research attention. Similar to computer-assisted learning which was once developed from advances in computer science, neuroeducation

should be developed, so that education can benefit from the medical and technological advances. Like any other academic learners, nursing students need international communication in addition to keeping themselves informed of the advances in medicine and health care. Given that English is the global language of communication and science, their general English courses which are limited to reading texts and passages have little to do with improving their communication skills in L2 as the major goal of EFL speaking. Hence the developed brain-based model of instruction was implemented to make the general English course practically communicative and productive for the nursing students. In other words, the instructional material and method was oriented toward brain-based learning in order to investigate its effects on English speaking skill of the nursing students.

Objectives

This study aimed to investigate the effects of a brain-based language instruction model on nursing students' English-speaking skill.

Methods

To test the hypotheses underpinning this quantitative quasi-experimental research, 64 nursing students (50 females & 14 males) aged 19-26 years and doing a required general English course at the foreign languages department of the Islamic Azad University of Kerman, Iran in the academic year 2021-2022 were investigated. A convenience sampling was adopted in this study where two general English classes were selected and randomly assigned to control and experimental groups. Since the distribution of male and female students was not equal, gender differences were not studied in this research. None of the participants had lived in an English-speaking country. To ensure homogeneity of the participants in terms of the English language proficiency level, a criterion-referenced measure by Longman ELT was used to evaluate 76 students, as a result of which 64 participants (32 in each class) were included in the study after excluding 25 students of either lower or upper level of English proficiency.

Speaking pre-test and post-test were conducted to measure the degree of improvement in English-speaking skill of the learners from both groups at the beginning and final sessions. Students were assessed individually by a 15-min interview using Speak Now Testing Program:

- Interview questions (i.e., a list of teacher-led interview questions)
- Role-play cards (i.e., cards for students to role-play situations in pairs)

A standardized framework adapted from Cambridge speaking assessment rubrics was used to ensure the

implementation of the same procedure in both classes. The assessment measured the participants' speaking knowledge (i.e., grammatical resource, lexical resource, and pronunciation) and speaking skills (i.e., discourse management, interactive communication, and global achievement).

The textbook "Speak Now 4" was selected as the course book to deliver the content of instruction during 14 sessions, each of which lasted 90 minutes. The conventional approach was implemented only through the activities included in the textbook and course syllabus for the control group. On the other hand, the brain-based model of instruction was used as the treatment for the experimental group.

The brain-based model of instruction was developed when the structural and functional brain regions, which are involved in language learning and cognitive functions, were explored and classified under the major activities and functions of the three large-scale brain networks (i.e., Salience, Default mode, Central executive). [Figure 1](#) shows the connections among three networks and their function and active process. Instruction process and class activities were developed for the experimental group based on the unique features of brain function that are conducive to foreign language speaking ability. Consequently, the course book instructional material and class activities were orientated toward brain-based principles and activation of the three large-scale networks. As for the experimental group and during the process of teaching speaking by considering this framework, the instructor ensured presenting, practicing, and assessing the content of the course book, which all took place in the sequence of: 1) encouraging interaction (SN), 2) creating or inferring experience (SN), particularly good experience, 3) inducing positive emotions (CEN) accordingly, and 4) reinforcing memory (DMN) and encouraging learners to interact effectively and have perseverance. These activities are manifestations of the underlying interdependent brain network functions.

All these classroom activities have been designed to facilitate activation and cooperation of the three large-scale networks as is the case in normal brain development since birth. The proposed hypothesis is a bottom-up process of tracing and bolstering neural connections and pathways in order for enhancing learning.

Data were analyzed by SPSS software (version 26) and using mean, standard deviation, independent-sample t-test, One-Way ANCOVA, and effect sizes to answer the research question (i.e., the objective of the study). The effect sizes were categorized as low ($d=0.2$), medium ($d=0.5$), and high ($d=0.8$).

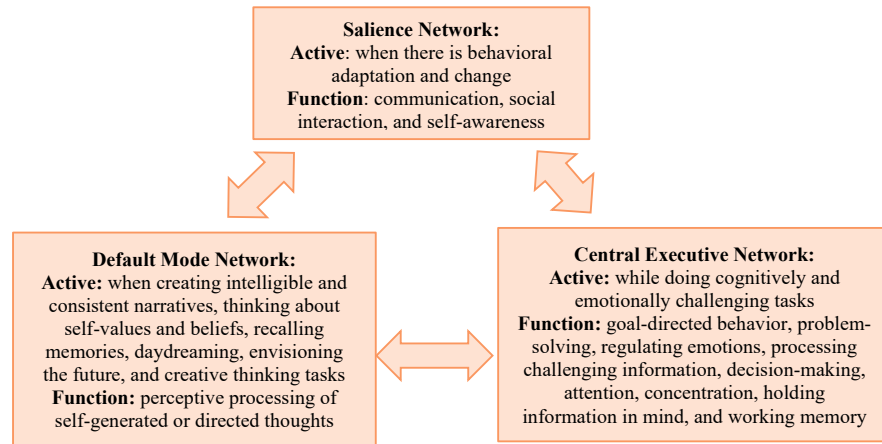


Figure 1. The Triple Networks' Areas of Activity and Functions

Results

According to the results, implementing brain-based English language instruction had no effect on speaking skill of the nursing students. Levene's test and normality checks were performed, and the assumptions were met. Homogeneity of variance, linear relationship between the dependent variable and covariate ($P > 0.50$), and homogeneity of regression slopes were observed ($P > 0.50$). Therefore, the ANCOVA test was performed to evaluate the speaking development variable.

As shown in Table 1, there was a significant difference between experimental group and control group regarding the mean scores achieved in the post-test speaking development. Therefore, implementing brain-based instruction significantly contributed to improving the participants' speaking skill ($P < 0.01$). The estimated partial Eta Squared was (partial $\eta^2 = 0.62$), which showed a good effect. Therefore, the null hypothesis was rejected and, according to the estimated marginal means, the experimental group was found to perform more successfully than the control group regarding the improvement of speaking skill (Table 1).

Moreover, analysis of the independent sample t-test for the pre-tests in both groups found no significant difference in their command of speaking. However, the results confirmed a significant difference in the mean scores for speaking development in the post-test of both groups with an increase in the mean score of the experimental group (Table 2). The effect size was 1.32 and the r was 0.55.

Discussion

Analyzing the brain's distributed functional and structural areas responsible for language-related activities based on the triple large-scale networks helped develop an instructional brain model which was used in this study to test practicality. The effect of this instructional model on the English-speaking skill of nursing students was investigated, and it was revealed that the experimental group outperformed the control group with a bigger effect size. The results of the speaking test demonstrated that the students in the experimental group performed better in terms of initiating a conversation since the treatment was based on cultivating interaction as the opening phase. It was detected that they were able to maintain and manage the flow of speaking more effectively as long as they benefited from the treatment involving creation of narratives and self-generated perceptive as well as expressing directed thoughts. When students from experimental group were asked to illustrate examples and support their viewpoints, they were found more prepared and more expressive than those from the control group. Moreover, the experimental group outperformed the control group regarding vocabulary knowledge and sentence structures with less grammatical and pronunciation errors.

This may have been attributed to the efficiency of the brain-based model. This model of instruction entails a cycle of cultivating interaction, generating experience, provoking positive emotions and, accordingly, reinforcing memory which motivates the learners to interact more effectively and continuously. Instructional and class activities practiced in this cycle framework are projections of the brain's triple large scale networks function in a triggered systematic way.

Table 1. The Result of Covariance Analysis and Estimated Marginal Means (Speaking Development)

	Source	Sum of Squares	df	Mean Square	F	P-Value	partial η^2
Covariance Analysis	Pre-test	65.650	1	65.650	34.003	0.000	
	Group	80.466	1	80.466	41.677	0.000	0.62
	Error	117.772	61	1.931			
	Corrected Total	259.984	63				
Estimated Marginal Means	Group	Estimated Marginal Mean	Std. Error				
	Control	15.75	0.246				
	Experimental	18.02	0.246				

df: Degree of freedom

Table 2. Independent Sample T-Test of Research Variable

Variable	Time	Group	N	Mean(SD)	T-Test	df	P-Value	Mean Difference	95% CI of the Difference	
									Lower	Upper
Speaking Development	Pre-Test	Control	32	13.96(1.42)	0.22	61.98	0.830	0.02	-0.72	0.78
		Experimental	32	13.94(1.45)						
	Post-Test	Control	32	15.75(2.16)	-5.09	46.77	0.000	-2.27	-3.11	-1.42
		Experimental	32	18.02(1.13)						

SD: Standard deviation; df: Degree of freedom; CI: Confidence interval

In other words, the relevance of implementing this model lies in the fact that it follows the natural learning process of the brain through establishing interaction and creating experience, creating positive emotion, and reinforcing the memory, which determine brain development since childhood. This finding was in line with the connectome theory which emphasizes the immersing functions of the brain due to conjoined actions of dispersed areas in the brain rather than the separate actions of distinct areas; however, it was inconsistent with brain modularity which suggests that single brain areas operate in isolation to process and produce cognitive functions. That is why simultaneous conjoint actions of the triple networks are emphasized and practiced in this model of instruction.

Our study results regarding the defined components for the brain-based teaching approach (BBTA), as developed in the model, were consistent with the findings from the study by Jensen (10) regarding two essential features for brain development; adaptability, which reinforces the fact that environmental factors such as experiences, actions, and interactions, causes changes in the brain and the integration which supports how well the structures of the brain cooperate and compete to store and process information. Occurrence of these changes, which are initiated by activation of the learners' perception, sensory-motor integration, joint attention, sharing of experience, and social involvement, was also confirmed by Caplan (11) who examined the association of epilepsy, language, and aspects of social behavior. Caplan underscored the importance of developing both social and language skills for intrapersonal and interpersonal functioning and quality of life through indicating the association and

connectivity of the biological and psychological underpinnings of language and social skills in adults and children. Regarding the social brain, eliciting emotion, and developing thinking skills as effective determinants of the brain-based language learning instruction, the empirical studies corroborated the original findings by Hileman (12) and Tate (13) who offered recommendation for engaging the brain and implementing strategies that potentiate brain-based learning.

As for the implementation of principles and strategies of brain-based teaching including brain activation, novelty, challenge, meaning-making, interactive feedback, and collaboration developed in classroom activities, the positive outcome was similar to the findings reported in the study by Tafti and Kadkhodaie (14) who investigated the positive effects of these principles and strategies on life skills including self-management, empathy, effective communication, awareness, stress management, decision making, and critical thinking as learning skills.

Finally, our study result regarding the overall speaking achievement of the experimental group was remarkably consistent with the findings by Immordino-Yang and Darling-Hammond (15) who revealed that conjoined brain functions and social relationships, emotional experience, as well as cognitive resources were required for brain development and taking advantage of learning opportunities. Despite the existence of a great potential for applying cognitive neuroscience findings to education, limited experimental studies have been conducted to investigate the application of brain-based principles in classrooms. Implementing this brain-based model of instruction,

which requires more practical investigation before its application in the educational system, may have positively contributed to not only general English courses but also to nursing field of study.

Conclusion

Brain-based compatible instruction, which is at the forefront of education presently, led to the emergence of neuroeducation. This study aimed to examine the connectome theory which concentrates on brain network connectivity. Given that different brain areas do not function in isolation and that the brain has a proven ability to perform multiple simultaneous functions, the L2 speaking skill was selected to help put a theory into practice. This selection was motivated by: first, completion of the speaking process requires multiple functions of the brain; and second, L2 speaking ability is considered a tedious skill to achieve among learners, including nursing students. Compatible activities, techniques, and strategies used in this experiment for simultaneous activation of the three large-scale networks were found to successfully help the learners improve their English-speaking skill.

Acknowledgements: The authors would like to thank all scholars of neurological studies who contributed to pedagogical investigations as well as all students who participated in this study.

Conflict of interests: The authors declare that they have no conflict of interests.

Ethical approval: This study was approved by the Islamic Azad University of Kerman branch with the ethical code No. 1400.17 948.



Funding/Support: This study received no funding support.

References

1. Ganis G, Thompson WL, Kosslyn SM. Brain areas underlying visual mental imagery and visual perception: an fMRI study. *Brain Res Cogn Brain Res*. 2004 Jul;20(2):226-41. doi: 10.1016/j.cogbrainres.2004.02.012. [PMID: 15183394]
2. Sporns O, Tononi G, Kötter R. The human connectome: a structural description of the human brain. *PLoS Comput Biol*. 2005 Sep;1(4):e42. doi: 10.1371/journal.pcbi.0010042. [PMID: 16201007] [PMCID: PMC1239902]
3. Friston KJ. Functional and effective connectivity: a review. *Brain Connect*. 2011;1(1):13-36. doi: 10.1089/brain.2011.0008. [PMID: 22432952]
4. Bubbico G, Chiacchiaretta P, Parenti M, Di Marco M, Panara V, Sepede G, et al. Effects of second language learning on the plastic aging brain: functional connectivity, cognitive decline, and reorganization. *Front Neurosci*. 2019 May 15;13:423. doi: 10.3389/fnins.2019.00423. [PMID: 31156360] [PMCID: PMC6529595]
5. Luk G, Pliatsikas C, Rossi E. Brain changes associated with language development and learning: A primer on methodology and

6. applications. *System*. 2020;89:102209. doi: 10.1016/j.system.2020.102209.
6. Sousa DA. *How the brain learns*. 5th ed. California, USA: Corwin Press; 2016.
7. Bressler SL, Menon V. Large-scale brain networks in cognition: emerging methods and principles. *Trends Cogn Sci*. 2010 Jun;14(6):277-90. doi: 10.1016/j.tics.2010.04.004. [PMID: 20493761]
8. Mahmoodi H, Narafshan MH. Identity types and learners' attitudes in language learning: Voices from students of medical sciences. *Research and Development in Medical Education*. 2020;9(1):17. doi: 10.34172/rdme.2020.017.
9. Bennett K, Lyons Z. Communication skills in medical education: an integrated approach. *Education Research and Perspectives*. 2011;38(2):45-56.
10. Jensen E. *Teaching with the brain in mind*. 2nd ed. Alexandria, Virginia USA: Association for Supervision and Curriculum Development; 2005.
11. Caplan R. Epilepsy, language, and social skills. *Brain Lang*. 2019 Jun;193:18-30. doi: 10.1016/j.bandl.2017.08.007. [PMID: 28987707]
12. Hileman S. Motivating students using brain-based teaching strategies. *Agricultural Education Magazine*. 2006;78(4):18-21.
13. Tate ML. Worksheets don't grow dendrites. *Instructional Leader*. 2013;26(2):1-3.
14. Tafti MA, Kadkhodaie MS. The effects of brain-based training on the learning and retention of life skills in adolescents. *Int J Behav Sci*. 2016;10(4):140-4.
15. Immordino-Yang MH, Darling-Hammond L, Krone C. *The Brain Basis for Integrated Social, Emotional, and Academic Development: How Emotions and Social Relationships Drive Learning*. Washington, D.C., USA: The Aspen Institute; 2018.

Developing and Validating an Assessment Blueprint for Clinical Skill Competencies in General Surgery for the Medical Undergraduates

Neetha Kundoor¹, Faiz Hussain², Sridhar Lingam², Venkat Narsimha Reddy³, Rekha Arcot⁴, Harshita Bondugula⁵, Srilatha Bashetti⁶

¹Department of Biochemistry, Apollo Institute of Medical sciences & Research, Hyderabad, Telangana, India.

²Department of General Surgery, Apollo Institute of Medical Sciences & Research, Hyderabad, Telangana, India.

³Department of General Surgery, Gandhi Medical College, Hyderabad, Telangana, India.

⁴Department of General Surgery, Dean, Apollo Institute of Medical Sciences & Research, Hyderabad, Telangana, India.

⁵Department of Dermatology, Apollo Institute of Medical Sciences & Research, Hyderabad, Telangana, India.

⁶Department of Biochemistry, Dr. Patnam Mahender Reddy Institute of Medical Sciences, Chevella, Telangana, India.

Received: 2023 January 12

Revised: 2023 January 12

Accepted: 2023 February 19

Published online: 2023 February 21

***Corresponding author:**

Apollo Institute of Medical Sciences and Research, Hyderabad, Telangana, India.

Email: neethareddy22@yahoo.com

Citation:

Kundoor N, Hussain F, Lingam S, Reddy VN, Arcot R, Bondugula H, Bashetti S. Developing and Validating an Assessment Blueprint for Clinical Skill Competencies in General Surgery for the Medical Undergraduates. Strides Dev Med Educ. 2023 February; 20(1): 8-15.
doi:10.22062/sdme.2023.198234.1156

Abstract

Background: Assessment is the requisite or essential part of medical education. A Blueprint is a calibrated or quality document that compiles the entire educational content and its outcome.

Objectives: The present study was done to develop an assessment blueprint for clinical skill competencies in the Department of General Surgery for medical undergraduates.

Methods: Blueprint was developed as an assessment tool for undergraduate medical students attending the third stage of general surgery, part 2. The feedback form was circulated among the departmental faculty to obtain their perception/ opinion about the designed blueprint. The feedback was then analysed.

Results: Feedback was 73- 83% satisfactory from the faculty's opinion, and they stated that it aligned with learning objectives and public health. Important topics were considered, and they can be used to assess in-depth knowledge to improve clinical skills and be considered an integral part of assessments.

Conclusion: Blueprint could be an essential tool to conduct unbiased, ethical, and consistent examinations because it has a structured format that reflects the competencies that can be assessed. This may help quality medical education by improving assessment standards.

Keywords: Blueprint, General Surgery, Medical Education, Assessment Tool

Background

Assessment is the requisite or essential part of medical education. Indian medical schools follow the traditional method of assessments, in which only a few structured cases, like long or short cases, are used to assess student's clinical skills (1), by which we cannot assess the total concepts covered in the curriculum framed and appears to be more theoretical and not aligned with the learning objectives. Introducing blueprint assessment as a technical component for skill assessment is an ideal solution, which helps reduce the standard drawbacks of assessment. A Blueprint is a calibrated or quality document that compiles the entire educational content and its outcome. It ensures to cover all the aspects of the curriculum and their educational domains during assessment (2). Blueprint specifies the subject content, topic, learning objectives, like skills, knowledge, and

attitude, and the tools and methods to assess the content. Blueprinting in assessment is essential as it is a perfect source of evidence supporting the content validity. Hence, to assess fairly and provide clear guidelines to students, such as what is to be studied, what is to be learned, skills to be acquired, etc., blueprinting assessments could be a gold-standard method for evaluation (3). A well-structured blueprint refers to a valuable educational tool to improve the assessment quality in medical education. The present study was done to develop an assessment blueprint for clinical skill competencies in the Department of General Surgery for medical undergraduates. It included designing the blueprint for assessing clinical skills among undergraduates of general surgery and analysing the faculty's perception of the process of designing an assessment blueprint.

Objectives

The aim of this study was to develop a blueprint for the clinical assessment of undergraduate medical students in the department of general surgery at the Apollo Institute of Medical Sciences and Research. We aimed to improve undergraduate medical education by contributing to the development of standard assessment methods and acquiring feedback from the experts.

Methods

It is a one-year cross-sectional study. The curriculum coordinator and the faculty from the Department of General Surgery from two different medical schools (Apollo Institute of Medical Sciences and Research and Gandhi Medical College) participated in developing the blueprint. All the medical schools in India have adopted a competency-based curriculum, which was proposed by the National Medical Commission (NMC) in 2019. The medical school curriculum has three phases: phase 1 (one year of pre-clinical subjects, including anatomy, physiology, and biochemistry), phase 2 (one year of para-clinical subjects, including community medicine, forensic medicine, pathology, pharmacology, microbiology, and clinical rotations), phase three has two parts: two years of clinical subjects, including community medicine and medicine, and allied subjects, including psychiatry, dermatology, obstetrics and gynecology, and paediatrics.

Planning: This blueprint was framed to assess the clinical competencies of medical students for their complete clinical postings in general surgery (From phase 2 to phase 3) at Apollo Institute of Medical Sciences & Research, Hyderabad.

Sensitization workshop

With the consensus from the faculty, all the competencies suggested by the NMC for undergraduate standards were considered in developing the blueprint. The process started with a series of workshops conducted by the medical education team to sensitize the faculty following a template, which was provided to all the Faculty of General Surgery. The content details are described in [Table 1](#).

The blueprint content was developed by ten specialists (from two different medical schools), the dean, and eight postgraduates.

Step 1: The subject experts defined the purpose and scope of the subject related to the blueprint. The curriculum contained competencies covering the entire syllabus included in phases 2 and 3. Firstly, the learning objectives were framed, and the subject experts prepared the teaching/learning (T/L) methods and the assessment tool for each competency.

Step 2: The weightage was identified for each competency based on two parameters, including the impact of the topic on health (I) and its frequency of occurrence (F) (I×F). Perceived impact of the topics on health was identified: (I)- 1) non-urgent, 2) serious but not life-threatening, and 3) life-threatening emergency- and frequency of occurrence of a particular disease (F): 1) rarely seen, 2) relatively common, and 3) very common. Based on the I×F, the topics were classified as “must know” with I×F of 6-9, “should know” with I×F of 3-4, and “good to know” with I×F of 1-2. The weightage coefficient for each competency was calculated as I×F/T. The sum of I and F is labelled as T. Number of questions of each competency was calculated by multiplying the weightage coefficient by the total number of items in the assessment. The total marks of each topic were calculated by multiplying the corresponding value of weightage (W) by the total marks the students were assessed as per the blueprint.

Step 3: Each competency was described in detail to ensure that the medical student is trained and assessed to meet the minimum level expected. The division of competency is described in [Table 2](#). The assessment was divided into OSCE (Objective Structured Clinical Examination) and Case-Based Discussion. Further, OSCE was divided into history taking, physical examination, clinical procedure, clinical reasoning, and communication skills.

Step 4: A faculty feedback questionnaire on the assessment blueprint was prepared. The feedback questionnaire was peer-reviewed and validated by the medical education team and used a 5-point Linkert scale to grade their perceptions.

Statistical analysis was done using Cronbach’s alpha to test the scale’s reliability. The value obtained was 0.585. The generally accepted rule is alpha between the 0.6-0.7 range indicating an acceptable level of reliability. To make an opinion about the blueprint designed, feedback was collected from the faculty of general surgery. The feedback form included certain standard validated questions to obtain valid perceptions of the faculty. The questions were framed to help us evaluate the importance or the need for the blueprint to assess the clinical skills of the medical students.

Results

[Table 1](#) depicts a spreadsheet created with column 1 showing the competency number followed by column 2 with the clinical competencies (systems). The competencies are part of the curriculum suggested by the NMC of India. The subject experts assigned the appropriate T/L method to each competency, which is mentioned in column 3, while two parameters were

considered to calculate age weight: 1) the perceived impact of that competency in terms of its impact on health in society (I) (columns 4 and 2) Frequency of its occurrence (F) (column 5).

The product was calculated by multiplying I and F for each competency to give a weightage in column 6. For calculating the weightage in column 7, each competency's product (I×F) was divided into the total competencies (Tis the sum of I×F of all competencies).

In columns 8 and 9, the weightage of each competency is multiplied by the number of items for an assessment. Here, the assessment was an objective structured clinical examination (OSCE) with 15 stations with ten marks each, followed by the phase (Phases 2 and 3), at which the competency was tested in column 10. The competency can be taught and assessed in one or more phases. This covered the total syllabus designed as per NMC guidelines. It gathers certain information on whether the blueprint makes the examination fair, covers all the essential topics, and should be an integral part of the examination, giving students what to know and aligning with learning objectives, and helping as a guide to constructing clinical exam format. It has all the details of various competencies, which were aligned with the T/L method and the appropriate assessment, and the phase, in which that particular competency is taught and assessed. It also gives information on the marks allotted to a competency based on the competency's impact score and the frequency of its application in clinical practice.

Table 3 explains the curricular contents, based on which the product I×F was categorized into "must know," "should know," and "nice to know." Thus, in our study, 52% of the competencies fall into must know category, 31% should know, and 17% nice to know. This guides the examiners in selecting the tasks for assessment; in this phase, the curriculum should be analyzed, and the marks should be allotted.

In Table 2, the competencies (curricular content) are further divided based on various patient presentations and conditions. This will help the examiner to assess all the aspects of the curriculum using various domains of OSCE. Some of the patient presentations and conditions can be assessed by one or more domains of OSCE. The results of the feedback questions were measured in percentage (Figure 1). Thus, 97% of the faculty believed that blueprint makes examination fair, 93% agreed that it covered all the subject-related important topics and can make an integral part of the assessment, 90% believed that it improves the validity of exams, 87% expressed that blueprint acts as a guide to constructing clinical exam format and it is an assessment plan framed according to what one must know and learn, 73% believed that this blueprint is aligned with learning objectives and can be used to assess skills and in-depth knowledge, and 70% felt that the weightage is given to public health important topics.

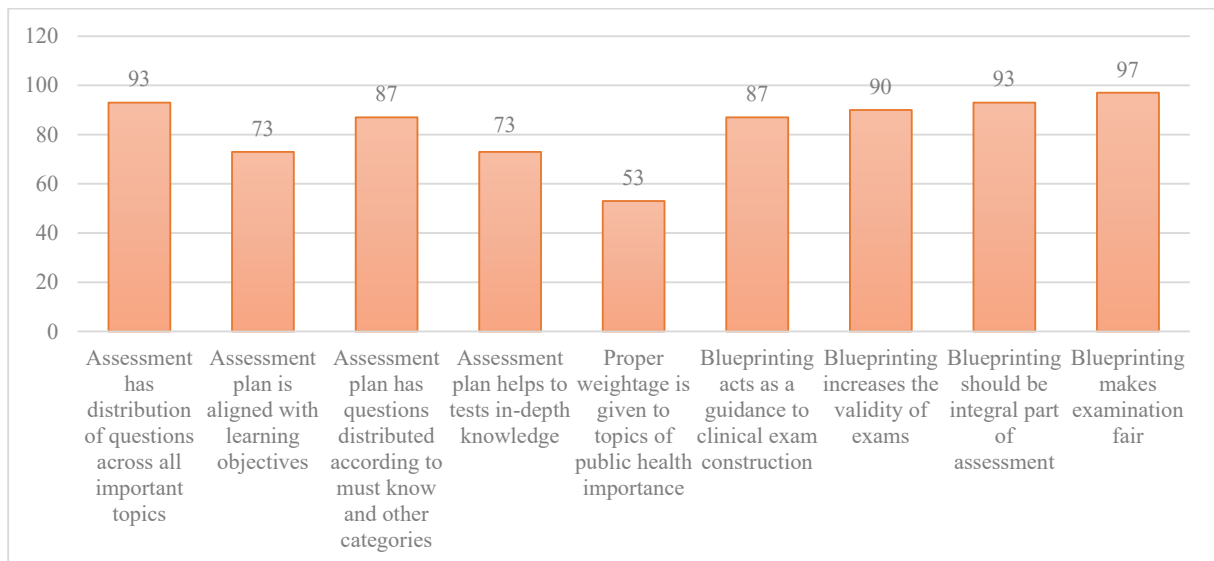


Figure 1: Measures of Faculty Feedback form in percentage

Table 1. Blueprint for Clinical Assessment in General Surgery for undergraduates

S.NO	Competency No.	SYSTEM/TOPIC	T/L method	Impact (I)	Frequency of Occurrence (F)	I×F	W=I×F/T	NUMBER OF QUESTIONS= W×15	Marks= W× 150	Rounding off (Culminate) closer to the next value	Phase 2	Phase3 (Part 1)	Phase3 (Part 2)
1	SU2.3	Communication with and counsel patients and families about the treatment and prognosis of shock and show empathy and care	Role Play	3	2	6	0.052	0.78	7.8	8			√
2	SU3.3	Counseling patients and family/friends for blood transfusion and blood donation	Role Play	2	3	6	0.052	0.78	7.8	8	√		
3	SU8.2	Showing professionalism and empathy with the patient during general surgery	Role Play	1	3	3	0.026	0.39	3.9	4	√		
4	SU9.3	Informing the results of surgical examinations and proper counseling with the patient	Role Play	1	3	3	0.026	0.39	3.9	4	√		
5	SU10.2	Describing the steps and obtaining informed consent in a simulated environment	Role Play	1	3	3	0.026	0.39	3.9	4	√		
6	SU10.4 (First Aid)	Performing basic surgical skills such as first aid, including suturing and performing minor surgeries in a simulated environment	DOAP	3	2	6	0.052	0.78	7.8	8			√
7	SU11.3 (Air Way)	Demonstrating airway maintenance on a mannequin or similar	DOAP	3	2	6	0.052	0.78	7.8	8			√
8	SU13.4 (Organ Transplant)	Counseling patients and relatives in the field of organ donation in a simulated environment	Role Play	1	1	1	0.008	0.12	1.2	2	√		
9	SU14.4 (Suturing)	Demonstrating asepsis and suturing techniques in a simulated environment	DOAP	2	3	6	0.052	0.78	7.8	8			√
10	SU17.2 (BLS)	Demonstrating the steps in Basic Life Support Transportation of an injured patient in a simulated environment	DOAP, SNAPPS	3	3	9	0.078	1.17	11.7	12	√		
11	SU17.10 (Chest Trauma)	Demonstrating airway maintenance Recognition and management of tension pneumothorax, hemothorax, and chest flap in a simulated environment	DOAP	3	3	9	0.078	1.17	11.7	12		√	

12	SU18.3 (Swelling)	Explaining and showing the clinical examination of the surgical patient, including swelling, and ordering the relevant tests for diagnosis. Describing and discussing an appropriate treatment plan.	SNAPPS	2	2	4	0.035	0.525	5.25	5	√	
13	SU22.3 (Thyroid Disorders)	Demonstrating and documenting the correct clinical examination of thyroid swellings and discussing the differential diagnosis and their management	SNAPPS	2	3	6	0.052	0.78	7.8	8	√	
14	SU25.4 (Breast Counseling)	Counseling the patient and obtaining informed consent for the treatment of malignant conditions of the breast	Role Play	3	2	6	0.052	0.78	7.8	8	√	
15	SU25.4 (Breast Examination)	Demonstrating the correct method of breast palpation for breast swelling on a mannequin or a similar condition	DOAP	1	2	2	0.017	0.255	2.55	2	√	
16	SU27.8 (Lymphatic System)	Demonstrating the correct examination of the lymphatic system	SNAPPS	1	2	2	0.017	0.255	2.55	2	√	
17	SU27.8 (Hernia)	Demonstrating the correct technique to examine the patient with the hernia and identify different types of hernias	SNAPPS	1	3	3	0.026	0.39	3.9	4	√	
18	SU28.9 (Abdomen)	Demonstrating the correct technique of examination of a patient with stomach disorders	SNAPPS	1	3	3	0.026	0.39	3.9	4		√
19	SU29.10 (Rectal)	Demonstrating a digital rectal examination of the prostate on a mannequin or a similar condition	DOAP SNAPPS	2	2	4	0.035	0.525	5.25	5	√	
20	SU30.5 (Scrotal)	Examination of scrotal swelling	SNAPPS	3	3	9	0.078	1.17	11.7	12	√	
21	SU27.6 Vascular System	Examination of the arterial system	SNAPPS	1	2	2	0.017	0.255	2.55	2		√
22	SU27.6 Vascular System	Examination of venous system	SNAPPS	3	2	6	0.052	0.78	7.8	8		√
23		Examination of ulcer	SNAPPS	3	3	9	0.078	1.17	11.7	12	√	
						114		14.805	148.05	150		

Table 2. Various patient presentations, conditions, and domains of OSCE

Outcomes	Presentation	Various patient presentations and conditions and the domains of OSCE							
		Conditions	History Taking	Physical Examination	Clinical Procedure	Clinical Reasoning	Data Interpretation	Communication/ Counselling skills	Training Phase
Communicating with and counseling patients and families about the treatment and prognosis of shock and demonstrating empathy and care		Septic shock							
Counseling patients and families/ friends about blood transfusion and blood donation		Counseling the patient/Family member on the significance of blood donation						√	Phase 2
		Obtaining consent for transfusion						√	Phase 2
Showing professionalism and empathy with the patient during general surgery	Peri-operative care: Minor procedures	Informing the patient about the procedure and associated risks						√	Phase 3 (Part 1)
		Obtaining consent for surgery						√	Phases 2 and 3 (Part 1)
Informing the patient of the results of surgical examinations and advising the patient appropriately	The routine investigation done before surgical procedure; Investigations related to any kind of malignancy	Investigation of the results for minor procedures, major procedures, and malignancy						√	Phases 2 and 3 (Part 1)
	Interpretation of Investigation results					√	√		
Performing basic surgical skills such as first aid, including suturing and performing minor surgeries in a simulated environment, Demonstration of asepsis and suturing techniques	Minor Injury Abscess	Hand washing Glowing and gowning Donning and doffing			√				Phase 2
		Preparation of antiseptic field			√				Phase 2
		Incision and closure of skin and subcutaneous tissue			√				Phase 3 (Part 2)
		Intercostal drain			√				Phase 3 (Part 2)
		Appropriate selection of instruments for various minor procedures			√	√	√	√	Phase 3 (Part 1)
		Surgical drainage of abscess			√				Phase 3 (Part 2)
		Catheterization (Male/Female)			√				Phase 3 (Part 1)
		Wound dressing			√				Phase 3 (Part 2)

Transplantation	Awareness of Organ Donation	Discussion about organ donation with the family of a dying patient						√	Phase 2,3 (Part 1)
Trauma	Injured patient	BLS			√				Phase 2/3 (Part 1)
		Airway management			√	√			Phase 3 (Part 1,2)
Skin and subcutaneous tissue	Subcutaneous swelling Ulcer	Lipoma, Neurofibroma keloid, Sebaceous cyst	√	√		√			Phase -2,3 (Part 1)
Breast	Breast lumps and nipple discharge, Acute Breast pain	Breast lumps: benign and malignant Breast abscess	√	√			√		Phase 3 (Parts 1 and 2)
		Patient counseling and obtaining informed consent for the treatment of malignant breast diseases						√	Phase 3 (Part 1)
Vascular and lymphatic diseases	Leg ulceration, Varicose veins, Limb Ischemia: Acute and Chronic, Lymphadenitis: Acute and Chronic	Diabetic ulcer, Venous insufficiency, Vascular injury, Thrombotic arterial disease	√	√		√	√		Phase 3 (Part 1,2)
Abdomen	Abdominal pain, Change in bowel habit Gastrointestinal, Hemorrhage Dysphagia, Dyspepsia, Jaundice	Appendicitis Intestinal, Obstruction, Peritonitis, Peptic ulcer disease Benign and malignant hepatic gall bladder Gastrointestinal malignancy	√	√	√	√		√	Phase 2, 3 (Part 1,2)
Hernias	Abdominal swelling	Inguinal hernias	√	√		√		√	Phases 2 and 3 (Part 1,2)
Rectal	Abdominal pain, Change in bowel habit, Gastrointestinal, Hemorrhage	Hemorrhoids and perianal disease, Anal fissures	√	√		√		√	Phase 2, 3 (Part 1,2)
Urinary system	Loin pain, Haematuria, Lower urinary tract symptoms	Urethral Strictures, Urinary calculus disease; Urinary tract infection	√	√	√	√		√	Phase 3 (Part 1,2)
Penis, testis, and scrotum	Scrotal swellings, Testicular pain	Hydrocele, Sebaceous cyst, Orchitis, Epididymo orchitis	√	√	√	√		√	Phase 3 (Parts 1 and 2)

Table 3. Categorization of competences

I×F	Category	Percentage	Phase		
			Phase 2	Phase 3 (Part 1)	Phase 3 (Part 2)
6-9	Must know	52%	2	5	5
3-4	Should know	31%	4	2	1
1-2	Nice to know	17%	1	2	1
Total		100%			

Discussion

The present study was done as a practice to improve the validity of assessment and conduct a fair assessment with a standardized and guided blueprint in the Department of General Surgery. The results will help the faculty to make decisions on the student's performance based on multiple data in formative assessments. Blueprint can be stated as a map for assessment ensuring the inclusion of all the aspects of the curriculum of different educational domains (4). Blueprint means "detailed action plan." In brief, it acts as a link between assessment and learning objectives. Blueprint enables the faculty to set the question paper in such a way that it covers most of the important concepts and tests the students' in-depth knowledge. It gives a clear idea to frame the appropriate questions to test that particular objective, specific to the content unit, with specified marks (5). It matches the exact modality of assessment with different competencies of the course content. Blueprint helps to reduce major validity threats, such as underweighting national health important topics, assessment bias, such as question paper format being either too easy or too difficult or examiner bias.

In a study conducted by Patil et al. (2017) on introducing a blueprint in assessments in the Department of Pathology, the faculty believed that the blueprint helps as a guide in framing the question paper and improves the validity of assessments (100%) and about 89% of the faculty expressed that that blueprint must be a constitutive part of assessments, as it makes the assessment fair (6). Considering the open-ended questions for both faculty and students, it was suggested that blueprinting must be used for all the examination phases, like summative, formative, internal, pre-final, and final university assessments. Our results are in accordance with this study. The result of the present study in the form of faculty's feedback indicated that developing the blueprint for the assessment purpose is essential and will be a template that guides the faculty to design the question paper with aligned learning objectives, covering the curriculum content specified for the course. It was also stated that it highlights the must-know contents, helps assess the students' in-depth knowledge and gives equal weightage

for all the topics to conduct a fair assessment. Our study results are in accordance with the previous studies (6).

We finally found that the faculty believed that a blueprint can be made as an integral part of the assessment and helps fair examinations.

Conclusion

This study designed an assessment blueprint as a tedious process because it involved multiple stakeholders. It is a valid and reliable tool because it aligns clinical competencies and learning objectives with assessments and ensures that all topics are given appropriate weightage. The assessment blueprint makes the examination fair not only for the students but also for the examiner. This may contribute to quality medical education by improving assessment standards.

Acknowledgements: I sincerely acknowledge Dr. Krishnaveni Desai and Mr. Radhakishan Narsini for their timely and valuable and timely advices.

Conflict of interests: The authors declare that they have no conflict of interests.

Ethical approval: AIMSIRB.RC.2021/07/017.

Funding/Support: Self-Funded.

References

1. Patil SY, Hashilkar NK, Hungund BR. Blueprinting in assessment: how much is imprinted in our practice? *J Educ Res Med Teach.* 2014;2(1):4-6.
2. Sood R, Paul V, Mittal S, Adkoli B, Sahni P, Kharbanda O. Assessment in medical education: trends and tools. New Delhi: KL Wig CMET, AIIMS; 1995.
3. Adkoli BV, Deepak KK. Blue printing in assessment. In: Singh T, Anshu, editors. Principles of assessment in medical education. New Delhi: Jaypee Publishers; 2012: 205-13.
4. Adkoli B. Attributes of a good question paper. In: Sood R, editor. Assessment in Medical Education: Trends and Tools. New Delhi: KL Wig Center for Medical Education and Technology, AIIMS; 1995.
5. Hamdy H. Blueprinting in medical education. *N Engl J Med.* 2007;356:387-95. doi:10.1056/NEJMra054784.
6. Sunita Y Patil, Manasi G, Hema BB, Ashwini R. Blueprinting in assessment: A tool to increase the validity of undergraduate written examinations in pathology. *Int J Appl Basic Med Res.* 2015 Aug;5(Suppl 1):S76-9. doi: 10.4103/2229-516X.162286. [PMID: 26380218] [PMCID: PMC4552073]

Systematic Observatory in Various Fields of Medical Sciences: The Necessity of the Future Complicated World

Reza Dehnavieh¹, Sara Zare^{2*}, Parisa Dehghanian²

¹Professor of Health and Medical Services Management, Health Foresight and Innovation Research Center, Institute for Future Studies in Health, Kerman University of Medical Sciences, Kerman, Iran

²MSc Student in Health and Medical Services Management, Department of Management, Policy and Health Economics, Faculty of Medical Information and Management, Kerman University of Medical Sciences, Kerman, Iran

Received: 2022 October 04; **Revised:** 2023 January 23; **Accepted:** 2023 February 28; **Published online:** 2023 February 28

***Corresponding author:** Department of Health Management, Policy and Economics, Faculty of Management and Medical Information Science, Kerman University of Medical Science, Kerman, Iran. Email: zares7749@gmail.com

Citation: Dehnavieh R, Zare S, Dehghanian P. Systematic Observatory in Various Fields of Medical Sciences: The Necessity of the Future Complicated World. *Strides Dev Med Educ.* 2023 February; 20(1):16-17. doi:10.22062/sdme.2023.197933.1124.

Keywords: Observatory, Medical Education, Trends

Dear Editor,

Similar to other sciences, medical sciences have witnessed fast progress and changes in the world around them in recent years. This factor, along with the relation of these sciences to the principal issue of health, has led the up-to-datedness of education in the fields of medical sciences to be of a particular place and importance. The up-to-datedness of education becomes more prominent, particularly when we pay attention to the fast environmental changes in the future as well. We will witness a more complicated environment for medical science education in the near future because of salient developments in the fields of technology, political and economic evolutions, demographic changes, etc. Therefore, one of the fundamental requirements to deal with these changes appropriately is to recognize the various changes influencing medical science education (1).

Some of these changes are related to social and demographic changes, including the increase in aging and the changes in the mean age of various beneficiary groups (service providers and recipients, students, and professors), the expectations of society and the workforce, and the pattern of migrations (2).

Some other changes are regarding the field of technology, such as the expanded use of telemedicine, changes in technology-based teaching methods,

including the metaverse, the increase of virtualization, the development of hybrid structures, the development of online learning, the increase of access to educational resources and services, the recognition of the source of many diseases, genetics-based treatments, and personalized medicine (3).

Economic and political evolutions, such as increasing financial limitations, reduced share of government in educational costs, the emergence of various business models, the entry of digital currencies into educational and competitive structures, and the specialization of the short-term educational courses market, increase the sensitivity to changes in this field (3).

In addition to the changes mentioned above, newfound diseases, lifestyle changes, increased immobility, increased unhealthy eating habits and reduced access to natural and organic food, the rampant growth of urbanization and its effect on villages and the increase of slum areas, environmental pollution, and climate change will also affect the field of medical science education (4).

The mentioned changes denote that in the field of medical science education, we should be sensitive to the features of the new and complicated environment and deal with them alertly. One of the methods that can be used to monitor changes and also to be assured of the up-to-dateness of medical science education is systematic observatory. "Observatory" literally refers to

an institution specially designed and equipped to monitor meteorological and astronomical phenomena and any building providing a broad view of the surrounding environment. Health observatory systems are defined as policymaking-oriented centers that carry out regular and continuous observations and analyses of health issues concerning a specific population and a geographic area (5).

Given the importance of this topic, during the previous years, actions have been taken to monitor education at the Institute for Futures Studies in Health, and the critical points of these actions are mentioned as follows. The first point is that observatory should be performed with the engagement of all beneficiaries in various fields of medical sciences. Shifting the importance of consciousness of the future and sensitization will help in the more serious engagement of beneficiary groups effectively. The next point is that observatory should be based on recognized scientific principles. Without paying attention to such principles, the produced evidence will be of low quality, and proper messages will not be produced. Another point is that observatory is a continuous process; therefore, we should rationalize our expectations toward it at the very first point. The last point is that observatory is an interdisciplinary process; thus, the engagement of social, economic, political, etc. experts in it will enrich it more and more and identify the dark facets of the future of the fields.

Observatory in the country's field of medical science education should be carried out systematically; the following recommendations are of particular importance to achieve such a goal.

- Definition of a specific program and structure for observatory, which certainly is not necessarily associated with adding institutional charts and organizations, and can be implemented by defining and entrusting tasks to universities with potential;

- Training the observatory fundamentals of fields and its importance to the beneficiary groups, including faculty members and students;

- Formulating an environmental survey mechanism in various fields of medical sciences with the engagement of various field's beneficiary groups;

- Facilitating the implementation of relevant projects at the national level (via the Nasr Center) and at the macro level of regions and universities;

- Networking among universities with the observatory potential in the country's field of medical science education and defining observatory activities in the field of medical science education in a convergent manner;

- Interpreting and sending observatory messages for policymakers at different national and academic levels.

Considering the remarkable changes in the coming world, the country's medical science education department seems to require a clear mechanism and program to monitor the changes and evolutions and to use the messages from this observatory in related decision-making. In such a program, the role of all beneficiary groups should be defined, and their power and potential should be benefitted to monitor changes and interpret and send relevant messages.

Supplementary Material(s): is available here [To read supplementary materials, please refer to the journal website and open [PDF/HTML](#)].

Conflict of interests: Authors mention that there is no conflict of interests in this study.

Ethical approval: Not applicable.

Funding/Support: Not applicable.

References

1. Ataolahi F, Dehnavieh R, Atashbahar O. Letter to the editor future research using research using environmental scanning technique. *Strategic studies of public policy*. 2017;6(21):7-9. [In Persian]
2. Poindexter K. The Future of Nursing Education: Reimagined. *Nursing education perspectives*. 2021;42(6):335-6.
3. Ahmad T. Scenario based approach to re-imagining future of higher education which prepares students for the future of work. *Higher Education, Skills and Work-based Learning*. 2020;10(1): 217-38. doi:10.1108/HESWBL-12-2018-0136.
4. Rajabi F, Esmailzadeh H, Rostamigooran N, Majdzadeh R, Doshmangir L. Future of health care delivery in Iran, opportunities and threats. *Iranian Journal of Public Health*. 2013;42(1 SUPPL 1):23-30.
5. Damari B, Heidari A, Rashidian A, Vosoogh Moghaddam A, Khosravi A, Alikhani S. Designing a health observatory system for the Islamic Republic of Iran. *Payesh(Journal of the Iranian Institute for Health Sciences Research)*. 2020;19(5):499-509. [In Persian]

Philosophy of Education to Make Health Professions Education (HPE) a Success

Sohrab Nosrati¹, Zahra Nouri Khaneghah¹, Elham Ramezanpour¹, Eshagh Moradi², Elham Karimi¹, Shoaleh Bigdeli^{3*}

¹PhD Student of Medical Education, Center for Educational Research in Medical Sciences (CERMS), Department of Medical Education, School of Medicine, Iran University of Medical Sciences, Tehran, Iran.

²PhD Candidate of Medical Education, Education Development Center (EDC), Urmia University of Medical Sciences, Urmia, Iran.

³Professor of Medical Education, SFU ALUMNI, AFAMEE, Center for Educational Research in Medical Sciences (CERMS), Department of Medical Education, School of Medicine, Iran University of Medical Sciences, Tehran, Iran.

Received: 2022 November 29; Revised: 2023 March 03; Accepted: 2023 March 07; Published online: 2023 March 07

*Corresponding author: Center for Educational Research in Medical Sciences (CERMS), Department of Medical Education, School of Medicine, Iran University of Medical Sciences, Tehran, Iran. Email: bigdeli.sh@iums.ac.ir

Citation: Nosrati S, Nouri Khaneghah Z, Ramezanpor E, Moradi E, Karimi E, Bigdeli Sh. Philosophy of Education to Make Health Professions Education (HPE) a Success. Strides Dev Med Educ. 2023 February; 20(1):18-19. doi: 10.22062/sdme.2023.198106.1144.

Keywords: Observatory, Medical Education, Trends

Dear Editor,

The most critical issue in a successful educational system is the selection of values, goals, and a coherent philosophy. The reason is that each educational system aims to educate an ideal human being, which cannot be trained without a value system, and goals. Education is a process of changing behaviors, and "philosophy or love of wisdom" is a factor affecting attitude, thinking, research, reasoning, and the general view of the human being of universe (1).

Philosophy is a way of thinking appropriately, living wisely, and trying to understand existence. Furthermore, philosophy of education is an interdisciplinary science investigating the relationship between education and philosophy. Moreover, it is the philosophical study of education and its challenges that is an essential requirement for Health Professions Education (HPE) worldwide (2).

Considering philosophy in educational systems of Health Professions is one of the current and future challenges of the field. The art of teaching is incomplete without philosophy, and philosophy alone cannot direct people toward aims and ideals. The relationship between philosophy and education is so close that neither one can function alone. Philosophy determines the destination, and education brings it to the fore; while,

currently, it seems that the relationship between philosophy, and education was neglected in the educational systems of health professions (3).

The philosophy of education has faced problems to play its fundamental role or societal effect in recent years. Sometimes it is so philosophical that it has not related to the teachers of the health professions, and in some cases, when the philosophy tries to be related to the teachers, it fails in doing this task correctly, and using the correct philosophical methods (4). Based on the necessity of educational philosophy, Peters has proposed four necessary fields of work for the application of philosophy in educational systems:

- 1) Analysis of concepts specific to education.
- 2) Applying ethics, and social philosophy to the hypotheses related to the content and methods of education.
- 3) Reviewing conceptual models, and hypotheses that educational psychologists have used.
- 4) Studying the educational content, philosophical features of a system, and other learning issues related to learning (3).

In general, the philosophy of education is the application of philosophical opinions to educational issues and systems. It is not simply a tool for looking at ideas; it also teaches you how to utilize ideas as effectively as possible. When educators understand that

they should carefully consider what they do and observe in the context of personal and societal development, a philosophy of education becomes relevant and helpful in educational systems. Considering the necessity and effects of educational philosophy on improving the educational systems, it is recommended to put more emphasis on the philosophical principles of education, and critical philosophical attitudes in academic centers and institutes. Hence; especially in Health Professions that deal with human beings, it leads to the selection of a holistic view to care for and treat the clients as a whole, human beings with transcendental values and existential dimensions to whom medicine, philosophy, and philosophy of education are dependent (5).

Conflict of interests: The authors declare no conflict of interests.

Ethical approval: Not applicable.

Funding/Support: No funding was received for the study.

References

1. Akrami K. An introduction to the philosophy of Islamic education. Tehran: Samt; 2010.
2. Noddings N. Philosophy of education. Oxfordshire, England, UK: Routledge; 2018.
3. Elias JL. Philosophy of education: Classical and contemporary. Melbourne, Florida: Krieger Publishing Company; 1995.
4. Carr W. The Routledge Falmer Reader in Philosophy of Education. 1 ed. London: Psychology Press; 2005: 34-49.
5. Khajeazad M, Bigdeli S, Larijani B, Khosropanah A, Beheshti S, Yazdani S. Transcendent Philosophy of Medicine: A Deductive Synthesis According to the Transcendental Wisdom (Mulla Sadra School of Thought). *Journal of religion and health*. 2021;60(2):881-902.

Challenges Faced by University Teachers in Virtual Education During Coronavirus Disease 2019 (COVID-19) Pandemic: A Systematic Review

Fatemeh Ameri¹, Meisam Dastani^{2*}, Abazar Gholami³, Maedeh Heidari⁴

¹M.Sc. Student of Health Information Technology, Student Research Committee, Department of Health Information Technology, School of Paramedical Sciences, Mashhad University of Medical Sciences, Mashhad, Iran.

²Ph.D. in Knowledge and Information Science (Information Retrieval), Education Development Center, Gonabad University of Medical Sciences, Gonabad, Iran.

³B.Sc. Student of Nursing, Department of Nursing, Student Research Committee, Ferdows School of Paramedical and Health, Birjand University of Medical Sciences, Birjand, Iran.

⁴M.Sc. Student of Geriatric Nursing, Student Research Committee, Department of Internal Surgical Nursing, School of Nursing and Midwifery, Mashhad University of Medical Sciences, Mashhad, Iran.

Received: 2022 September 28

Revised: 2023 February 08

Accepted: 2023 March 19

Published online: 2023 March 19

***Corresponding author:**

Education Development Center,
Gonabad University of Medical
Sciences, Gonabad, Iran.

Email: meisam.dastani@gmail.com

Citation:

Ameri F, Dastani M, Gholami A, Heidari M. Challenges Faced by University Teachers in Virtual Education During Coronavirus Disease 2019 (COVID-19) Pandemic: A Systematic Review. *Strides Dev Med Educ.* 2023 March; 20(1):20-28. doi:10.22062/sdme.2023.197931.1123

Abstract

Background: COVID-19 affected education systems around the world. Virtual education was chosen as a solution not to stop education in schools and universities. While the resolution was adopted to prevent education in the countries, it presented new challenges and complications for university teachers.

Objectives: This systematic review examines teachers' challenges during COVID-19 in virtual education.

Methods: The present study is a systematic review based on the PRISMA guideline. To conduct this study, Web of Science, PubMed, and Scopus databases were searched from 1 December 2019 to 11 November 2021. The inclusion criteria for this study were original research articles published in English that examined the challenges faced by professors in virtual education during COVID-19.

Results: Finally, 17 articles were included from the 2219 articles found in the initial search stage, which examined the challenges faced by Professors in virtual education. The results indicated that the most critical challenges facing Professors during the COVID-19 pandemic were as follows, in order of highest to lowest: 1) Limitations on Internet access and appropriate communication infrastructures, 2) lack of access to computer equipment and hardware, 3) low levels of familiarity and necessary training of teachers and students in working with virtual education systems.

Conclusion: According to the results of the present study, teachers have faced many challenges due to the existing circumstances and the rapid shift from face-to-face to virtual education. Relevant organizations and institutions should train teachers and students to apply virtual education tools properly.

Keywords: COVID-19, University Teachers, Virtual Education, Challenges, Problems

Background

The outbreak of Covid-19 in December 2019 (1) affected education systems worldwide and led to the temporary closure of schools and universities and the cancellation of in-person classes (2). Instead of canceling their classes, most educational centers encouraged the teachers to provide educational materials and hold classes through virtual education and virtual training (3). On this basis and considering the need to observe social virtually and break the chain of transmission, virtual education has become more

prevalent than ever (4, 5). The WHO also identified virtual education, such as radio, television, the Internet, and other devices, as one of the best ways to continue education during the COVID-19 crisis (6).

Due to the growth of communication technologies, teachers have been encouraged to hold virtual classes to fill the face-to-face education gaps (7). Undoubtedly, virtual education has provided an extensive range of benefits in the COVID-19 conditions, the most important of which is the provision of the possibility for students and trainers to learn and train at any time

and place, creating discussions and virtual groups separate from the classroom, and holding virtual tests (8, 9). Nevertheless, virtual education has some challenges, including limited access to physical facilities such as laboratories, lack of practical classes, and loss of student interest in learning (8, 9).

In addition, at the beginning of the crisis and virtual education, teachers and students faced challenges such as a lack of familiarity of students and teachers with virtual education platforms and a lack of correct installation of related software on computers and smartphones (7). Keshavarzi et al. addressed the inadequate organizational culture, unsatisfactory infrastructure, neglect the intellectual property rights, and disregard for ethics as among the problems and challenges of virtual education during COVID-19 (10). Accordingly, Contreras et al. claimed that universities should have all the necessary facilities and components for online education and a formal regulation for virtual education (11). Another study also stated the challenges of virtual education, such as professors' inability to teach the material in virtual form, lack of proper feedback from students, lack of discipline, and the possibility of student cheating (12).

Limitation in practical exercises, such as weakness in virtual clinical simulation systems, has also been one of the important challenges in different fields, for example, nursing education (13, 14). In another viewpoint, sociocultural issues related to media and poor media literacy of parents are another major challenge in virtual education (15). Due to the unpreparedness of educational centers in the provision of suitable training platforms and the unfamiliarity of trainers with virtual education methods, the need for this kind of education during the COVID-19 crisis faced serious challenges (16, 17).

Table 1. Reference search strategy in scientific databases

Time limitation	From 1 December 2019 to 11 November 2021	Number of records
Language limitation	English	
Database	PubMed, Scopus, Web of science	
PubMed	(((((("Problems") OR ("Challenges")) OR ("Barriers")) OR ("Obstacles"))) AND (((((((("Remote learning") OR (" Online learning")) OR ("Tele education")) OR (" Virtual teaching")) OR ("Virtual university")) OR (" E-learning")) OR ("Virtual education"))) AND (((((((((((("COVID-19 ") OR ("COVID 19")) OR (" 2019-nCoV ") OR ("2019 nCoV ") OR ("Coronavirus Disease-19")) OR ("Coronavirus Disease 19")) OR ("2019 Novel Coronavirus ") OR (" 2019-nCoV Disease")) OR ("Coronavirus Disease 2019")) OR ("SARS Coronavirus 2")) OR ("SARS-CoV-2")) OR (" SARS CoV 2"))	768
Scopus	TITLE-ABS-KEY-AUTH("Problems") OR TITLE-ABS-KEY-AUTH("Challenges") OR TITLE-ABS-KEY-AUTH("Barriers") OR TITLE-ABS-KEY-AUTH("Obstacles") AND TITLE-ABS-KEY-AUTH("Remote learning") OR TITLE-ABS-KEY-AUTH(" Online learning") OR TITLE-ABS-KEY-AUTH("Tele education") OR TITLE-ABS-KEY-AUTH("Virtual teaching") OR TITLE-ABS-KEY-AUTH(" Virtual university") OR TITLE-ABS-KEY-AUTH(" E-learning") OR TITLE-ABS-KEY-AUTH("Virtual education") AND TITLE-ABS-KEY-AUTH("Sars Cov 2") OR TITLE-ABS-KEY-AUTH("SARS Coronavirus 2") OR TITLE-ABS-KEY-AUTH("Coronavirus Disease 2019") OR TITLE-ABS-KEY-AUTH("Coronavirus Disease-19") OR TITLE-ABS-KEY-AUTH("2019 nCoV ") OR TITLE-ABS-KEY-AUTH((" 2019-nCoV ") OR TITLE-ABS-KEY-AUTH("Covid 19") OR TITLE-ABS-KEY-AUTH("COVID-19 ") OR TITLE-ABS-KEY-AUTH("2019 Novel Coronavirus ") OR TITLE-ABS-KEY-AUTH("SARS-CoV-2"))	551

Objectives

Many studies have been conducted on virtual Education During Coronavirus Disease 2019 worldwide. Some studies have investigated the challenges students face during COVID-19, while some have reported challenges teachers face in virtual education. According to the research of the researchers, no comprehensive study was found that examined the challenges of professors during the corona epidemic and studied their challenges. Therefore, this study aims to systematically review the challenges experienced by teachers in virtual education during the COVID-19 pandemic.

Identifying the challenges of virtual education based on the point of view of teachers who were at the head of education during the Covid-19 era can help to increase the productivity of virtual education and solve the challenges. Therefore, this review study was designed and implemented to explain university teachers' opinions about the challenges of virtual education during the Covid-19 pandemic.

Methods

The present study is a systematic review based on the PRISMA guideline (18). This review aimed to investigate teachers' challenges in virtual education during the COVID-19 pandemic. For this purpose, PubMed, Scopus, and Web of Science databases were searched to retrieve English articles. The search of references in the mentioned scientific databases and based on the search strategy presented in table 1 was performed independently by three researchers. If there was a discrepancy, it was referred to the fourth person. The searches were conducted from 1 December 2019 to 11 November 2021.

Web of science	TITLE: ("Problems") OR TITLE: ("Challenges ") OR TITLE: ("Barriers") OR TITLE: ("Obstacles") AND TITLE: ("Remote learning ") OR TITLE: (" Online learning ") OR TITLE: ("Tele education ") OR TITLE: ("Virtual teaching ") OR TITLE: ("Virtual university ") OR TITLE: ("E-learning ") OR TITLE: ("Virtual education ") AND TITLE: ("COVID 19") OR TITLE: ("COVID-19") OR TITLE: ("2019-nCoV") OR TITLE: ("2019 nCoV") OR TITLE: ("Coronavirus Disease-19") OR TITLE: ("Coronavirus Disease 19") OR TITLE: ("2019 Novel Coronavirus") OR TITLE: ("2019-nCoV Disease") OR TITLE: ("SARS Coronavirus 2") OR TITLE: ("SARS-CoV-2") OR TITLE: ("SARS CoV 2")	900
----------------	--	-----

Table 2. PICOs, inclusion criteria and exclusion criteria applied to database search

PICOS	Inclusion Criteria	Exclusion Criteria
Population	university teachers	Student and other degrees
Intervention	COVID-19 pandemic	Other times
Comparison	-	-
Outcome	challenges in virtual education	Other outcome
Study design	original research articles	short articles, letters to the editor, conference abstracts, review articles

The criteria for inclusion and exclusion are state in table 2. After selecting the studies, according to the inclusion and exclusion criteria, data was collected using a data extraction form based on the study's objectives. The collected data were analyzed using the content analysis method.

Quality Evaluation and Extraction

Following selecting the relevant studies based on inclusion and exclusion criteria, the data was collected using a form according to the study objectives. The articles' titles, abstracts, and full texts were reviewed independently by researchers using the STROBE checklist (19). In this way, the articles confirmed in at least 20 of the 22 items in the checklist were included in the study; then, the desired data were extracted from eligible articles and recorded in Excel software.

The possible discrepancies were referred to another person. The data extraction table included the following parts: authors' name and year of the study, Research Type, Country, Statistical Population, Platforms, and Challenges.

Results

In the initial review of three databases, 2219 articles were retrieved and entered into a reference management software named EndNote Ver.20. After removing duplicate and irrelevant items based on the evaluation of the title, abstract and full text, finally, 17 articles were selected, which were published to introduce teachers' challenges in the COVID-19 period. Figure 1 shows the search and selection process of articles.

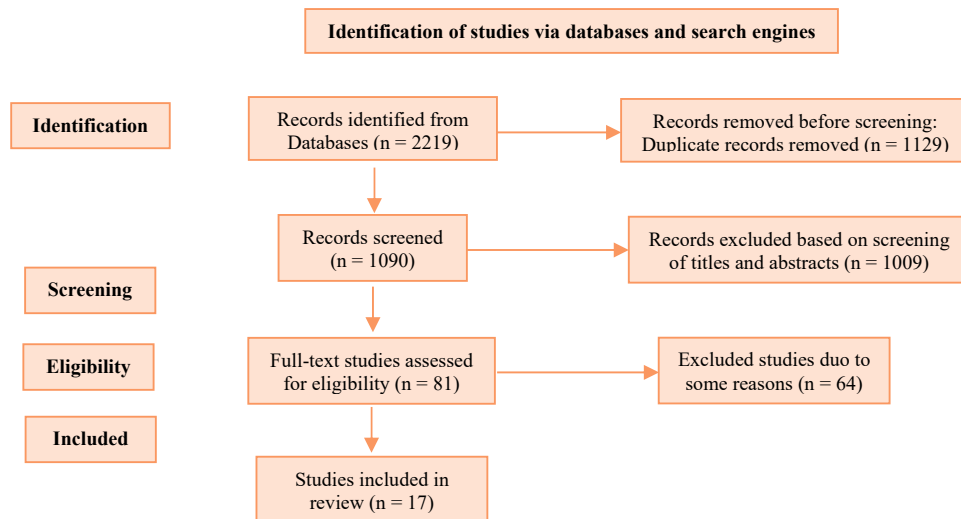


Figure 1. PRISMA flow diagram

Table 3. Results of reviewing the selected studies

Author/ Publication year	Country	Population	Challenges
(Zalat et al, 2021) (20)	Egypt	346 staff in both basic sciences (such as anatomy, physiology, pathology, histology, biochemistry, parasitology, pharmacology, microbiology) and clinical departments	Unstable internet connection
			Inadequate computer labs
			Limited number of computers/laptops
			Technical issues
(Yu et al, 2021) (21)	United States	18 faculty members	Lack of interaction and discussion
			Lack of familiarity with the teaching method
(Thaheem et al, 2021) (22)	Pakistan and Indonesia	20 teachers (10 from Pakistan and 10 from Indonesia)	Solutions: Technology support (100%), Advice from colleagues (66.7%), Holding workshops of Zoom software (61.1%)
			Feeling confused
			Not ready to change the face-to-face class to online method
			Lack of readiness to teach online
			Technological challenges, such as slow internet speed, power outages, and limited use of technology by students
			Lack of training the teachers to use technology
			Solutions: Both countries should focus on the needs and gaps of online education simultaneously or non-simultaneously. Administrators should consider the problems of teachers and students during online classes.
(Romaniuk et al, 2020) (23)	Poland	Teachers working at the Maria Grzegorzewski University	Internet connection problems
			Hardware problems
			Software problems
			Lack of experience in online teaching
			Solutions: Renovating the existing solutions, Investing in technical infrastructures, such as digital library resources
(Singh et al, 2021) (24)	India	Faculty members of Punjab Medical Institutions (209 teachers at the university)	Limited internet access
			Lack of training in the use of digital platforms
			Not ready for e-learning
			Lack of sufficient devices/hardware
			Increased workload
			Lack of personal interaction with students
			Poor responses from students
			Difficulty in creating visual plans for courses
			Fatigue and anxiety/personal fear of e-learning
			Distraction while teaching
Solutions: Changing interactive methods and content in online lectures, Providing the necessary infrastructures such as a strong Internet connection, hardware, and devices required for classes			
(Muller et al, 2021) (25)	Singapore	14 instructors from a major university in Singapore	Decreased student participation
			Difficulty in meeting students' needs
			Lack of proper learning
			Increased workload of instructors
			Solutions: Promoting different ways of participation, integrating tests and videos into pre-recorded lectures/live polls, Developing social relationships with others, Proper education and planning
(Padhi et al, 2021) (26)	India	24 faculty members from AIIMS, Bhubaneswar, Odisha, India	Lack of controlled environment
			Network problems during online classes
			Lack of attention from students
			Limitation of practical activities by students

(Tsai et al , 2020) (27)	Pennsylvania State	576 faculty members from Pennsylvania State University	Lack of learning resources
			Challenges related to technology
			Not coincidence of distance courses with face-to-face ones
			Lack of performance evaluation of classroom participation and communication
			Challenges related to technology
			Increased psychological load and other stresses
			Solutions: Need for more organizational support, More support for students and teachers
(Smith et al, 2021) (28)	Midwestern United States	15 faculty members from a Midwestern state university	Lack of proper technology
			Increased workload
			Limited self-efficacy
(Sedaghatjou et al, 2020) (29)	Multiple countries	101 Faculty Members of STEM International	Lack of resources
			Training problems
			Evaluation problems
(Shidiq et al, 2020) (30)	West Java Indonesia	55 chemistry teachers	Problems related to technology
			Limited access to electronic devices and the Internet in some areas
			Difficulty in performing laboratory activities
			Challenges related to evaluation of students' learnings
			Lack of proper understanding of the student's situations
(Ng et al, 2020) (31)	Hong Kong	Three instructors from primary, secondary, and higher education institutions	Decreased interaction between teacher and student
			Digital gap
			Technical concerns
			Lack of student motivation
			Privacy
			Solutions: Borrowing digital devices, Increasing parental support, Use of combined education methods, Training technology literacy
(Alsobhi et al, 2021) (32)	Saudi Arabia	213 University teachers	Problems with internet connection
			Slow internet speed during online lectures
			Lack of access to computers, smartphones, and tablets
(Elberkawi et al, 2021) (33)	Benghazi, Libya	101 faculty members from 6 faculties of the University of Libya	Time-consuming processes of file sharing
			Not easy to upload educational files
			Difficulty of student evaluation methods
			Problems with accessing the Internet
			Problems with working with applications
			Power outage
			Lack of access to necessary facilities
			Solutions: Providing a suitable infrastructure for the Internet, Providing appropriate tools, information, and education platforms for teachers
			(Almazova et al, 2020) (34)
Problems with electronic environments of universities and their support services			
Lack of readiness of teachers to teach online			
Lack of readiness of students to learn online			
Inability to use the facilities of online and offline classes			
Limited communication with students			
Solutions: Dealing with psychological barriers while holding online educational activities, Development of hardware and software infrastructures, Organizational support and providing recommendations related to the implementation of educational activities in a digital educational environment, developing some applications for professional improvement of teachers, providing supervisory support from the university by focusing on determining the workload of teachers while working online			

(Elshami et al, 2021) (35)	United Arab Emirates	70 Faculty members	A great deal of workload
			Time-consuming processes of preparation and presentation of distance education materials
			Technical issues
			Solutions: Institutional support and appropriate organizational policy to increase teachers' satisfaction
Alzubaidi et al, 2021 (36)	Multiple countries	111 colleges of pharmacy from 28 countries, among which, 46 colleges were selected from 21 countries, which included 42 faculty members and 26 managers	Lack of integration of evaluations
			Impossibility of holding practical and laboratory classes
			Increased work-related stress
			No use of appropriate technology and preparation of high-quality educational materials
			Problems with online lectures
			Lack of interaction with the student

Table 3 shows that the population of these studies is from the countries of United States (3 studies), India (2 studies), and finally, the countries of Poland, Indonesia, China, Egypt, Singapore, United Arab Emirates, Saudi Arabia, Libya, and Russia have been one study each. Also, three studies were conducted in several different countries. The population of these articles included university professors and higher education teachers. The sample size also had been in the range of 3 to higher than 576 samples in articles. Zoom Meeting, Google Meeting, and social media applications such as Skype, WhatsApp, Telegram, Facebook, and YouTube are the most commonly used platforms for virtual education.

Table 3 presents university teachers' most important challenges during the COVID-19 pandemic. Accordingly, limitations related to Internet access and appropriate communication infrastructure (7 studies), lack of familiarity and necessary training of teachers and students in working with virtual education platforms (6 studies), lack of access to computer equipment and hardware (5 studies), the prevalence of physical and mental problems in teachers and students, lack of proper interaction between students and teachers, increased workload of teachers, and impossibility of holding practical classes are an important challenge in virtual education during COVID-19.

Discussion

The results of the study indicated that the most critical challenges facing teachers during the COVID-19 pandemic were as follows, in order of highest to lowest: 1) Limitations on Internet access and appropriate communication infrastructures, 2) lack of access to computer equipment and hardware, 3) low levels of familiarity and necessary training of teachers and students in working with virtual education systems, 4) prevalence of physical and psychological problems in teachers and students, 5) lack of proper

interaction between students and teachers, 6) increase in the workload of teachers, and 7) impossibility of holding practical classes.

That one of the most important challenges that teachers faced during this crisis was related to internet access. According to the definition of virtual education, the internet and intranets are considered the main technology (37). In this regard, it has been stated that during the COVID-19 pandemic, many universities also lacked the necessary infrastructure and tools for virtual education (38). The limitations related to the infrastructures for virtual education, such as internet bandwidth limitations, have resulted in poor efficiency in audio, video, and animations and have wasted time (39). Other studies also stated challenges, including internet bandwidth and mobile data prices (40, 41).

The present study's findings also demonstrated that the limitation of students' and teachers' access to hardware and software systems had been another challenge in virtual education from the teachers' perspective during the COVID-19 pandemic.

Other studies also stated challenges like lack of access to computers or laptops (42, 38). This study's results are consistent with the present study's results. Some other research pieces have discussed that the lack of access to cyberspace and electronic equipment for all students, especially in remote areas, caused inequality in educational opportunities, and many students were disregarded (43, 44). Moreover, due to the home quarantine programs for other occupations, computers and IT equipment at home might be in demand by parents and other household members; therefore, home education could be difficult for students and teachers (45).

It was also concluded that the lack of technical knowledge and inability to work with virtual education systems had been another challenge for teachers during the COVID-19 pandemic. Since the outbreak of COVID-19 and the closure of classrooms occurred suddenly. Without prior planning, training teachers

and students and making proper plans for selecting virtual education platforms was impossible. In this regard, previous studies have shown that a forced shift to virtual education has caused stress, uncertainty, and anxiety. It has been difficult for teachers to change mindsets, become accustomed to online tools, and learn new skills, such as speech recording (25). This study's results are consistent with the present study's results. Posey & Pintz (2017) stated that virtual education changed the roles and responsibilities of educators (46). For this purpose, and to design and deliver virtual education effectively, educators need to be aware of the features necessary to design and present this type of education. In this regard, they must first improve their technical skills to protect themselves against technological advances (47).

According to the results, another challenge was increased physical and mental problems during the virtual education. Alhosseini Abolmaali claimed that during the COVID-19 pandemic, students have suffered from many psychological problems. On the other hand, physical problems have occurred due to the inactivity of students and teachers, and they have become overweight, which has caused serious damage to their physical health (48). Numerous studies in this context have also indicated that virtual education during the COVID-19 pandemic has had different academic and educational consequences, including burnout (49, 50), anxiety, and stress (51). This study's results are consistent with the present study's results.

Lack of classroom interactions has been another challenge of virtual education during the COVID-19 crisis (41). Communication and interaction play important roles in teaching, learning, and achieving its purposes (52).

Furthermore, the present review indicated other challenges in virtual learning, such as problems related to parents and family, low quality and limited learning resources, lack of necessary instructions and regulations regarding virtual education, and privacy concerns. Examining the challenges of virtual education from the point of view of university professors was one of the limitations of the present research. Also, this study only examined studies published in English.

Conclusion

Virtual education has replaced face-to-face education during the COVID-19 pandemic; however, teachers have faced many challenges due to the existing circumstances and the rapid shift from face-to-face to virtual education. The results of the present study demonstrated that the lack of access to the appropriate equipment and limited access to the Internet had been

the main challenges of virtual education from the teachers' perspective. Moreover, teachers' and students' lack of sufficient ability and experience was another important challenge that teachers faced during the COVID-19 pandemic. Accordingly, educational officials and administrators should consider the ability of students and teachers to access equipment, and to increase equality and educational justice, physical and financial facilities should be supplied to provide appropriate equipment and infrastructure for people who cannot access these platforms and infrastructures. Moreover, it is suggested that to improve the quality of virtual education and learning, the necessary training be provided to increase the skills of educators in using virtual learning platforms.

Acknowledgements: The researchers thank the vice president of the Research and Technology of the University who sponsored the project and all those who assisted in conducting the research.

Conflict of interests: There was no conflict of interest.

Ethical approval: The article is extracted from a research project approved by the Research and Development Center of Medical Education of Gonabad University of Medical Sciences with the ethical code IR.GMU.REC.1400.165.

Funding/Support: This study was funded by education development center of Gonabad University of Medical Sciences.

References

1. Cullen W, Gulati G, Kelly BD. Mental Health In The Covid-19 Pandemic. *QJM : Monthly Journal of the Association of Physicians*. 01 May 2020; 113(5):311-2. doi: 10.1093/qjmed/hcaa110. [PMID: 32227218] [PMCID: PMC7184387]
2. Ebadi A, Heidarlanlu E. Virtual learning: A new experience in the shadow of coronavirus disease. *Shiraz E Medical Journal*. 2020;21(12):1-2. doi:10.5812/semj.106712.
3. Dastani M. Covid 19: a new beginning in virtual education at the Medical Universities of Iran. *Horizons of Medical Education Development*. 2020;11(1):1-4. doi:10.22038/HMED.2020.50428.1059. [In Persian]
4. Ranjbar Kouchaksaraei S, Rohaninasab M, Nikjo P, Jannati Y. The education users' opinion about the E-learning In Covid-19 pandemic in the world: A review study. *Clinical Excellence*. 2021;10(4):41-51. [In Persian]
5. Peloso Rm, Ferruzzi F, Mori Aa, Camacho Dp, Franzin Leds, Margioto Teston Ap, et al. Notes from the field: concerns of health-related higher education students in Brazil pertaining to distance learning during the coronavirus pandemic. *Eval Health Prof*. 2020 Sep;43(3):201-203. doi: 10.1177/0163278720939302. [PMID: 32608250]
6. World Health Organization. Key Messages And Actions For Covid-19 Prevention And Control In Schools. [cited 2020 Mar 8].

- Available from: <https://covid19-evidence.paho.org/handle/20.500.12663/792>.
7. Dastani M. Virtual education contents of Medical Universities during the COVID-19 outbreak an opportunity to promote Universities on the web. *J Med Educ Dev.* 2020; 13(38): 1-2. doi:10.29252/edcj.13.38.1.
 8. Allo MDG. Is the online learning good in the midst of Covid-19 Pandemic? The case of EFL learners. *Jurnal Sinestesia.* 2020;10(1):1-10.
 9. Onyema EM, Eucheria NC, Obafemi FA, Sen S, Atonye Fg, Sharma A, et al. Impact of Coronavirus pandemic on education. *Journal of Education and Practice.* 2020;11(13):108-21.
 10. Keshavarzi Mh, Soltani Arabshahi SK, Gharrahee B, Sohrabi Z, Mardani Hamooleh M. Exploration of faculty members' perceptions about virtual education challenges in medical sciences: a qualitative study. *J Adv Med Educ Prof.* 2019 Jan;7(1):27-34. doi: 10.30476/JAMP.2019.41042. [PMID: 30697546] [PMCID: PMC6341450]
 11. Contreras CP, Picazo D, Cordero-Hidalgo A, Chaparro-Medina PM. Challenges of virtual education during the covid-19 pandemic: Experiences of Mexican University professors and students. *International Journal of Learning, Teaching and Educational Research.* 2021;20(3): 188-204. doi:10.26803/ijlter.20.3.12.
 12. Mukhtar K, Javed K, Arooj M, Sethi A. Advantages, Limitations and Recommendations for online learning during COVID-19 pandemic era. *Pak J Med Sci.* 2020 May;36(COVID19-S4):S27-S31. doi: 10.12669/pjms.36.COVID19-S4.2785. [PMID: 32582310] [PMCID: PMC7306967]
 13. Sadeghi Mahali N, Arsalani N, Rad M, Nematifard T, Khaki S, Fallahi-Khoshkenab M. Comparison of virtual education challenges in nursing before and after Covid-19; A systematic review. *Iran J Systematic Rev Med Sci.* 2021;1(3):81-103. [In Persian]
 14. Souza-Junior VDD, Mendes Iac, Tori R, Marques Lp, Mashuda Fkk, Hirano Laf, et al. VIDA-Nursing v1. 0: immersive virtual reality in vacuum blood collection among adults. *Rev Lat Am Enfermagem.* 2020;28:e3263. doi: 10.1590/1518-8345.3685.3263. [PMID: 32491118] [PMCID: PMC7266633]
 15. Kalateh Sadati A, Saboohi Golkar Z. Virtual learning and parental stress experience in the Covid-19 pandemic: A qualitative study in tabas city. *Tolooebehdasht.* 2022;21(2):31-40. doi:10.18502/tbj.v21i2.10339.
 16. Dastani M. COVID-19 and online education in Iran's Universities of Medical Sciences: A narrative review. 2021;13(3):E116958. doi:10.5812/jjhs.116958.
 17. Sadati L, Nouri Z, Hajfiroozabadi M, Abjar R. Faculty members' experiences about virtual education opportunities and challenges during the Covid-19: A Qualitative Study. *Journal of Medical Education Development.* 2021; 14 (42):1-10. doi:10.52547/edcj.14.42.1.
 18. Page MJ, Mckenzie JE, Bossuyt PM, Boutron I, Hoffmann TC, Mulrow CD, et al. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. *Rev Esp Cardiol (Engl Ed).* 2021 Sep;74(9):790-799. doi: 10.1016/j.rec.2021.07.010. [PMID: 34446261]
 19. Knottnerus A, Tugwell P. STROBE--a checklist to Strengthen the Reporting of Observational Studies in Epidemiology. *J Clin Epidemiol.* 2008 Apr;61(4):323. doi: 10.1016/j.jclinepi.2007.11.006. [PMID: 18313555]
 20. Zalut MM, Hamed MS, Bolbol SA. The experiences, challenges, and acceptance of e-learning as a tool for teaching during the COVID-19 pandemic among university medical staff. *PLoS One.* 2021 Mar 26;16(3):e0248758. doi: 10.1371/journal.pone.0248758. [PMID: 33770079] [PMCID: PMC7997029]
 21. Yu F, Wooster J, Yang T. Pharmacy students and faculty perceptions of online team-based learning due to the COVID-19 pandemic. *Pharmacy Education.* 2021;21:121-5. doi:10.46542/pe.2021.211.121125.
 22. Thaheem SK, Abidin MJZ, Mirza Q, Pathan HU. Online teaching benefits and challenges during pandemic COVID-19: a comparative study of Pakistan and Indonesia. *Asian Education and Development Studies.* 2022;11(2): 311-23. doi:10.1108/AEDS-08-2020-0189.
 23. Romaniuk MW, Łukasiewicz-Wieleba J. Crisis remote education at The Maria Grzegorzewska University during social isolation in the opinions of students. *International Journal of Electronics and Telecommunications.* 2020; 66(4): 807-12.
 24. Singh A, Gupta K, Yadav VK. Adopting E-learning facilities during Covid-19: exploring perspectives of teachers working in Indian public-funded elementary schools. *Education.* 2021; 3(13): 1-15. doi:10.1080/03004279.2021.1948091.
 25. Müller AM, Goh C, Lim LZ, Gao X. Covid-19 emergency elearning and beyond: Experiences and perspectives of university educators. *Education Sciences.* 2021;11(1):19. doi:10.3390/educsci11010019.
 26. Padhi KS, Balmuchu G, Acharya PS, Singh SR, Joseph T. The perspectives of educators and learners on E-learning: a cross-sectional descriptive study in a Medical School. *Adv Med Educ Pract.* 2021 Sep 21;12:1059-1066. doi: 10.2147/AMEP.S326147. [PMID: 34584482] [PMCID: PMC8464331]
 27. Tsai C-H, Rodriguez GR, Li N, Robert J, Serpi A, Carroll JM. Experiencing the transition to remote teaching and learning during the Covid-19 pandemic. *Interaction Design and Architectures.* 2020;(46): 70-87. doi:10.55612/s-5002-046-004.
 28. Smith Y, Chen Y-J, Warner-Stidham A. Understanding Online Teaching Effectiveness: Nursing Student And Faculty Perspectives. *J Prof Nurs.* 2021 Sep-Oct;37(5):785-794. doi: 10.1016/j.profnurs.2021.05.009. [PMID: 34742506]
 29. Sedaghatjou M, Hughes J, Liu M, Ferrara F, Howard J, Mammana MF. Teaching STEM online at the tertiary level during the COVID-19 pandemic. *International Journal of Mathematical Education in Science and Technology.* 2021;54(3):365-81. doi:10.1080/0020739X.2021.1954251.
 30. Shidiq A, Permanasari A, Hendayana S, Editors. Chemistry teacher responses to learning in the Covid-19 outbreak: challenges and opportunities to create innovative lab-work activities. *J Phys Conf Ser.* 2021; 1806(1): Iop Publishing. doi:10.1088/1742-6596/1806/1/012195.
 31. Ng Tk, Reynolds R, Chan MY, Li XH, Chu SKW. Business (Teaching) as usual amid the Covid-19 pandemic: a case study of online teaching practice in Hong Kong. *Journal of Information Technology Education :Research.* 2020;19:775-802. doi:10.28945/4620.
 32. Alsobhi A, Meccawy M, Meccawy Z. The Impacts Of E-Learning Readiness In Higher Education During Covid 19 Pandemic. *International Transaction Journal of Engineering, Management, & Applied Sciences & Technologies.* 2021;12(7):1-12.
 33. Elberkawi EK, Maatuk AM, Eltajoury WM, Elharish SF. Exploring online learning challenges during covid-19 pandemic: Perspective of instructors. *Proceedings of the International Conference on Data Science, E-Learning And Information Systems; 2021 Apr 5 -7; Ma'an Jordan.* 2021: 266-70. doi:10.1145/3460620.3460767.
 34. Almazova N, Krylova E, Rubtsova A, Odinokaya M. Challenges and opportunities for Russian higher education amid Covid-19: teachers' perspective. *Education Sciences.* 2020;10(12):368. doi:10.3390/educsci10120368.
 35. Elshami W, Taha MH, Abuzaid M, Saravanan C, Al Kawas S, Abdalla ME. Satisfaction with online learning in the new normal: perspective of students and faculty at medical and health sciences colleges. *Med Educ Online.* 2021 Dec;26(1):1920090. doi: 10.1080/10872981.2021.1920090. [PMID: 33974523] [PMCID: PMC8118529]

36. Alzubaidi H, Jirjees FJ, Franson KL, Saidawi W, Othman AM, Rabeeah ZH, et al. A global assessment of distance pharmacy education amid COVID-19: teaching, assessment and experiential training. *Int J Pharm Pract.* 2021 Dec 4;29(6):633-641. doi: 10.1093/ijpp/riab064. [PMID: 34609503]
37. Atashak M. Theoretical and applied principles of electronic learning. *Quarterly Journal of Research and Planning in Higher Education.* 2007;13(1):135-56.
38. Mortazavi F, Salehabadi R, Sharifzadeh M, Ghardashi F. Students' perspectives on the virtual teaching challenges in the COVID-19 pandemic: A qualitative study. *J Educ Health Promot.* 2021 Feb 27;10:59. doi: 10.4103/jehp.jehp_861_20. [PMID: 34084806] [PMCID: PMC8057160]
39. Shahbeigi F, Nazari S. Virtual Education: Benefits and Limitations. *The Journal of Medical Education and Development.* 2012;6(1):47-54. [In Persian]
40. Tadesse S, Muluye W. The impact of COVID-19 pandemic on education system in developing countries: a review. *Open Journal of Social Sciences.* 2020;8(10):159-70. doi:10.4236/jss.2020.810011.
41. Pokhrel S, Chhetri R. A literature review on impact of COVID-19 pandemic on teaching and learning. *Higher Education For The Future.* 2021;8(1):133-41. doi:10.1177/2347631120983481.
42. Hamilton J, Fox M, Mcewan M. Sessional Academic Success: A Distributed Framework For Academic Support And Development. *Journal of University Teaching & Learning Practice.* 2013;10(3):9. doi:10.53761/1.10.3.9.
43. Abbasi F, Hejazi E, Hakimzade R. Lived experience of elementary school teachers about the opportunities and challenges of teaching in the educational network of students (SHAD): A Phenomenological Study. *Research in Teaching.* 2020;8(3):24-1.
44. Salimi S, Fardin MA. The Role of corona virus in virtual education, with an emphasis on opportunities and challenges. *Research in School and Virtual Learning.* 2020;8(2):49-60.
45. Dill E, Fischer K, Mcurtrie B, Supiano B. As Coronavirus Spreads, The Decision To Move Classes Online Is The First Step. What Comes Next. *The Chronicle of Higher Education.* 2020:4-7.
46. Zheng L, Smaldino S. Key instructional design elements for distance education. *Quarterly Review of Distance Education.* 2003;4(2):153-66.
47. Volery T, Lord D. Critical Success Factors In Online Education. *International Journal of Educational Management.* 2000; 14(5): 216-23. doi:10.1108/09513540010344731.
48. Abolmaali Alhosseini K. Psychological and Instructional consequences of Corona disease (Covid-19) and coping strategies with them. *Educational Psychology.* 2020;16(55): 157-93.
49. Fernández-Castillo A. State-Anxiety And Academic Burnout Regarding University Access Selective Examinations In Spain During And After The Covid-19 Lockdown. *Front Psychol.* 2021 Jan 27;12:621863. doi: 10.3389/fpsyg.2021.621863. [PMID: 33584481] [PMCID: PMC7873299]
50. Zis P, Artemiadis A, Bargiotas P, Nteveros A, Hadjigeorgiou GM. Medical studies during the Covid-19 pandemic: the impact of digital learning on medical students' burnout and mental health. *Int J Environ Res Public Health.* 2021 Jan 5;18(1):349. doi: 10.3390/ijerph18010349. [PMID: 33466459] [PMCID: PMC7796433]
51. Romash I. The nature of the manifestation of procrastination, level of anxiety and depression in medical students in a period of altered psycho-emotional state during forced social distancing because of pandemic Covid-19 and its impact on academic performance. *Mental Health: Global Challenges Journal.* 2020;3(2):6-11. doi:10.32437/mhgcv4i2.92.
52. Abbasi M, Maleki M, Romanian S. Investigate the effect of social skills training on reducing classroom silence, fear of negative evaluation and shyness of female students. *Education Strategies in Medical Sciences.* 2020;13(4): 306-15.

How to Give Feedback on Professionalism in Clinical Education: A Narrative Review

Shiva Khayyati Motlagh Bonab¹, Aeen Mohammadi², Sevda Fazlizade³, Elnaz Hashemzadeh⁴, Reyhaneh Golbaf², Hojjat Torkmandi⁵, Mohammad Abdi^{2*}

¹Department of Midwifery, Maragheh Branch, Islamic Azad University, Maragheh, Iran.

²Department of Medical Education, School of Medicine, Tehran University of Medical Sciences, Tehran, Iran.

³MSc of Psychiatric Nursing, Tehran Azad Medical University, Tehran, Iran.

⁴Department of Nursing, Tabriz university of Medical Sciences, Tabriz, Iran.

⁵Department of Nursing, Zanjan University of Medical Sciences, Zanjan, Iran.

Received: 2022 December 29

Revised: 2023 April 21

Accepted: 2023 May 06

Published online: 2023 May 08

*Corresponding author:

Department of Medical Education,
School of Medicine, Tehran University of
Medical Sciences, Tehran, Iran.
Email: m.abdi252@gmail.com

Citation:

Khayyati Motlagh Bonab Sh,
Mohammadi A, Fazlizade S,
Hashemzadeh E, Golbaf R, Torkmandi
H, Abdi M. How to Give Feedback on
Professionalism in Clinical Education: A
Narrative Review. Strides Dev Med Educ.
2023 May; 20(1):29-37.
doi:10.22062/sdme.2023.198214.1154

Abstract

Background: Professionalism means understanding a profession and introducing it to the society through professional behaviors. In particular in clinical settings, constructive feedback is provided in education to create professional behaviors.

Objectives: This study aimed to investigate giving feedback on professionalism in clinical education.

Methods: A narrative review was conducted in PubMed and Google Scholar on the publications over the last 10 years. Eight hundred twenty-six articles were found in the first step, among which 30 were handed over to the expert panel. Fifteen of 30 articles were finally selected.

Results: The data of the studies were in four categories: feedback techniques, feedback in curriculum, the scope of feedback, and feedback outcome. Feedback on professionalism was mostly presented through online services, portfolio, video-based systems, by a preceptor or peers, longitudinally in internship courses, and Multi Source Feedback (360 degree). In a study, feedback on professionalism was considered formally in the curriculum. Educational experts give both formative and summative feedback (most of which were formative). Based on the literature, feedback can enhance learning professionalism, curriculum reforms, system support, student comfort, evaluations, and efficacy of professionalism.

Conclusion: Multi-Source feedback assessment was the most used tool for giving feedback in professionalism, and the most popular form was informal-formative feedback. Since professionalism is a multidimensional concept related to personal communication, multi-source tools have been the most commonly used in the literature.

Keywords: Feedback, Professionalism, Clinical Education

Background

Although a century has passed since the attention to professionalism, no common definition has been reported for it in the literature and it is still considered a complicated issue (1, 2). Professionalism is one of the main behavioral principles in clinical settings and it deals the relationship between physicians and society. These relationships and behaviors are described based on House's Personality and Social Structure Perspective (PSSP) model in three levels of social structure, interactions, and individual personality (3). To be professional, a doctor should have personality traits that match the structure of the environment, and the mutual interactions of these components create professional

behavior (4). Imbalance in such interactions can reduce the doctors' motivation or lead to social structure, both of which can be harmful. These traumatic issues mostly result in insufficient clinical skills, irresponsibility, unpunctuality, invasion of patients' privacy, disrespectfulness, lack of communication, and breaches of confidentiality (5), which can be prevented by education and preparation of the physicians for clinical settings. Medical education has tried to investigate them through evaluation (6), teaching (7), integration in the curriculum (8), and feedback (9). Among these, the focus of studies over the last decade has been on feedback, and it is recognized as effective in the teaching-learning process (10, 11). Providing feedback

is necessary for effective interactions between the two parties. It is so important that the foundation of professionalism is based on interactions (12).

The most important place for these interactions to take place is in the clinical setting for doctors and students, as it also includes the main doctor-patient relationships (13). In addition to education and evaluation, feedback is needed for achieving the best possible clinical interactions (14). Feedback is a reciprocal process including giving specific information about comparing the observed behavior of a student with a standard one to improve functions and operation (15). The real purpose of feedback is to help students and professors participate in a meaningful feedback process and to assist educational institutes develop a constructive feedback culture (16).

There are different types of constructive feedback in medical education. According to Tuma et al. (2020), types of feedback include 1) Feedback based on the setting and structure (formal and informal feedback), 2) Feedback based on their main aim (Constructive, Inspiring, Corrective), 3) Feedback based on their time and breadth (summative or formative), 4) Feedback with different presentation methods (Sandwich, Pendleton) (15). Kleij et al. (2019) have categorized feedback in groups by the role of the students: 1) Feedback in which students have no role (transmission model), 2) Limited role for students (information processing model) 3) Some student roles (communication model) (communication mode) and 4) Feedback with a fully active role of the students (dialogic model) (17). There are some models for standard feedback such as FEEDBACK, a novel feedback tool that encompasses the focus of learning, student self-evaluation (reflection), the encounter with the patient (professionalism), one task that the student should continue to do (reinforcement), one task that they could do better (improvement) and a key take-home message for self-directed learning. In describing the feedback process, they pay attention to the following at each stage: identifying learning objectives, a chance to reflect, feedback on communication skills/professionalism, specific suggestions for improvement, clear take-home message, and personalized feedback (18). Sometimes feedback takes place in the educational settings, and it is designed according to the educational conditions, such as feedback based on the homework, university projects, and exams (19). Feedback may also be specified (20) or general (21).

Feedback patterns which were described in the previous paragraphs are too general and there is a need

to a specific kind of feedback in every educational situation. Humanistic and social structures form the foundation for teaching and evaluating professionalism (3), which is completely different from other academic settings. There are always some teaching and learning processes going on in a typical academic situation, but clinical context treatments, preventions, social communication, and education are occurring at the same time (22).

In addition to students and educators, health care providers, patients, and their families are present and interact with them. Each of these is in a particular condition that differentiates clinical education from academic one (23). The patient faces symptoms of illness, anxiety, pain, and tension (24), and the patient's family faces stress, anxiety, and worry (25). Care providers also face busy work, anxiety, and job fatigue (26). An essential part of professionalism is evaluation and feedback on learners' professional behavior with others in the clinical setting. Thus, it is necessary to pay attention to feedback on professionalism regarding that the one of the significant differences in giving feedback on professionalism is in clinical education vs. academic. Elliott et al. (2020) (27), Keshmiri et al. (2020) (28), and Duijn et al. (2019) (29) noted the lack of studies in this field. Thus, to fill the knowledge gap in this field and having not found a review study, and for answering the question of "How to give feedback on professionalism in clinical education", prompted the researchers to conduct this study.

Objectives

This study aimed to investigate giving feedback on professionalism in clinical education.

Methods

"How should be feedback on professionalism is given in clinical education" was the question of this research. The best way to answer such a question based on our goals, context, and resources was to conduct a narrative review. In a narrative review, researchers try to find new aspects of knowledge and solve ambiguities by focusing on a certain subject (30). Therefore, this review was conducted to find what had already been done and to address the existing gaps for future approaches to be planned and filled. Narrative review has been used in different medical education studies such as Klasen M. et al. (2019) (31) and Ross et al. (2021) (32).

The search process consisted of two steps:

At first, a simple non-systematic search was conducted in Google Scholar and PubMed with "professionalism", "education", and "feedback" as key

terms. Google Scholar and PubMed are popular database and search engines for scholarly publications. Almost all publications can be found with PubMed and Google Scholar. On the other hand, PubMed is the largest database of medical science publications (33). We realized that no narrative review has been written before in this subject (10-19). All review papers were devoted to general feedback in clinical education, and there were no reviews specialized in giving feedback in the field of professionalism in clinical education. With the data collected during this step, a conceptual framework was developed for the second stage of the search.

In the second step, a systematic search was conducted based on the MESH terms and the keywords of the systematic reviews (feedback, professionalism, clinical education) in PubMed and additional records identified through manual search in Google scholar (22 January 2012 to 22 January 2022). Our search strategy was:

((Feedback OR comment* OR response OR evaluat* OR assess*) AND (professionalism OR "Medical Professionalism" OR "Professionalism, Medical" OR "Professionalism Education" OR "Education, Professionalism" OR 'Surgical Professionalism' OR "Professionalism, Surgical") AND ("clinical education" OR "Clinical Clerkship" OR "clinical practicum" OR "Clinical Practice" OR "Clinical Clerkships" OR 'Clerkships, Clinical' OR 'Clerkship, Clinical' OR 'Clinical Apprenticeship' OR 'Apprenticeship, Clinical' OR 'Apprenticeship, Clinical' OR 'Apprenticeships, Clinical' OR "Clinical Apprenticeships"))).

This strategy was supported by a research librarian. Our search was conducted in PubMed and Google scholar by exploring the reference lists of selected articles, whereby we identified additional references.

Inclusion/exclusion criteria

We included all articles in medicine, which used different approaches for feedback on professionalism. The inclusion criteria were the investigation of feedback on professionalism in clinical education. Articles that did not report feedback on professionalism in clinical education in their results section were excluded from the study. Figure 1 summarizes our search and selection process.

Screening stages of articles:

1. Two researchers conducted the search separately.
2. The search results were inputted into Endnote.
3. Duplications were removed.
4. Each individual researcher read the title and abstract.
5. The selected articles were reviewed by two researchers.

6. The full text of the articles was reviewed by two researchers (were the conflict papers marked for the focus group).

The selected articles were entered into the focus group.

Results

Eight hundred and twelve articles were identified by searching in PubMed and 14 articles by manual search (n=826). According to the title and abstract, 66 articles were selected in the first step. By a full-text review, we removed sixty-six out of 66 articles. Papers that did not report feedback on professionalism in clinical education in their results section or those with mismatched titles and texts were excluded from the list. At last, the focus group chose 15 articles from the 30 remaining ones to discuss, organize, summarize, and answer the question: "What is the best way of giving feedback on professionalism in clinical settings?" The evaluation criteria of articles were based on a checklist that was designed for each article. This checklist included the title of the article, a summary of the methodology, and the results. In the final column, there was yes/no. which indicated whether this article offers a suitable answer to the research question or not. After the introduction of each article, the group members presented their opinions. Articles that were drafted yes were selected for the final report.

The expert panel identified some articles not to be qualified enough to answer the research question (Figure 1).

Note that the review articles in Table 1 are related to the general aspect of giving feedback in clinical education. Thus, no review that specifically assesses the feedback provided on professionalism in clinical education was found.

Articles about feedback on professionalism in clinical settings investigated it from four categories: feedback techniques, feedback in curriculum, scope of feedback, and feedback outcome (Table 1). Of 15 articles, one of them mentioned anonymous feedback through online settings (34); One had used portfolios as a tool for giving feedback (35); Some had pointed out video-based system feedback (36, 48). Feedback given by a preceptor (37) or peers (38, 50) was also mentioned in some Studies. Some had offered to give feedback in a longitudinal form in clerkship (39).

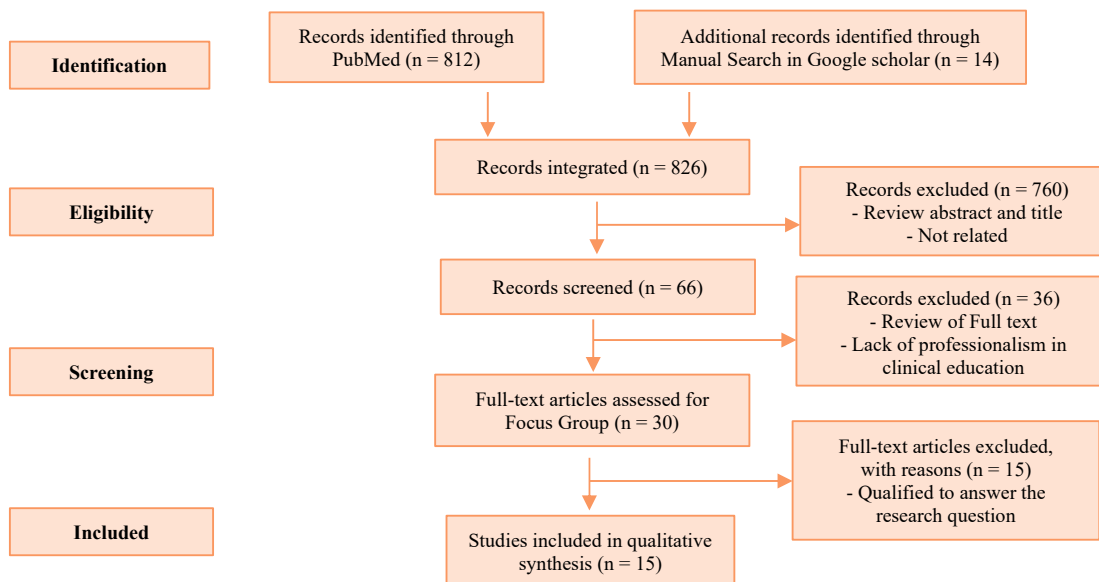


Figure 1. Flowchart of screening and selection of the articles

Most studies mentioned Multi Source Feedback (MSF) or 360 degrees as an appropriate feedback method (40-43, 47). In one study, feedback had a specified role in professionalism education in the curriculum (44). According to studies, feedback on professionalism was given both in summative and formative forms (35, 40, 45), with most studies mentioning the formative forms (36). Ten of 15 articles introduced feedback to be effective for

educating professionalism (34, 46), curriculum improvements (40), increase in qualifications (36), system support (44), professional behavior in clinical settings (43), student comfort (37), more accurate evaluations (42, 47) and finally better efficiency of professionalism (38). A summary of the results from the articles is provided in Table 2.

Table 1. Conceptual framework of studies about giving feedback on professionalism in clinical settings

Topic	Classification of studies	Result
Feedback on professionalism in clinical settings	Techniques of giving feedback	360 degree (29-32, 36), anonymous feedback through online settings (34), portfolio (35), video-based system feedback (36, 48), given by a preceptor (37), given by a peer (38, 50), give feedback in a longitudinal form in clinical clerkship (39).
	Feedback in Curriculum	Considering feedback on professionalism in clinical settings formally and hidden in the curriculum (42).
	Scope of feedback	Feedback on professionalism was given both in summative and formative form (35, 40, 45), most of the studies had mentioned formative forms (36).
	Outcome of feedback	Educating professionalism (34, 46), curriculum improvements (40), increase in qualifications (36), system support (44), professional behavior in clinical settings (43), student comfort (37), more accurate evaluations (42, 47) and better efficiency of professionalism (38).

Table 2. Articles about feedback in clinical professionalism

Author, Year	Design	Participant	Module of Feedback	Outcome
Upreet Dhaliwal, 2018, (34)	Qualitative study	All clinical batch students	Anonymous reflective narratives (online)	Writing of narratives enhanced learning about professionalism
Erynne A Faucett, 2017, (35)	Review	Otolaryngology resident	Specificity reflection, action plans, balancing reinforcing, corrective feedback. Summative and formative form	Not reported
John D Mitchell, 2018 ,(48)	Prospective cohort study	All medical students	Video-based educational program Negative/constructive feedback	Not reported
Paul S. Mueller 2015, (40)	Review	Articles published	Formative and summative feedback Multisource feedback (MSF) (360-degree)	Develop and improve professionalism curricula
Sydney McQueen, 2019, (36)	Scoping review	Surgical training	Video-based feedback, and surgical training - formative	Development of competence.
Yuhong Zhao, 2013, (41)	Educational intervention	Surgery residents	MSF	Not reported
Kathryn J.Smith, 2021 (45)	Scoping review	Articles published	Feedback type was formative and summative	Not reported
Mark Hochberg, 2017,(39)	Educational intervention	Surgical clerkship	Mandated mid-clerkship feedback	Not reported
Leslie A Hoffman, 2017, (43)	Quasi-experimental	Medical students	MSF	Increased professionalism
Freudenreich, 2018, (44)	Educational intervention	Psychiatry	Curriculum content based on participant feedback.	Better advocates for system change
Brauch, 2013, (37)	Qualitative study	First year resident	Preceptor feedback	Increasing comfort and understanding.
Ricardo Riveros, 2016, (42)	Randomized clinical trial.	Anesthesia residents	MSF	Multi-source feedback questionnaire to assess professionalism had good reliability and internal consistency.
Jha V, 2015, (46).	Mixed	Medical students	Model of the intercultural development continuum	Efficacy of professionalism
Ansari Ali, 2013, (47)	Cohort	Emergency physicians	MSF	MSF showed reliability, validity, and feasibility for professionalism feedback
Sarah Lerchenfeldt 2019, (38)	Systematic review	Articles published	Peer feedback	Effectiveness on professional behavior.

Discussion

The results of the studies were placed in four categories: feedback techniques, feedback in curriculum, the scope of feedback, and feedback outcome.

Feedback techniques

Most of the studies had chosen 360-degree for giving feedback on professionalism. Emphasis on the use of one single method does not seem to be effective enough. An effective and accurate approach would be the combination of several different approaches (49). With such an approach, students can have a more realistic view and reflect better on their behaviors (43). Thus, this might be one of the main reasons for the existing emphasis on 360-degree (MSF) feedback. Use of feedback from a variety of sources can help students gain new perspectives about themselves. Further, this approach can improve many aspects such as communication skills, interpersonal skills, professionalism, leadership, and social participation (38). There are some recommendations for improving the quality of the feedback. Feedback should be specific and should be usable quickly (50). It should be given in different settings in longitudinal and different forms (40). Use of role models along with feedback can foster the improvement process (43). For creating an atmosphere without unnecessary pressure, use a standardized patient is recommended. Feedback can be used as a factor for learning and personal development (49), and it can have a role in the personal development of the students in the curriculum (50). Therefore, it is recommended to follow the points mentioned, such as having multiple sources of feedback, attention to different professions in clinical setting, and applying the role model to design a guideline. It is also suggested that the practice of giving feedback in the field of professionalism should be considered in the form of general skills in medical education, and practical research should be done on this matter.

Feedback in curriculum

In a study, feedback was an essential part of the curriculum (42). If feedback finds its way through the organizational culture, then it can become part of their curriculum (38). Personal development is one of the main goals of many medical curricula and such a goal is related to the use of feedback. People working in medical settings should be able to criticize themselves and their co-workers or the medical team members, and when such skills are lacking, constructive feedback is less likely to be given. Further, the ability to give and receive constructive feedback can lead to lower stress levels in workplaces such as clinical settings (52).

Thus, a standard curriculum should provide students with chances for participation in feedback processes and the educational environment should be designed according to this issue, so that the students and professors would be able to improve their functions and behaviors and have chances for personal reflection (38). In a standard curriculum, chances should exist for interactions between teachers and students. Students should be observed directly by their professors and receive instructions according to their functions as well as behaviors (51). According to Burgess et al. (2020), this curriculum should be able to familiarize students with the purpose and nature of various forms of providing feedback, to receive feedback from students and use them, have diverse activities, and challenge students to engage in new activities. (38).

Students and teachers need to develop qualified and improved relationships that are based on trust, which can be accomplished by a carefully designed and clarified curriculum. The difference between evaluation and feedback processes should be completely explained to students and faculty members. The curriculum should include opportunities to give and receive feedback and improve performance in professionalism without any scoring or grading for students (51). We suggest that the process of design, implementation, and assessment should be considered for giving feedback in professionalism in clinical education as in other courses. For this purpose, the best way is to integrate it longitudinally during internships.

Scope of feedback

In most studies, feedback could be given as summative or formative (32, 38, 43) (most of which were formative) (34). The feedback which is given over time (formative) can improve the self-regulation and self-evaluation skills of the students. As a result, students can improve their cognitive and behavioral abilities through this type of feedback (48).

Creating a professional identity is a long-term process and requires time as well as attention. There also should be no contradictions in the formal, informal, and hidden curriculum (53). Some aspects of the curriculum which can support professional development are integrating identity creation into the school curriculum, engaging students in identity improvement plans, and creating a welcoming and supportive society. In addition to the mentioned issues, students should receive help and support in the entire process (54). Further, students should not face any contradiction in educational settings. Sometimes the student learns something and faces the opposite in the clinical setting. For example, a professor insists on interdisciplinary

health care but does not seem to consult with others while making clinical decisions. A doctor who teaches communication skills does not look at her patient during a visit. In short, it should be kept in mind that professionalism is not created instantly and requires time and effort from all disciplines (55).

As a way of perfectly approaching the considered goals of summative and formative feedback, students are urged to keep a portfolio, since this will allow them to monitor their progress and they will be able to evaluate the path they have taken. (40). Clinical settings are highly complicated and there is a possibility for clinical professors to be distracted from students while facing problems such as lack of time. Professors should pay close attention to the students' emotions. Because students are often so vulnerable, their emotions need to be considered carefully.

Paying attention to their emotions can also enhance their future performance through the hidden curriculum (56). Hidden curriculum is one of the most vital issues to be considered. Upon receiving wrong feedback, an honest and committed student may totally change to someone who is less likely to communicate, less compassionate, and far from the expected goals (57). Also, successful formative and summative evaluation needs to have educational effects. Educational effects encourage students to learn better. To achieve this goal, it is necessary to involve the student in the evaluation process. Also, peer evaluations in this process have a significant impact, especially for students who are friends and spend time together outside of class hours. In this way, they can see each other's behavior in clinical clerkships and give feedback to each other repeatedly over time. Of course, this method needs careful investigation and appropriate culture.

Feedback outcome

Finally, we review the outcomes of giving feedback in the field of professionalism in clinical education. According to the literature, feedback can increase learning about professionalism (31, 44), curriculum improvements (38), system support (42), student comfort (45), quality of professionalism evaluations (40, 45), and efficacy of professionalism (46). Meanwhile, there are some variables that are effective in conveying the feedback message among people, such as facial expression, and body postures, which have not been discussed enough in the literature (58). It can be concluded that all these consequences pass through the lens of professional identity. All of these goals are attained by creating a professional identity (59) and through long-term planning and education (60). Longitudinal terms, workshops, seminars,

in-service education, appropriate educational opportunities, and comprehensive planning are the best solutions for forming social identity. According to the long-term nature of the creation of professional skills, there is a need to frequent formative feedback. In order to achieve more outcomes, it is very effective to review feedback results and report them to students, teachers, and educational managers.

Knowledge gap

Feedback in medical education is one of the most important topics and fortunately there are several studies dealing with it. However, there are still some gaps in different parts for example goals of feedback on professionalism such as differences between formal and informal feedback, personal or group feedback, body postures, investigating brand new ways of giving feedback (61), and examining the factors affecting feedback (teacher, student, educational environment etc.) on professionalism, which can be investigated in future studies.

Limitations: The main limitation of our study was the 10-year (2012-2022) period of review of published articles, though it was sufficient to answer our research question.

Conclusion

The main tool used for feedback on professionalism was 360 degree (MSF) and the most popular form was informal - formative feedback. Since professionalism is a multidimensional concept related to personal communication, multi-source tools are mostly used in the literature. Forming professionalism is a time-consuming process and it takes numerous efforts over time.

Most of the time, feedback is provided in an informal form and through the hidden curriculum. Giving and receiving constructive principled feedback on professionalism requires planning in basic and clinical education in the formal, informal, and hidden curriculum.

Acknowledgements: We thank the researchers whose papers helped us answer our questions.

Conflict of interests: Noting

Ethical approval: Not applicable.

Funding/Support: None.

References

1. Cruess SR, Cruess RL, Steinert Y. Teaching professionalism across cultural and national borders: Lessons learned from an AMEE workshop. *Med Teach.* 2010;32(5):371-4. doi: 10.3109/01421591003692730. [PMID: 20423254]

2. Ong YT, Kow CS, Teo YH, Tan LHE, Abdurrahman ABHM, Quek NWS, et al. Nurturing professionalism in medical schools. A systematic scoping review of training curricula between 1990–2019. *Med Teach.* 2020 Jun;42(6):636-649. doi: 10.1080/0142159X.2020.1724921. [PMID: 32065016]
3. House JS. The three faces of social psychology. *Sociometry.* 1977; 40(2):161-77. doi:10.2307/3033519.
4. Goldie J. Assessment of professionalism: A consolidation of current thinking. *Med Teach.* 2013;35(2):e952-6. doi: 10.3109/0142159X.2012.714888. [PMID: 22938675]
5. Irby DM, Hamstra SJ. Parting the Clouds: Three Professionalism Frameworks in Medical Education. *Acad Med.* 2016 Dec;91(12):1606-1611. doi: 10.1097/ACM.0000000000001190. [PMID: 27119331]
6. Voigt-Barbarowicz M, Brütt AL. The Agreement between Patients' and Healthcare Professionals' Assessment of Patients' Health Literacy—A Systematic Review. *Int J Environ Res Public Health.* 2020 Mar 31;17(7):2372. doi: 10.3390/ijerph17072372. [PMID: 32244459] [PMCID: PMC7177784]
7. Berger AS, Niedra E, Brooks SG, Ahmed WS, Ginsburg S. Teaching Professionalism in Postgraduate Medical Education: A Systematic Review. *Acad Med.* 2020 Jun;95(6):938-946. doi: 10.1097/ACM.0000000000002987. [PMID: 31517687]
8. O'Sullivan H, Van Mook W, Fewtrell R, Wass V. Integrating professionalism into the curriculum: AMEE Guide No. 61. *Med Teach.* 2012;34(2):e64-77. doi: 10.3109/0142159X.2012.655610. [PMID: 22289014]
9. Berk RA. Using the 360° multisource feedback model to evaluate teaching and professionalism. *Med Teach.* 2009 Dec;31(12):1073-80. doi: 10.3109/01421590802572775. [PMID: 19995170]
10. Horsburgh J, Ippolito K. A skill to be worked at: using social learning theory to explore the process of learning from role models in clinical settings. *BMC Med Educ.* 2018 Jul 3;18(1):156. doi: 10.1186/s12909-018-1251-x. [PMID: 29970052] [PMCID: PMC6029173]
11. Liu HL, Wang TH, Lin HK, Lai CF, Huang YM. The Influence of Affective Feedback Adaptive Learning System on Learning Engagement and Self-Directed Learning. *Front Psychol.* 2022 Apr 27;13:858411. doi: 10.3389/fpsyg.2022.858411. [PMID: 35572271] [PMCID: PMC9094679]
12. Collins J. Professionalism and physician interactions with industry. *J Am Coll Radiol.* 2006 May;3(5):325-32. doi: 10.1016/j.jacr.2006.01.022. [PMID: 17412075]
13. Bombeke K, Symons L, Vermeire E, Debaene L, Schol S, De Winter B, et al. Patient-centredness from education to practice: The 'lived' impact of communication skills training. *Med Teach.* 2012;34(5):e338-48. doi: 10.3109/0142159X.2012.670320. [PMID: 22452275]
14. Weinstein DF. Feedback in Clinical Education: Untying the Gordian Knot. *Acad Med.* 2015 May;90(5):559-61. doi: 10.1097/ACM.0000000000000559. [PMID: 25406602]
15. Tuma F. Feedback in medical education. *Treasure Island (FL): StatPearls Publishing;* 2023 Jan.2022 Sep 26. [PMID: 31335031]
16. Ramani S, Könings KD, Ginsburg S, Van der Vleuten CP. Meaningful feedback through a sociocultural lens. *Med Teach.* 2019 Dec;41(12):1342-1352. doi: 10.1080/0142159X.2019.1656804. [PMID: 31550434]
17. Van der Kleij FM, Adie LE, Cumming JJ. A meta-review of the student role in feedback. *International Journal of Educational Research.* 2019;98:303-23.
18. Hall C, Peleva E, Vithlani RH, Shah S, Bashyam M, Ramadas M, et al. FEEDBK: a novel approach for providing feedback. *Clin Teach.* 2020 Feb;17(1):76-80. doi: 10.1111/tct.13026. [PMID: 31074179]
19. Tan A, Hudson A, Blake K. Adolescent narrative comments in assessing medical students. *Clin Teach.* 2018 Jun;15(3):245-251. doi: 10.1111/tct.12667. [PMID: 28612480]
20. Sebo P, Maisonneuve H, Fournier JP, Senn N, Haller DM. General practitioners' views and preferences about quality improvement feedback in preventive care: a cross-sectional study in Switzerland and France. *Implement Sci.* 2017 Jul 26;12(1):95. doi: 10.1186/s13012-017-0623-7. [PMID: 28747187] [PMCID: PMC5530524]
21. Vu JV, Harbaugh CM, De Roo AC, Biesterveld BE, Gauger PG, Dimick JB, et al. Leadership-Specific Feedback Practices in Surgical Residency: A Qualitative Study. *J Surg Educ.* 2020 Jan-Feb;77(1):45-53. doi: 10.1016/j.jsurg.2019.08.020. [PMID: 31492642] [PMCID: PMC6944744]
22. Moonaghi HK, Zardosht R, Razavi ME, Ahmady S. Perceived challenges by the Iranian Baccalaureate Surgical Technology students in their clinical education: A qualitative study. *Biosci Biotech Res Comm.* 2017;10(3):542-50. doi: 10.21786/bbrc/10.3/31.
23. Laura Watts, Tess Mcpherson, Joanna Robson, George Rawlings, Burge S. Patient experiences of participation in a medical student teaching workshop. *Med Teach.* 2015 Jan;37(1):94-6. doi: 10.3109/0142159X.2014.947946. [PMID: 25154410]
24. Saeidi M, Safaei A, Sadat Z, Abbasi P, Sarcheshmeh MSM, Dehghani F, Tahrekhani M, Abdi M. Prevalence of Depression, Anxiety and Stress Among Patients Discharged from Critical Care Units. *J Crit Care Med (Targu Mures).* 2021 May 12;7(2):113-22. doi: 10.2478/jccm-2021-0012. [PMID: 34722912] [PMCID: PMC8519366]
25. Abdi M, Jolfaei M, Ghasemi M, Dinmohammadi MR, Torkmandi H, Khademi E. Fazio-Londe Syndrome and Patient-centered Nursing Care: A Case Report. *Journal of Client-Centered Nursing Care.* 2020; 6(2):135-44. doi:10.32598/JCCNC.6.2.275.2.
26. Abdi M, Pourrahimi A, Yousefi K, Nouri Khaneghah Z, Rabie Siahkhalil S, Torkmandi H. A Preventive Approach to the Risk of Substance Abuse in Medical Personnel with Migraine: A Case Report. *Preventive Care in Nursing & Midwifery Journal.* 2019; 8(4):23-6. doi: 10.29252/pcnm.8.4.23.
27. Elliott BN. The teaching and evaluation of professionalism for DPT students during the clinical education experience. *Internet Journal of Allied Health Sciences and Practice.* 2020 Oct 12;18(4):11.
28. Keshmiri F, Farahmand S, Bahramnezhad F, Hossein-Nejad Nedaei H. Exploring the challenges of professional identity formation in clinical education environment: A qualitative study. *J Adv Med Educ Prof.* 2020 Jan;8(1):42-9. doi: 10.30476/jamp.2019.74806.0. [PMID: 32039272] [PMCID: PMC6946943]
29. Duijn CCMA, Dijk EJV, Mandoki M, Bok HGG, Cate OTJT. Assessment Tools for Feedback and Entrustment Decisions in the Clinical Workplace: A Systematic Review. *J Vet Med Educ.* 2019;46(3):340-52. doi: 10.3138/jvme.0917-123r. [PMID: 31460844]
30. Grant MJ, Booth A. A typology of reviews: an analysis of 14 review types and associated methodologies. *Health Info Libr J.* 2009 Jun;26(2):91-108. doi: 10.1111/j.1471-1842.2009.00848.x. [PMID: 19490148]
31. Klasen JM, Lingard LA. Allowing failure for educational purposes in postgraduate clinical training: a narrative review. *Med Teach.* 2019 Nov;41(11):1263-9. doi: 10.1080/0142159X.2019.1630728. [PMID: 31280625]
32. Ross S, Pirraglia C, Aquilina AM, Zulla R. Effective competency-based medical education requires learning environments that promote a mastery goal orientation: A narrative review. *Med Teach.* 2022 May;44(5):527-534. doi: 10.1080/0142159X.2021.2004307. [PMID: 34807798]
33. Martín-Martín A, Orduna-Malea E, Thelwall M, López-Cózar ED. Google Scholar, Web of Science, and Scopus: a systematic comparison of citations in 252 subject categories. *Journal of Informetrics.* 2018; 12(4): 1160–77. doi:10.1016/j.joi.2018.09.002.
34. Dhaliwal U, Singh S, Singh N. Reflective student narratives: honing professionalism and empathy. *Indian J Med Ethics.* 2018 Jan-Mar;3(1):9-15. doi: 10.20529/IJME.2017.069. [PMID: 28803221]

35. Faucett EA, McCrary HC, Barry JY, Saleh AA, Erman AB, Ishman SL. High-Quality Feedback Regarding Professionalism and Communication Skills in Otolaryngology Resident Education. *Otolaryngol Head Neck Surg.* 2018 Jan;158(1):36-42. doi: 10.1177/0194599817737758. [PMID: 29065274]
36. McQueen S, McKinnon V, VanderBeek L, McCarthy C, Sonnada R. Video-Based Assessment in Surgical Education: A Scoping Review. *J Surg Educ.* 2019 Nov-Dec;76(6):1645-1654. doi: 10.1016/j.jsurg.2019.05.013. [PMID: 31175065]
37. Brauch RA, Goliath C, Patterson L, Sheers T, Haller N. A qualitative study of improving preceptor feedback delivery on professionalism to postgraduate year 1 residents through education, observation, and reflection. *Ochsner J.* 2013 Fall;13(3):322-6. [PMID: 24052760] [PMCID: PMC3776506]
38. Lerchenfeldt S, Mi M, Eng M. The utilization of peer feedback during collaborative learning in undergraduate medical education: a systematic review. *BMC Med Educ.* 2019 Aug 23;19(1):321. doi: 10.1186/s12909-019-1755-z. [PMID: 31443705] [PMCID: PMC6708197]
39. Hochberg M, Berman R, Ogilvie J, Yingling S, Lee S, Pusic M, et al. Midclerkship feedback in the surgical clerkship: the "Professionalism, Reporting, Interpreting, Managing, Educating, and Procedural Skills" application utilizing learner self-assessment. *Am J Surg.* 2017 Feb;213(2):212-6. doi: 10.1016/j.amjsurg.2016.08.001. [PMID: 27756451]
40. Mueller PS. Teaching and assessing professionalism in medical learners and practicing physicians. *Rambam Maimonides Med J.* 2015 Apr 29;6(2):e0011. doi: 10.5041/RMMJ.10195. [PMID: 25973263] [PMCID: PMC4422450]
41. Zhao Y, Zhang X, Chang Q, Sun B. Psychometric Characteristics of the 360° Feedback Scales in Professionalism and Interpersonal and Communication Skills Assessment of Surgery Residents in China. *J Surg Educ.* 2013 Sep-Oct;70(5):628-35. doi: 10.1016/j.jsurg.2013.04.004. [PMID: 24016374]
42. Riveros R, Kimatian S, Castro P, Dhumak V, Honar H, Mascha EJ, et al. Multisource feedback in professionalism for anesthesia residents. *J Clin Anesth.* 2016 Nov;34:32-40. doi: 10.1016/j.jclinane.2016.03.038. [PMID: 27687342]
43. Hoffman LA, Shew RL, Vu TR, Brokaw JJ, Frankel RM. The Association Between Peer and Self-Assessments and Professionalism Lapses Among Medical Students. *Eval Health Prof.* 2017 Jun;40(2):219-243. doi: 10.1177/0163278717702191. [PMID: 28705026]
44. Freudenreich O, Kontos N. "Professionalism, Physicianhood, and Psychiatric Practice": Conceptualizing and Implementing a Senior Psychiatry Resident Seminar in Reflective and Inspired Doctoring. *Psychosomatics.* 2019 May-Jun;60(3):246-54. doi: 10.1016/j.psych.2018.12.005. [PMID: 30626491]
45. Smith KJ, Farland MZ, Edwards M, Buring S, Childs GS, Dunleavy K, et al. Assessing professionalism in health profession degree programs: A scoping review. *Curr Pharm Teach Learn.* 2021 Aug;13(8):1078-1098. doi: 10.1016/j.cptl.2021.06.006. [PMID: 34294251]
46. Jha V, Mclean M, Gibbs TJ, Sandars J. Medical professionalism across cultures: a challenge for medicine and medical education. *Med Teach.* 2015 Jan;37(1):74-80. doi: 10.3109/0142159X.2014.920492. [PMID: 25073712]
47. Al Khalifa K, Al Ansari A, Violato C, Donnon T. Multisource feedback to assess surgical practice: a systematic review. *J Surg Educ.* 2013 Jul-Aug;70(4):475-86. doi: 10.1016/j.jsurg.2013.02.002. [PMID: 23725935]
48. Mitchell JD, Ku C, Diachun CAB, DiLorenzo A, Lee DE, Karan S, et al. Enhancing Feedback on Professionalism and Communication Skills in Anesthesia Residency Programs. *Anesth Analg.* 2017 Aug;125(2):620-31. doi: 10.1213/ANE.0000000000002143. [PMID: 28598926]
49. Perkins SQ, Dabaja A, Atiemo H. Best Approaches to Evaluation and Feedback in Post-Graduate Medical Education. *Curr Urol Rep.* 2020 Aug 13;21(10):36. doi: 10.1007/s11934-020-00991-2. [PMID: 32789759]
50. Cobbold C, Wright L. Use of Formative Feedback to Enhance Summative Performance. *Anatolian Journal of Education.* 2021;6(1):109-16. doi:10.29333/aje.2021.619a.
51. Watling CJ, Ginsburg S. Assessment, feedback and the alchemy of learning. *Med Educ.* 2019 Jan;53(1):76-85. doi: 10.1111/medu.13645. [PMID: 30073692]
52. Burgess A, Van Diggele C, Roberts C, Mellis C. Feedback in the clinical setting. *BMC Med Educ.* 2020 Dec 3;20(Suppl 2):460. doi: 10.1186/s12909-020-02280-5. [PMID: 33272265] [PMCID: PMC7712594]
53. Silveira GL, Campos LK, Schweller M, Turato ER, Helmich E, de Carvalho-Filho MA. "Speed up"! The influences of the hidden curriculum on the professional identity development of medical students. *Health Professions Education.* 2019;5(3):198-209. doi:10.1016/j.hpe.2018.07.003.
54. Cruess SR, Cruess RL, Steinert Y. Supporting the development of a professional identity: general principles. *Med Teach.* 2019 Jun;41(6):641-649. doi: 10.1080/0142159X.2018.1536260. [PMID: 30739517]
55. Stetson GV, Kryzhanovskaya IV, Lomen-Hoerth C, Hauer KE. Professional identity formation in disorienting times. *Med Educ.* 2020 Aug; 54(8): 765-6. doi: 10.1111/medu.14202. [PMCID: PMC7267337] [PMID: 32344447]
56. Wear D, Bickel J. Educating for professionalism: Creating a culture of humanism in medical education. Iowa, United States: University of Iowa Press; 2009. doi:10.2307/j.ctt20q1ws6.
57. Hilton S, Southgate L. Professionalism in medical education. *Teaching and Teacher Education.* 2007;23(3):265-79. doi:10.1016/j.tate.2006.12.024.
58. Wu J, Hagiya T, Tang Y, Hoashi K. Effects of objective feedback of facial expression recognition during video support chat. *Proceedings of the 16th International Conference on Mobile and Ubiquitous Multimedia;* 2017 Nov 26-29; Geneva, Stuttgart Germany. 2017: 293-7. doi:10.1145/3152832.3152848.
59. Iserson KV. Talking About Professionalism Through the Lens of Professional Identity. *AEM Educ Train.* 2018 Dec 4;3(1):105-112. doi: 10.1002/aet2.10307. [PMID: 30680357] [PMCID: PMC6339534]
60. Marcotte LM, Moriates C, Wolfson DB, Frankel RM. Professionalism as the Bedrock of High-Value Care. *Acad Med.* 2020 Jun;95(6):864-867. doi: 10.1097/ACM.0000000000002858. [PMID: 31274519]
61. Mahoney P, Macfarlane S, Ajjawi R. A qualitative synthesis of video feedback in higher education. *Teaching in Higher Education.* 2019;24(2):157-79. doi:10.1080/13562517.2018.1471457.

Error Assessment of Artificial Intelligence Results: What We Need to Do in Medical Education

Mahdi Zarei¹, Maryam Zarei^{2*}

¹MD-MPH, Student Research Committee, Tabriz University of Medical Sciences, Tabriz, Iran.

²MSc of Computer Networking, Khajeh Nasir Toosi University of Technology, Tehran, Iran.

Received: 2023 February 10; **Revised:** 2023 May 08; **Accepted:** 2023 June 10; **Published online:** 2023 June 19

***Corresponding author:** Khajeh Nasir Toosi University of Technology, Tehran, Iran. Email: maryam.zarey@gmail.com. Email: maryam.zarey@gmail.com

Citation: Zarei M, Zarei M. Error Assessment of Artificial Intelligence Results: What We Need to Do in Medical Education. Strides Dev Med Educ. 2023 June; 20(1):38-39. doi: 10.22062/sdme.2023.198333.1173.

Keywords: Medical Education, Artificial Intelligence, Assessment Error

Dear Editor,

McCarthy initially utilized artificial intelligence (AI) in 1955 (1). AI is a machine endowed with intelligent capabilities, including comprehension, reasoning, processing, learning, and communication, enabling it to execute various professional tasks or assist individuals in their endeavors (2).

Products founded on AI play a crucial role in identifying and resolving human problems, particularly those pertaining to healthcare provision. Presently, AI finds extensive application in various domains such as imaging, pathology, surgery, endocrinology, orthopedics, and ophthalmology, offering healthcare services at reduced costs and time, enhanced accuracy, and broader patient coverage (3). According to the World Health Organization, the utilization of AI is projected to benefit an additional one billion individuals through improved access to health services, emergency healthcare for an additional one billion people, and enhanced overall health and well-being for one billion more individuals (4).

Apart from the advantages of employing AI in medicine, numerous challenges lie ahead. These include transforming the doctor-patient relationship, ensuring patient confidentiality and data security, addressing issues of transparency, inadequate facilities and infrastructure, concerns regarding accountability and responsibility, inherent biases in data input, and physicians' unfamiliarity with the algorithms utilized in

these systems (5, 6). Notably, a significant challenge revolves around medical students' (future physicians) limited familiarity with the process of assessing AI outcomes in clinical settings. Given that the accuracy of results, their applicability to clinical decision-making, prescription practices, and other therapeutic interventions serve as the foundation for deploying AI in clinical environments, comprehensive education on these aspects should be integrated into students' curricula to equip them with the necessary skills to tackle forthcoming challenges.

Evaluating the accuracy of AI outcomes in clinical settings comprises three fundamental components:

- 1) Accuracy of input data,
- 2) Sufficient volume of data within the database,
- 3) Assessment of result accuracy by considering the patient's signs, symptoms, and evidence-based medicine (3, 7, 8).

Simultaneously, it is imperative to instill in students, during their studies, the significance of accurate input data and the evaluation of results based on clinical evidence. These principles should be incorporated into the educational curriculum to establish trustworthiness in the final outcomes. Hence, the ensuing discussion will focus on the aforementioned two aspects:

Checking the accuracy and quality of primary input data: The reliability and trustworthiness of results obtained from AI systems rely on comprehensive, accurate, consistent, and readily available primary data that exhibits the desired validity and reliability (3).

When considering the quality of initial data entry, two types of errors may occur: measurement error and representation error. Measurement error pertains to inadequately measured data, often resulting in underrepresentation. Conversely, representation error arises when the population data, intended to be encompassed by the AI system, is inaccurately or incompletely entered. To mitigate these errors and ensure validity, reliability, and data quality, physicians must meticulously measure the primary data before inputting it into the database. In this context, reliability refers to the stability and consistency of measurement results, while data validity addresses whether the data accurately captures the intended information (3, 9). To guarantee the accuracy of results and uphold data quality, it is essential to provide students with comprehensive training beyond the core curriculum. This additional training should encompass various aspects, including proper data entry techniques, the underlying mechanisms of AI, fundamental theories such as machine learning, assessment of data reliability and validity, and interdisciplinary brainstorming sessions involving engineers, education experts, and statisticians. These initiatives aim to familiarize students with the subject matter and ensure they possess the necessary skills to evaluate and enhance the quality of data entered into the system, thereby enhancing result accuracy.

Assessing the accuracy of AI results based on clinical evidence: Once an adequate volume of data has been secured in the database and the quality and accuracy of the input data have been verified, the critical aspect of utilizing AI in clinical settings involves reviewing and evaluating the final outcome generated by AI. It is imperative that a physician assesses the result. This evaluation process is predicated on three fundamental pillars: evidence-based medicine, understanding the pathophysiology of diseases, and considering the signs, symptoms, and familial medical history of patients.

During this stage, the physician, possessing knowledge of AI algorithms, thoroughly considers the system-generated results while simultaneously delving into the pathophysiology of diseases and differential diagnoses. Additionally, they attentively assess the disease's signs and symptoms, take into account the patient's family medical history, and proficiently apply evidence-based medicine (EBM). Through this comprehensive evaluation (8, 10), the physician arrives at a final diagnosis and initiates the appropriate therapeutic interventions.

To ensure doctors possess comprehensive and adequate familiarity with disease pathophysiology and evidence-based medicine (EBM), it is imperative to emphasize the integration of AI in the medical education curriculum. Despite the increasing utilization of AI in medicine and medical education, it remains crucial to prioritize learning the pathophysiology of diseases and biomedical sciences. Furthermore, expanding the training in clinical reasoning, EBM, and critical thinking throughout various stages and courses of medical education, particularly for undergraduate students, can enable future physicians to make accurate therapeutic decisions based on AI. Additionally, such training equips them with the ability to identify and address potential erroneous outcomes provided by AI, thereby ensuring the adoption of appropriate solutions.

Conflict of interests: The authors declare that he has no competing interests.

Ethical approval: Not applicable.

Funding/Support: Not applicable.

References

1. Chan KS, Zary N. Applications and challenges of implementing artificial intelligence in medical education: integrative review. *JMIR Med Educ.* 2019 Jun 15;5(1):e13930. doi: 10.2196/13930. [PMID: 31199295] [PMCID: PMC6598417]
2. Nilsson NJ. *Artificial intelligence: a new synthesis.* San Francisco, California: Morgan Kaufmann; 1998.
3. Barocas S, Selbst A. Data quality and Artificial Intelligence—mitigating bias and error to protect fundamental rights. *European Union Agency for Fundamental Rights.* 2018;20.
4. Kolachalama VB. Machine learning and pre-medical education. *Artif Intell Med.* 2022 Jul;129:102313. doi: 10.1016/j.artmed.2022.102313. [PMID: 35659392]
5. Iliashenko O, Bikkulova Z, Dubgorn A. Opportunities and challenges of artificial intelligence in healthcare. *E3S Web of Conferences;* 2019; 110(EDP Sciences): 02028. doi:10.1051/e3sconf/201911002028.
6. Aung YY, Wong DC, Ting DS. The promise of artificial intelligence: a review of the opportunities and challenges of artificial intelligence in healthcare. *British Medical Bulletin.* 2021;139(1):4-15. doi:10.1093/bmb/ldab016. [PMID:34405854]
7. Lynn LA. Artificial intelligence systems for complex decision-making in acute care medicine: a review. *Patient Saf Surg.* 2019 Feb 1;13:6. doi: 10.1186/s13037-019-0188-2. [PMID: 30733829] [PMCID: PMC6357484]
8. Srivastava TK, Waghmare L. Implications of artificial intelligence (AI) on dynamics of medical education and care: a perspective. *J Clin Diagn Res.* 2020; 14(3):1-2. doi:10.7860/JCDR/2020/43293.13565.
9. Isgut M, Gloster L, Choi K, Venugopalan J, Wang MD. Systematic Review of Advanced AI Methods for Improving Healthcare Data Quality in Post COVID-19 Era. *IEEE Rev Biomed Eng.* 2023;16:53-69. doi: 10.1109/RBME.2022.3216531. [PMID: 36269930]
10. de Leon J. Teaching medical students how to think: narrative, mechanistic and mathematical thinking. *Actas Esp Psiquiatr.* 2018 Jul;46(4):133-45. 2018;46(4):133-45. [PMID: 30079927]

A Critical Review of Civil Liability of Medical Science Researchers in Iran

Ali Arefi Maskouni^{1*} 

¹Assistant Professor of Law Department, Faculty of Law and Theology, Kerman Shahid Bahonar University, Kerman, Iran.

Received: 2023 February 26

Revised: 2023 March 13

Accepted: 2023 March 15

Published online: 2023 June 10

***Corresponding author:**

Faculty of Law and Theology, Kerman
Shahid Bahonar University, Kerman,
Iran.

Email: arefi@uk.ac.ir

Citation:

Arefi Maskouni A. A Critical Review of
Civil Liability of Medical Science
Researchers in Iran. Strides Dev Med
Educ. 2023 June; 20(1):40-47.
doi:10.22062/sdme.2023.198380.1183

Abstract

Background: The importance of medical science development is well known to everyone, and conducting various studies is necessary to achieve this development. In the meantime, the occurrence of mistakes and failures in the process of conducting medical science research is inevitable. In such an atmosphere, the significance of the civil liability issue in medical science research becomes obvious, and since dealing with this area in private law has been neglected by the legislator, and this important matter needs particular laws, it requires legislation to recognize the legal foundations of that issue.

Objectives: The current research was conducted aiming to critically review the civil liability issue of medical science researchers.

Methods: The method used in this study was critical review. A review study helps us understand what we know at present in a specific scientific field.

Results: Relying on each of the jurisprudential principles based on whether the study is therapeutic or non-therapeutic, and clinical or non-clinical, can lead to a different outcome in assigning liability to the researcher. Also, although there are definite foundations for civil liability in the legal system of Iran, in the field of medical science research, we are encountering a void of definite and revised regulations and procedures.

Conclusion: In addition to recognizing the studies in medical sciences, it is also necessary to provide the possibility to induce the least legal challenges in therapeutic or non-therapeutic clinical studies on a human subject. Although there are civil liability foundations stemming from medical science research in Iranian law, unfortunately, no certain procedure and law are observed in this regard, and it is necessary for the legislator to resolve this serious void by approving appropriate regulations because due to the complexities in medical science subjects, the general principles of civil liability regulations cannot be a solution on its own.

Keywords: Civil Liability, Medical Science Research, Researcher's Liability, Jurisprudence, and Law

Background

Medical sciences have had increasing progress in their various fields in Iran over recent years, and this progress was not possible without widespread research in all fields related to these sciences (1).

Topics concerning the role of law in medical science research in Iran were clearly proposed for the first time by the formation of the National Ethics Committee on Medical Science Research in 1999, the approval of the bylaw of this committee, and then the approval of the Tehran Statement (Approved Codes for the Protection of Human Subjects in Medical Sciences Research) in the same committee in which the legal status of medical science research was specifically considered. In a previously conducted scientific study, the degree of attention to the subjects of medical ethics in medical science research among students of Tehran University of

Medical Sciences during the years 1994 to 1997 was investigated, the data of which denote insufficient attention to the subjects of medical ethics in the process of conducting studies (2)

One of the essential issues of private law in the present era is the civil liability issue in the area of newly emerging activities. Although medicine and its related sciences have an old history, one cannot deny that nowadays, the speed of development in this field of experimental sciences has increased and exposed it to changes to the extent that the present conditions cannot be regarded as the previous conditions. On the one hand, these developments have increased the risk propensity of workers in the field of medical sciences. On the other hand, because of technical complexities, the field of medical sciences remains unknown to most of those who use these services. Such conditions strongly provide the conditions for the

emergence of disputes between providers and users of medical science services.

The presence of a single procedure in dealing with disputes induced in medical science research is a need felt by researchers and officials relevant to these studies in recent years. Because of the absence of a single law that objectively enumerates researchers' obligations, they are located in an ambiguous atmosphere that can challenge their motivations for the increasing development of their work, and individuals who are willing to participate in medical science research are also reluctant to participate in such an ambiguous atmosphere. Providers of medical science research services have serious concerns about responding to possible mistakes in their studies. The concern of unjust force to compensate for the damages that, in their opinion, they were not at fault for their occurrence can disappoint researchers and decelerate the development of medical sciences. Therefore, the exact determination of civil liability limits in medical science research seems beneficial for both the providers of these studies and their users. The current research was conducted to investigate the civil liability sources of medical science research in Iranian law.

Objectives

The current research was conducted aiming to critically review the civil liability issue of medical science researchers.

Methods

The method used in this study was critical review. A review study helps us understand what we know at present in a specific scientific field (3). A review study aims not only to describe and summarize previous literature, but a good review study should also be analytical, critical, and prescriptive. A critical review expresses the pros and cons of research studies conducted in a specific scientific field. It aims to review the most important and relevant research studies conducted in that scientific field and critical discussion about them (4). In the present study, the published texts concerning the legal principles and foundations related to medical science research available in Iran were investigated through a critical view.

Inclusion Criteria

The first inclusion criterion included the selection of studies to examine legal issues in research in various

books and research, and the second criterion included the entrance of books and theses related to the research subject.

The articles presented in conferences, congregations, and reports, and also the lack of access to the articles' full texts were also considered exclusion criteria (Figure 1).

Results

The first part of the findings dealt with explaining the research topic from the perspective of existing texts, including the explanation of the civil liability concept and the classification of medical science research, and the second part dealt with legal and jurisprudential sources in medical science research.

• Definition of Research in Medical Sciences

"Investigation and research are practices aiming to generally recognize the general chemical, physiological, or psychological processes" (5).

"The boundary between research and medicine is not totally obvious because both often appear together, just like research designed and conducted to evaluate a drug or a therapy that gets out of the usual and standard mode and turns into an experiment. Here, the word medicine refers to any practice that is in itself helpful for the patient and is carried out only to promote a patient's health and recovery, and the aim is to provide an individual with a diagnosis, preventive measure, or treatment. On the contrary, research refers to an action performed to test a hypothesis or draw a conclusion. Research is often designed in an official protocol that has an objective and methods to achieve the objective (procedure)" (5).

When the objective of medical practices is to investigate the rate of effectiveness or safety of a new therapy, and the subject is a human being under clinical care and clinical operation, research and therapy seem to be able to appear together. Overall, in cases where there is a doubt about whether a medical action is a research or therapy, as a general rule, research (whether mere research or research combined with therapy) appears to be considered the basis because this rule is more efficient in preserving the human dignity and rights of the individuals engaged in the process of medical operations, and as soon as the doctor and other medical staff enter the research stage, the subjects will benefit from more legal support.

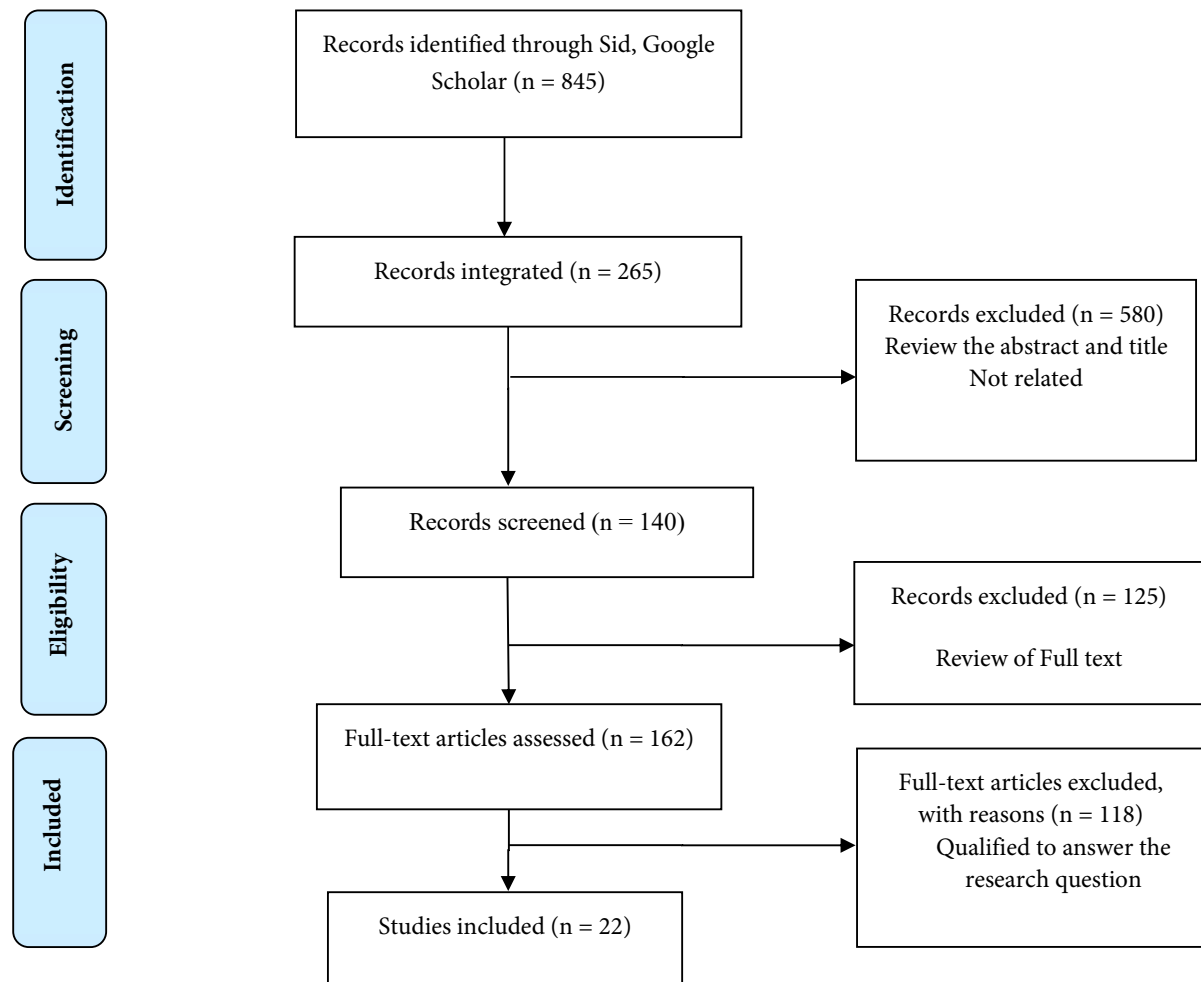


Figure 1: Screening diagram and selection of articles

It must be stressed once again that one cannot regard medicine and therapy as a form of research just because of deviating a doctor or medical staff from the usual path because, in such a case, the rights of patients and clients to receive medical services will be exposed to the risk of violation. Therefore, merely a type of innovation in the path of therapy should be regarded as research that has been foreseen in advance and has been approved by competent expert authorities, and concerning therapy-related research (therapeutic research), the possibility of treating the patient should also be reasonably included in conducting the research.

- **Classification of Medical Science Research**

An important point that should be considered regarding medical science research is that these types of research can also be different in practice in terms of civil liabilities depending on the diversity of their types. Thus,

the most important and common types of classification of such research are explained in the following.

A) Therapeutic and Non-therapeutic Research

If a conducted study while discovering new medical knowledge also seeks to treat a patient (the subject), it is called therapeutic research, and if it is not trying to treat the subject, it is called non-therapeutic research. Therapeutic research deals with examining a drug, treatment process, or diagnostic process on patients. Such research does not aim to benefit those who have undergone this trial, but the interests of patients who will be affected by the same disease in the future are intended" (6).

B) Clinical and Non-clinical Research

Another common classification is classifying medical science research into clinical and non-clinical. If the researcher has a subject case for his/her research and deals with conducting a field study on the effective

variables in his/her research for a subject, the research should be called clinical, and if he/she relies on library studies and reviews, then the research will be of a non-clinical type.

In the definition of clinical and non-clinical research, it can be said: "Regarding clinical research, a systematic categorization should be considered between clinical research whose aim is to treat the patient and clinical research whose topic is only scientific and has no therapeutic value for the human subject under research" (6).

Concerning non-clinical research, the condition is obviously different from other types of medical science research because when talking about non-clinical research, then conventional library method research and conducting various tests and during various foreseen stages, the results of all findings are used for human or non-human purposes.

C) Drug and Vaccine Production-Related Research

Considering the available procedures and laws governing conducting medical science research, this group of research should be evaluated clinically on human subjects in their final stages for final approval. It is evident that such research will finally be classified as clinical research. Of course, there is a difference between drug and vaccine-production-related research in terms of being therapeutic or non-therapeutic because the drug must be evaluated on the patient to measure its degree of efficiency and effectiveness, but the vaccine must be tested on individuals who are totally healthy, and in some cases, the history of the disease in question will even hinder the competence to participate in the vaccine test. From this perspective, drug-related research is therapeutic, and vaccine-related research is non-therapeutic (6).

D) Food and Nutrition-Related Research

In the field of medical sciences, there is always food and nutrition-related research as well. Since this group of research is not for treatment, they are certainly regarded as non-therapeutic. Now, if a human subject is investigated in the process of this group of research to obtain research results, that research should be classified as clinical research; otherwise, the mentioned research will naturally be of a non-clinical type (6).

The Civil Liability Concept

Civil liability has been created aiming at damage indemnification and compensation. Therefore, wherever someone is liable for compensating damage, civil liability is involved. In other words, civil liability is the manifestation of the relationship between the damage-causing person and the damaged person, which

often takes a financial form, and this relationship comes to an end with paying an amount as damage compensation (7).

Civil liability has been indeed created following damage compensation. In contrast, criminal liability is associated with punishment, and this punishment can be reforming the perpetrator or warning other society members, or the punishment may be enforced in defense of society. Civil liability and criminal liability have been previously merged. In many crimes, the punishment of someone who committed a crime was to pay damages to the damaged person himself/herself, as blood money (Dieh) in Islamic law has also the same meaning (8).

What is referred to as the damage must be certain and definite, and an individual cannot be condemned to pay possible damages; of course, it is sometimes difficult to calculate the precise amount of imposed damage, such as when the damage is related to the loss of physical ability for life, which does not remain as resorting to approximation and guessing a remedy to calculate the damage because the individual's rest of life or the amount of his/her usage of the lost ability for life cannot be accurately measured, or in the assumption that the occurred physical injury is a type of disease whose effects and consequences will expand over time at an unpredictable speed is also a similar situation.

From the perspective of the proponents of the theory of fault in civil liability, the induced loss must be predictable before its occurrence to the individual who has caused the damage. Of course, the proponents of the theory of fault in Iran's civil liability system acknowledge that the predictability that is a manifestation of the fault caused by the damage-causing person is not relevant in cases of pure liability (9).

Legal Sources in Medical Science Research

Civil Code

In Iran's Civil Code, regulations on tortious liabilities have been mentioned. This code has regarded tortious liabilities to be four causes, including usurpation and what has the force of usurpation, deliberate destruction, indirect destruction, and utilization. Out of these four topics, only deliberate and indirect destruction can be raised regarding medical science research, which, as stipulated by the Civil Code in Articles 328 and 331, these two topics are only relevant to belongings.

Therefore, deliberate and indirect destruction in Civil Code can only be used very limited in civil liability topics related to medical science research. In these articles of the Civil Code, the basis of civil liability tends to be strict liability or subjective liability. According to

the authors, “the Civil Code of fault-based liability has no priority over objective liability in this regard, and the weakness and strength of the causality relationship play a more important role in determining the liable person” (10).

Law of Tort

As acknowledged by some researchers, “In the law of tort, the legislator has considered fault to be the basis of liability and has regarded it as the principle” (9). Accordingly, if civil liability is considered in medical science research, it should be acknowledged that given the absence of specific laws in this field and the remaining law of tort, fault-based liability should be taken as the basis. However, the issue will not be solved so easily, at least regarding some examples of damages caused by medical science research. The law of tort, which is a general law in this field, has indeed not abolished the principles present in the Civil Code regarding indirect and deliberate destruction, which are considered specific to the law of tort, and these articles continue their legal life (10).

Islamic Penal Code

The Islamic Penal Code approved in 1991 had inconsistency in adopting the basis for doctor’s liability. On the other hand, in Articles 319 and 321, absolute liability and strict liability were accepted, while in Article 320, fault-based liability was raised (11). However, the Penal Code approved in 2013 followed a different procedure and by virtue of Article 495 and its note, “whenever a doctor causes physical loss or injury in his/her treatments, he/she is the blood money guarantor unless his/her action is in accordance with medical regulations and technical standards, or if he/she has obtained acquittal before the treatment and does not commit any fault, and if the acquittal of the patient is not valid because of his/her immaturity or insanity, or acquittal of the patient is not possible because of anesthesia, etc., the acquittal will be obtained from the patient’s guardian.”

In the Islamic Penal Code of 2013, the legislator moved a step from absolute liability to the theory of fault, and by adopting such a theory, although he has regarded the doctor’s liability as the document, he has allowed the doctor to be freed from the liability. The reason may be that adopting the basis of absolute liability for doctors challenges them in performing medical actions, and the fear of liability will be a barrier to providing medical services.

Adopting the procedure of the Islamic Penal Code of 2013 for medical science research, particularly research with a therapeutic aspect, will lead to the same problem in medical science research. If the theory of fault

assumption or statistics is followed in medical science research and one of the technical and specialized standards of therapy is considered rather than giving an effect as much as transferring the evidentiary burden of proof to the acquittal, the medical science research-related social interests will be considered better in the field of civil liability.

Jurisprudential Foundations of Civil Liability in the Field of Medical Science Research

Based on the famous opinion in Shi’a jurisprudence, “absolute liability” should be considered in civil liabilities. Therefore, in different types of civil liability or tortious liability, no place has been considered for the presence of a fault, and the damage-causing person has been regarded as liable absolutely (12, 13).

“Ghaedeh Lazarar”

The principle of harm is one of the most famous principles of jurisprudence, which is used in various cases. “The importance of the mentioned principle is to the extent that many jurists have devoted an independent treatise of their writings and interpretations to it since distant years” (14). Although different theories have been suggested by Shi’a jurists regarding the interpretation and domain of application of this principle, this principle can be considered the foundation of civil liability, which is completely consistent with absolute liability (15).

Accordingly, if the damage is caused concerning a research study (whether medical science research or otherwise), the civil liability of compensation will be with the damage-causing person, regardless of whether he/she has committed a fault in this regard or not. A point that should be taken into account is that in research, the researcher (whether a real or a legal person) is often engaged as an active agent in juridical fact. Therefore, in most damages, the researcher should be considered liable for damage compensation unless another agent interferes in causing the damage in such a way that it removes the causality between the researcher and the damage caused.

“Ghaedeh Etlaf”

The principle of deliberate destruction is an important and substantial principle in civil liability, which includes compensation for physical and financial damages (16). In the Civil Code of Iran, being a guarantor of an insane and a minor in compensating for the damages they have caused from their own belongings can be evidence of this claim that the principle of deliberate destruction involves absolute and strict liability. Also, if the researcher causes a loss of properties and bodies via conducting the research based

on the principle of deliberate destruction, the researcher's civil liability can be considered.

“Ghaedeh Zamane Yad”

Based on this principle, by creating domination over others' property, the liability of compensation, the benefits, and the same thing the possessor has possessed emerges. According to this principle, absolute liability has also been considered, and the fault does not contribute to knowing the possessor as liable (17).

The acceptance of the principle of liability of unlawful possession as the basis of the researcher's civil liability seems to be difficult because, as mentioned in the principle of liability of unlawful possession, creating domination over other's property is raised, and basically, this issue determines the border between the examples of this principle and the principle of deliberate destruction. In contrast, the researcher cannot have physical domination over the research subject (which in medical science research is human in many cases) to have physical dominance. On the other hand, this principle is often raised regarding property, and in medical science research, we are not dealing with property.

In response to this issue, perhaps today we can talk about the benefits of health or the benefits resulting from body organs as being property because even though limited and approximate, they can be calculated and valued, even if these things cannot be assigned or transferred. Furthermore, it should be said that the ownership and being the property in its different dimensions is a function of the custom of time and place. Therefore, customs may regard some medical science research subjects as property. However, it should be noted again that if we want to regard the principle of liability of unlawful possession as the basis, the research must be accompanied by domination over property, and if the research conducted by the medical science researcher has led to losing some interests of the subject, over which the researcher has not dominated in a particular sense, the issue will be among the examples of the principle of deliberate destruction.

“Zamane Ghoror”

Based on this principle, if an individual causes to deceive another individual with his/her behavior and, as a result of this deception, causes damage to a third party or if he/she himself/herself is damaged, it is the first individual who is considered liable for the damage caused. There are two assumptions regarding this principle. First, if the deceiver intends to deceive, which in this case, there is no disagreement on his/her being liable, but assuming that the deceiver does not intend to

deceive the person, some have rejected the possibility of knowing the deceiver as liable (15).

In any case, although the principle of liability against deception may be relied on and looked attentively in some assumption of damages caused regarding medical science research, the fact is that considering its limited scope that involves only cases of deception, this principle at least alone cannot be regarded as the basis of civil liability and cannot be considered in medical science research as in the first one.

The precision in the opinions collected in medical malpractice cases clarifies that the observance of scientific standards, the disease nature, the lack of a necessary relationship between the injury and medical measures, and the patient's negligence or fault are among the most important indicators that can contribute to the non-identification of the responsibility of medical service providers. Therefore, in the first place, observing scientific standards and making wise and conventional efforts can be effective in exonerating the doctor from liability. Based on this criterion, as much as the doctor is familiar with the state-of-the-art science, does not commit any fault, has sufficient precision in diagnosing the disease, and chooses an appropriate treatment method given the patient's condition, these are enough for the doctor to exonerate from liability. In the second place, some factors can be assumed as external factors beyond the medical service providers' will, and they are not involved in the realization or the emergence of that event. Therefore, if the event is unpredictable, unpreventable, or correctable, it will cut the causality relationship (18).

Discussion

Given the recognition of jurisprudence and legal foundations of the medical science researcher's liability, we can conclude that if the conducted research is of therapeutic type, we will encounter a phenomenon with different dimensions because the therapy and its resultant liabilities are separate issues. Also, although therapeutic research seeks to treat a subject's disease, one cannot deny that the predominance of research over therapy exists, and therapy is an outcome that should be obtained from research. In such a case, simply due to the presence of a therapeutic approach, it is impossible to regard the therapeutic liability of the doctors and medical staff as the basis for finding the person liable for compensating possible damages. On the other hand, it is not possible to leave the subject without legal support, and by resorting to foundations such as the jurisprudential principle of “assumption of risk: *velonti nonfit injuria*,” to rule that he is not entitled to claim damages because his/her action to

participate in the research is not the only cause of the assumed damage and other multiple and complex factors are also involved.

The different views and the lack of a specific law for medical science research can greatly enhance the risk of non-enforcement of justice in legal disputes stemming from liability in such research.

Numerous comments have been made regarding the civil liability of the medical science researcher. Although based on the theory of fault, the occurrence of fault by the researcher must be ascertained so that the researcher can be considered liable; based on the jurisprudential principle of harm, merely the association between the research activities and the damage caused suffices to regard the researcher as liable.

Depending on whether the research is therapeutic or non-therapeutic or clinical or non-clinical, relying on any of the jurisprudential principles can lead to different results in assigning liability to the researcher. Although there are definite foundations for civil liability in the legal system of Iran, in the field of medical science research, we are encountering a void of definite and revised regulations and procedures.

Conclusion

According to the present study's findings, although civil liability foundations stemming from medical science research are observed in Iranian law, unfortunately, there is no specific procedure and law in this regard. Therefore, it is suggested that the legislator eliminate the serious voids in this field by enacting appropriate regulations. Due to the complexities in general regulations concerning civil liability, these regulations should be stated more simply and practically, and special laws should be formulated in this area to provide legal support to medical science researchers.

Supplementary Material(s): is available here [To read supplementary materials, please refer to the journal website and open [PDF/HTML](#)].

Acknowledgements: We would like to thank the efforts of our dear colleague, Mr. Mohammad Reza Zangiabadi, for his collaboration in the stages of compiling this study.

Conflict of interests: The current research has not been submitted to other journals or publication sites and is not under review. The authors have no affiliation with any organization with direct or indirect financial interests in the topic discussed in this article.

Ethical approval: Not applicable.

Funding/Support: None.

Brief Definitions of Specialized Words

“Ghaedeh Lazarar”: The principle of harm is one of the famous principles of jurisprudence that is used in most cases of jurisprudence, meaning that harm is not legitimate in Islam, and any harm and loss is negated in Islam.

“Ghaedeh Etlaf”: The principle of deliberate destruction is one of the most famous jurisprudential principles, and jurists have used it extensively. The content of this principle is the same as the meaning of “he/she who causes a damage shall be liable for its compensation,” meaning that “if someone destroys, consumes, or uses other’s property without the permission of the property owner, he/she is a guarantor.”

“Ghaedeh Zamane Yad”: The content of this principle is that anyone who dominates over other’s property, in any way unjustly, ignorantly, in trust, benevolently, becomes the guarantor of that property, and as long as he/she returns it to its owner, this liability does not fall from him/her.

“Zamane Ghoror”: The lexical meaning of deception in Islamic jurisprudence is “a person damages another person due to his/her negligence and ignorance, in which case, the deceiving person is the guarantor of the damaged person.

References

1. Ashrafzadeh Farsangi M. (Dissertation). Patient's rights in the condition of doctor's acquittal from civil liability in Iranian law. Kerman: Shahid Bahonar University; 2014. [In Persian]
2. Smith T, Larijani B. Ethics in medical research. Tehran: Baraye Farda Pub; 2009. [In Persian]
3. Jesson J, Lacey F. How to do (or not to do) a critical literature review. *Pharmacy Education*. 2006; 6(2): 139-48. doi:10.1080/15602210600616218.
4. Saunders MN, Rojon C. On the attributes of a critical literature review. *Coaching: An International Journal of Theory, Research and Practice*. 2011; 4(2): 156-62. doi:10.1080/17521882.2011.596485.
5. Abbasi M. Medical Law and Responsibility in Islam. (Translation). Mubarak Al-Sh, Bin Mohammad Q. Tehran: Sina Legal Cultural Institute Pub; 2012. [In Persian]
6. Abbasi M. Collection of Ethics Codes in Research. Tehran: Sina Legal Cultural Institute Pub; 2013. [In Persian]
7. Khodabakhshi A. Basics and Concepts of Civil Responsibility, Tehran: Jungle Pub; 2013. [In Persian]
8. Katouzian N. Civil Rights Introductory Course: Civil Liability. Tehran: Publishing Company; 2015. [In Persian]
9. Bahrami Ahmadi H. Civil Liability (Civil Rights). Tehran: Mizan Legal Foundation Pub; 2019. [In Persian]
10. Katouzian N. Civil rights: non-contractual requirements (compulsory guarantee). Tehran: University of Tehran; 2018. [In Persian]
11. Safaei SH. Basis of Civil Liability of Physicians With A Glance at the New Bill for Islamic Penal Code. *Quarterly of Judicial Law Views*. 2012; 17(85): 141-56. [In Persian]

12. Mohseni F, Ansari R. Reciprocal impact of criminal responsibility And civil liability. *Journal of Legal Research*. 2019; 22(86): 353-81. doi: 10.29252/LAWRESEARCH.22.86.353. [In Persian]
13. Salehi SM, Faramarzi Razini F, Ghasemzadeh N. Physician's liability and presumption of innocence based on Shiite jurists' opinions: a review study. *Iranian Journal of Medical Ethics and History of Medicine*. 2013; 6(3): 17-29. [In Persian]
14. Montazeri S, Sadr Tabatabai MA. Analysis of the reasons and principles of medical responsibility in light of the teachings of Jurisprudence. *Journal of Criminal Law Research*. 2018; 6(21): 197-226. doi:10.22054/jclr.2018.12556.1219. [In Persian]
15. Bahrami Ahmadi H. Compulsory guarantee of "civil responsibility": with a comparative study in jurisprudence of Islamic religions and legal systems. Tehran: Imam Sadiq University; 2014. [In Persian]
16. Ahmadi S, Meskar M, Nargesian M. Physician Responsibility from the Perspective of Islamic Jurisprudence in Iran. *J Babol Univ Med Sci* 2016; 18 (2) :64-8. doi: 10.22088/jbums.18.2.64. [In Persian]
17. Wafai A, Ferman Ashtiani Y. (2022) The Role of Iodine Guarantee in Islamic Jurisprudence and Jurisprudence. *Qonun Yar*. 2022;5(19): 224-39. [In Persian]
18. Javan Jafai Bojnordi A, moshirahmadi A, Asrari M. Analyzing Indicators of Physicians non Responsibility in Forensic Precedent. *Alborz University Medical Journal*. 2022; 11 (4) :457-68 . [In Persian]

Explanation of A Framework for the Effective Implementation of E-Learning at Universities of Medical Sciences: A Mixed Exploratory Method

Zohrehsadat Mirmoghtadaie¹, Zeinab Shakiba², Sara Shafian^{3*}, Soleiman Ahmady¹

¹Assistant Professor, Department of E-Learning, Virtual School of Medical Education and Management, Shahid Beheshti University of Medical Sciences, Tehran, Iran.

²MSc. Science in E-learning in Medical Sciences, Shahid Beheshti University of Medical Sciences, Tehran, Iran.

³Department of Medical Education, Education Development Center, Kerman University of Medical Sciences, Kerman, Iran.

*Professor, Department of Medical Education, Virtual School of Medical Education and Management, Shahid Beheshti University of Medical, Sciences, Tehran, Iran.

Received: 2022 December 12

Revised: 2023 May 21

Accepted: 2023 June 10

Published online: 2023 June 10

*Corresponding author:

Department of Medical Education,
Kerman University of Medical Sciences,
Kerman, Iran.
Email: hajarshafian@gmail.com

Citation:

Mirmoghtadaie Z, Shakiba Z, Shafian S, Ahmady S. Explanation of A Framework for the Effective Implementation of E-Learning at Universities of Medical Sciences: A Mixed Exploratory Method. *Strides Dev Med Educ.* 2023 May; 20(1):48-58. doi:10.22062/sdme.2023.198150.1149

Abstract

Background: E-learning is considered the most important technology that can support new teaching-learning approaches. The objective of e-learning is to provide the same access and create the same educational space for all learners at any point, and optimize the methods of presenting course content for deeper and more serious learning.

Objectives: The present study was conducted to develop a standard framework for the effective implementation of e-learning in medical science education.

Methods: This study was conducted in two phases in 2022 using a mixed exploratory method. In the first (qualitative) phase, the initial framework was obtained from a comparative review of existing literature. In the second (quantitative) phase, the calculated standards were prepared in the form of an online questionnaire and sent to 20 e-learning experts in medical sciences. After data analysis, a framework of e-learning standards were proposed.

Results: Nine dimensions and 58 standards were approved as the framework of e-learning standards. The lowest and highest content validity ratio (CVR) based on the analyzes were reported to be 0.77 and 0.88, respectively. As a result, all dimensions and 58 standards were approved. Also, the intraclass correlation (ICC) between 0.75 and 0.90 showed good reliability and high agreement between experts.

Conclusion: Using a standard framework to implement e-learning helps to improve the quality of e-learning courses in medical sciences and brings more trust from internal and external stakeholders in these courses. Therefore, it is necessary to focus on the field of education and attempt to make educational organizations work in the best way in any situation, such as the fact that the world has recently been exposed to the COVID-19 pandemic which led to the tendency of universities to use it.

Keywords: E-learning, Medical Science Universities, E-Learning Standards, Delphi Technique

Background

E-learning is defined as active and intelligent learning, which, while evolving in the teaching-learning process, plays a fundamental and central role in expanding, deepening and stabilizing the culture of information and communication technology (1). Some researchers believe that e-learning has more advantages than traditional methods, including ease of use, cost-effectiveness, regular updates, flexibility, support for learners to succeed in education, better control over the environment, and accessibility (2, 3). In some studies, including Costa et al. (4), Wang (5), Singh and Min (6),

Ghoreishi et al. (7), and Bali and Liu (8), students have reported high satisfaction with e-learning. In addition, the effectiveness of e-learning is influenced by the active learner, learner-based, content, interaction, consideration of individual differences of learners, flexibility, providing feedback and assessment (2). In their study results, Alqudah et al. suggested the use of suitable technical settings, the support of e-learning systems, the simultaneous use of two asynchronous and synchronous types independent of time (3).

In medical education, there is a growing tendency to replace traditional teaching with electronic courses,

especially blended learning, to meet the needs of students in relation to easy access to information and other technical skills (4). The COVID-19 pandemic caused the closure of universities, and in this great threat that brought the face-to-face education system of universities into serious danger, an exceptional opportunity arose for the position of e-learning in Iran to face a fundamental transformation (5). Although it seems that the advantages of e-learning have overtaken its limitations and it has become an attractive choice in the field of improving competencies and updating medical knowledge and skills in continuing medical education, facilitating the possibility of continuing education at higher levels and promoting lifelong learning culture among professors and students, it should be noted that the design and implementation of successful and highly effective e-learning courses at universities of medical sciences need attention to requirements (6).

A review of the fate of organizations in recent years shows that there have been successful organizations in the field of development that have been able to, with a correct understanding of the environment and its developments and an accurate and realistic assessment of internal capabilities, develop effective brochures based on their mission and provide a suitable platform for the implementation (7). It is necessary to survive in the competitive world, align with the conditions of the new era, think and act globally and find better opportunities (8).

Despite the widespread adaptation of education around the world by electronic methods, especially during the COVID-19 pandemic, this type of education has not yet been recognized in higher education centers, including universities of medical sciences, and is facing challenges (9). These challenges are divided by researchers into three categories "challenges related to students, including inappropriate access or lack of high-speed and efficient Internet connection, software, and hardware limitations, a place to study, and lack of interaction between professors and students; challenges related to professors, including job challenges and increased workload, access to equipment, adequate familiarity with technical issues; challenges related to administrators policymakers, including problems related to the transition to digital learning and challenges related to equipment, infrastructure, and technical issues (10). Selim stated the critical factors for the success of e-learning mainly in four main groups of teacher, learner, content, and support of the university (11). In a study by Fleming et al., which was conducted to identify factors affecting the success of e-learning,

these factors included initiative, reducing complexity, and technical support (12).

According to the existing literature, the focus of most studies has been on introducing capacities, challenges, and solutions for the effective implementation of e-learning. In fact, few studies have been conducted to propose a framework for its effective implementation in medical science education. What is certain is that the e-learning system at universities of medical sciences in Iran is on the path of development. The conducted studies have shown that the use of e-learning at universities of medical sciences in Iran, despite the advance in recent years, is facing shortcomings compared to advanced countries. Therefore, reflecting on the above issues suggest the necessity of a basic and fundamental action in education, especially in the main and fundamental component (development of the main effective components of its implementation). Also, with the knowledge of the environment and identification of the existing developments, the necessary changes should be made in order to continue the dynamic life. These changes should be along with current knowledge and meet educational needs. As a result, the present study was conducted given the need for the effective implementation of e-learning in the field of medical science education by a strategic approach to developing a standard framework for providing effective e-learning.

Objectives

The present study was conducted to develop a standard framework for the effective implementation of e-learning in medical science education.

Methods

Given that the items related to the effective implementation of e-learning at universities of medical sciences have not been identified and there was no structural and theoretical guide, exploratory mixed methods design, which is one of the strategies of the integrated method, was used. This method includes the collection and analysis of quantitative and qualitative data in one study (13). A sequential exploratory design is a mixed research design in which the quantitative phase of data collection and analysis follows the qualitative phase of data collection and analysis (14). The present study was conducted in two qualitative (the review of literature related to the study question) and quantitative (the use of the opinions of experts in the field of e-learning in medical science education) phases.

Qualitative phase: content analysis

In the first phase, using the content analysis method, the basic structure and the influencing factors in each of

the dimensions of the model were identified by analyzing the existing literature. The statistical population of the study included all the studies conducted on the components affecting the implementation of e-learning in medical and health sciences education. The articles using the keywords "e-learning design, development standards courseware, instructional design standards, technical standards, e-learning implementation, delivery standards, online, e-learning, virtual education, and education" were searched in Web of Science, Education Resources Information Center (ERIC), Scopus and PubMed databases. The screening process of the articles in this field included

checking the non-repetition, appropriateness of the title, abstract, introduction, and conclusion with the research topic, and the result was the selection of 41 articles. After selecting the articles that are completely related to the objective of the research using the qualitative content analysis, a six-step process including "familiarity with the data, creating initial codes, searching for selective codes, forming subcategories, defining and naming the themes, and preparing the report and drawing of the thematic network" was reviewed and finally, the initial format of the framework was prepared (15) (Figure 1).

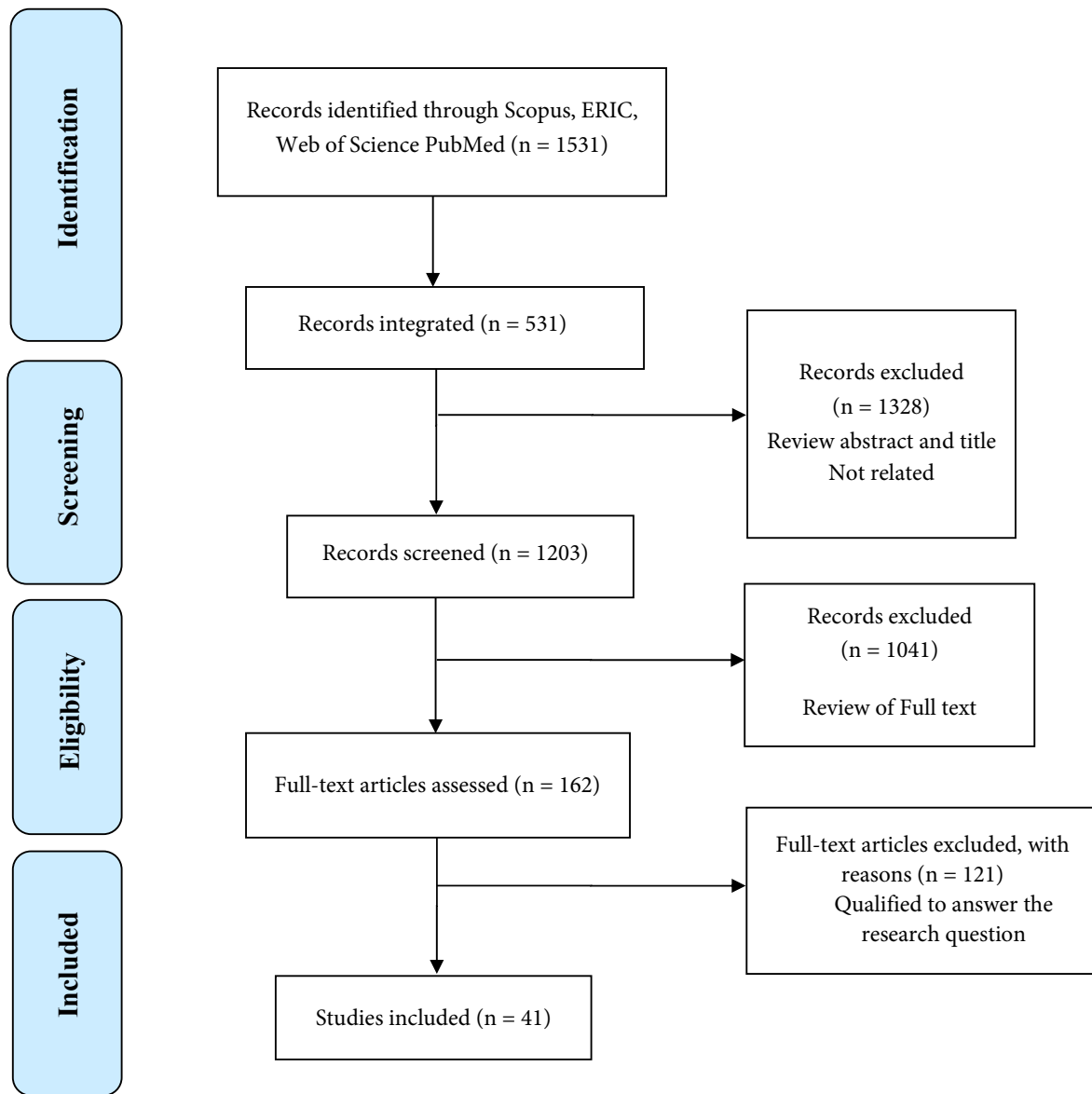


Diagram 1: Flowchart of screening and selection of articles

Quantitative phase: Delphi technique

In the quantitative phase, after identifying the components of the framework to improve the results and check its details, the Delphi technique (16) was used twice to determine the final factors and criteria. To collect opinions, a semi-structured questionnaire on a five-point Likert scale (completely agree, agree, no idea, disagree, and completely disagree) was used that was distributed online using Porsline (<https://porsline.ir>). The statistical population of the research included experts in the field of e-learning in medical sciences, who were purposefully included in the study, and due to the lack of complete knowledge, the snowball method was also used to identify the research samples. Finally, 20 experts in the field of e-learning with written articles, scientific lectures, student theses in bachelor's and doctorate degrees in this field, and were also faculty members of medical sciences universities, were included in this study (17). In order to verify the obtained information, the questionnaire was sent to experts in the field of e-learning in the country's medical sciences through email, and analyzing and summarizing.

After receiving the completed questionnaires in the first phase and organizing the answers and applying the comments, the questionnaires were again sent to the participants through Porsline in order to collect the opinions and suggestions of the experts regarding the compliance of the proposed standards with the educational conditions of the country and achieve a relative agreement.

Results

After collecting the questionnaires of the second phase, data were analyzed to verify the developed standards, and for this purpose, CVR and content validity index (CVI) (18-20) were used. According to the number of participants (n=20), items whose CVR was less than 0.49 were excluded from the questionnaire (21). Then, using the mean CVR scores, the remaining CVI questions were measured. CVI higher than 0.75 or 0.80 was considered as acceptable and desired (22). To confirm the reliability of the questionnaire, ICC was used (23).

The results of the first phase showed the development of the initial framework of e-learning standards including 9 dimensions and 58 standards (Table 1). The results of the second phase showed that according to the demographic information of the participants, 57% of the respondents of the Delphi technique were women. The validity of the content showed that the score of 3 standards was lower than the desired level. Therefore, these questions should be excluded from the questionnaire (Table 2). The validity

of the whole questionnaire was 0.82 and its subscales were between 0.77 and 0.88. Given that the coefficient of all dimensions was close to 1, the questionnaire has high validity (Table 3).

Cronbach's alpha coefficient for the questionnaire was calculated as 0.95 and between 0.55 and 0.87 for its subscales. Given that these values were higher than 0.70, the questionnaire showed a satisfactory internal consistency, and the assurance of the internal correlation of the questions was obtained. The value of the Pearson correlation coefficient was obtained at an interval of one week for the questionnaire twice 0.90 and was significant at the 0.05 level, and reported between 0.71 and 0.91 for the subscales, indicating the reliability of the questionnaire. The ICC value for the questions of the questionnaire was calculated at 0.95 and between 0.83 and 0.95 for the subscales, indicating the high level of agreement between experts in the questionnaire (Table 4).

Table 1. Dimensions and standards of the effective implementation of e-learning framework in medical science education

Dimension	Standard
Course management standards (6 standards)	In the content of the course, the information of the university and the producer should be included, and the content should be free of any advertisements outside the university.
	The training provider should take reasonable and reliable measures to reduce the risk of fraud and misconduct of learners and other people.
	Before the start of the course, the duties of the learners should be given to them, and the consequences of not complying with they should be fully explained.
	Access to the course shall be restricted to users with access credentials issued by the University.
	Comprehensive and complete guidance on how to work with the system should be given to learners and details should be provided to each student and show where they can get guidance.
	All the course content should be provided to the learners at the same time in the electronic learning management system.
Educational design and pedagogy standards (6 standards)	The design of the course and the learning topic should be in accordance with the principles of educational design (at the beginning of the course, a dedicated storyboard should be developed).
	Continuous interaction between learner, teacher, and content should be considered.
	Support a wide range of learning styles (visual, auditory, etc.).
	Learning topics should include activities, assignments, and reflections, and appropriate feedback should be given to learners about them.
	The content should be presented in a logical order based on the objectives of the curriculum.
Curriculum standards (4 standards)	The introductory part should have a brief review of the lesson and act in an inductive way that can motivate the learners to pay attention to the lesson.
	The content and arrangement of the course should cover all topics and objectives of the curriculum.
	The course plan or lesson plan for the courses should be developed and provided to the learners at the beginning of the course.
	The course should use formative e-learning assessments and quizzes throughout the course to gauge student understanding of the subject matter.
Technical standards (8 standards)	Up-to-date and new content should be used in content development.
	The electronic learning management system should be easily accessible to all users.
	The content of the course should be accessible at home or university with low bandwidth.
	The content can be used on all operating systems such as PC and Mac
	Multimedia content is optimized for size and use with standard computer graphics and systems (for example zipped files, MP3 files, JPEG or TIFF for photos, and GIF or PNG for computer graphics).
	Video, image, and audio file formats can be played in commonly used plugins or players.
	Textual content should be available to learners in standard formats along with audio and visual content.
	The content contains full information about the author(s) of the content, respecting the rights of the authors to use pseudonyms or remain anonymous.
Design, visual and media standards (7 standards)	The learning management system should allow the user to control the pace of his learning; Especially when looking at videos, animations and text (providing content navigation to learners).
	The content of the menus, icons, or navigation signs (such as the reading icon, audio file, video, etc.) should be compatible with each other in terms of form and function.
	The content should use a standard font visible on the web for content.
	Spelling and terms used throughout the learning topic are correct and abbreviations are fully defined.
	Key terms should be displayed on the screen and defined in the e-learning management system glossary.
	Regular formatting includes white space, effective use of color and graphics when necessary, and text color that is clearly readable against background colors.
	The text is organized in readable paragraphs for presentation on the computer screen.
The provided content should have an appropriate tone, readability, look and feel.	

Table 1. Dimensions and standards of the effective implementation of e-learning framework in medical science education (continue)

Dimension	Standard
Content standards (9 standards)	All content should be appropriate for the audience and designed to enhance learning.
	Clear instructions for using the content should be provided at the beginning of the course.
	Explanations of all rules, technical considerations for the content of each session should be provided.
	The content should include graphics and images related to the content, and all graphics and images should be appropriate, relevant, and complementary to the learning.
	If additional references are included for further study, the references should be current, useful, relevant, and available to learners as additional references from the beginning of the course.
	The content should be downloadable for future use by learners.
	Learners should view all the content of the e-learning course with correct spelling, grammar, and punctuation.
	The course should provide a positive and interactive learning experience for the student and the content should be consistent with the objectives.
	Spelling, grammar, and punctuation should be correct in all contents.
Comprehensive assessment and course standards (12 standards)	A comprehensive assessment should be on time to avoid the gap between the end of the course and the beginning of the the assessment process and harming the learners.
	Any learner who is unsuccessful in the assessment can be offered again using an alternative assessment. If he fails the second attempt, he should re-enroll in the course.
	Assessments should include clear instructions so learners know how to complete them.
	Exam questions should be organized at three easy, medium, and difficult levels.
	The questions should be diverse and should not include several types of questions, including multiple-choice, sorting, drag and drop, filling, and descriptive types.
	The learner should be free to select the first question to answer; i.e., like a paper question sheet, he should be able to start from wherever he wants and move between answered and remaining questions.
	After the end of the test, an option should be available to the learner, by clicking on it, he can review the question, the wrong answer, and the correct answer.
	Tests should include appropriate feedback, and meaningful, useful, and relevant feedback should refer to the learner to additional information where necessary and where it can be found.
	Through continuous review, the opinions of the learners should be assessed and revised.
	The content of the course and its presentation method should be assessed and revised under the supervision of experts in the field of e-learning and medical education.
	A quality assessment should be performed to ensure that the course functions correctly and that there are no errors.
	Audio and visual content should be assessed in terms of quality.
Learner support standards (6 standards)	Online content should be provided to all learners participating in an online course, and learners should be informed of how to access this content at the beginning of selecting a unit.
	All educational content such as books and supplementary content should be made available to online learners.
	Appropriate support and guidance for e-learning and assessment should be available.
	Learner service support is designed to promote and maintain a collaborative virtual learning community and support learners.
	Learners should be informed of any planned breakdowns and disruptions in the e-learning system.
	Supplementary and supporting information should be provided to the learner and used as a reference tool after completing the course.
Professor support and training standards (3 standards)	Self-learning and training of hardware and software used for the development of e-learning content should be available for all professors.
	There should be technical support for the content produced and presented by the professors.
	The professors who develop e-learning courses should successfully complete the e-Learning Accreditation Course.

Table 2. Standards removed according to CVR

Dimension	Standard	CVR
Course management standards	Access to the course shall be restricted to users with access credentials issued by the University.	0.4
	All course content should not be provided to learners at the same time in the electronic learning management system.	0.2
Comprehensive assessment and course standards	Students who are unsuccessful in the assessment can be offered again using an alternative assessment. If they fail the second attempt, they should re-enroll in the course.	0.3

Table 3. Validity coefficients of the dimensions of the standards framework for the effective implementation of e-learning in medical science education

Dimension	CVR
Total	0.820
Course management standards	0.87
Educational Design and pedagogy standards	0.80
Curriculum standards	0.77
Technical standards	0.81
Design, visual, and media standards	0.88
Content standards	0.82
Comprehensive assessment and course standards	0.80
Learner support standards	0.83
Professor support and training standards	0.80

Table 4. Reliability coefficients of the dimensions of the standards framework for the effective implementation of e-learning in medical science education

Dimension	Internal consistency (Cronbach's alpha)	Pearson's correlation coefficient (test-retest)	ICC
Total	0.95	0.90	0.95
Course management standards	0.63	0.83	0.91
Educational Design and pedagogy standards	0.55	0.75	0.85
Curriculum standards	0.76	0.78	0.87
Technical standards	0.71	0.83	0.91
Design, visual, and media standards	0.77	0.91	0.95
Content standards	0.87	0.72	0.83
Comprehensive assessment and course standards	0.87	0.87	0.91
Learner support standards	0.63	0.92	0.94
Professor support and training standards	0.78	0.91	0.95

Discussion

According to the results of the present study, in order to effectively implement e-learning, a framework was proposed with 9 dimensions and 58 standards, including "course management standards, educational design and pedagogy standards, curriculum standards, technical standards, design, visual and media standards, content standards, comprehensive assessment and course standards, learner support standards, and professor support and training standards. One of the strengths of the present study was the attention to the development of a standard framework that takes into account all educational, content, technical, and executive dimensions. In addition, what highlights the implementation of the present study was the use of the opinions of medical science faculty members who simultaneously had scientific activities related to e-learning.

E-learning has found its place and identity in today's information age. It seems, today, e-learning can eliminate some of the limitations of face-to-face training. While policy-making and planning should be done in a way that does not become a challenge. There are different frameworks in different studies. For example, the general framework of e-learning in a study by Khan includes eight categories of success factors including "technology, education, organization, management, interface, support, assessment and ethics" (24).

AbuSneineh and Zairi proposed a framework that addressed the five dimensions of "training, technology, support, faculty members, and institution" (25). Bhuasiri et al. investigated the success factors affecting the adoption of e-learning systems in developing countries and their results showed 6 dimensions and 20 factors, which mainly focused on the importance of

curriculum design, knowledge of technology, motivation, and behavior of learners (26).

Other research has attempted to standardize various aspects of e-learning. Although they have not directly mentioned the word standardization, the measures they have taken to improve the quality of e-learning through the integration of learning theories have in practice led to the standardization of e-learning. For example, Holsapple and Lee-Post investigated the content quality and content usability services in e-learning systems (27). In order to identify the critical success factors of e-learning in higher education, Basak et al. in a study proposed a framework based on 8 topics including "technological, management, organization, education, assessment, resources, and social and ethical interaction" affecting the ease of use and perceived usefulness (28).

As mentioned in the present study, curriculum design standards are an important part of e-learning quality. Similarly, in a study by Blicek et al., curriculum design was generally consistent with expectations or requirements for knowledge, skills, and curriculum elements based on professional outcomes. The main challenge for institutions for curriculum design is to combine the flexibility in time and place for learners that e-learning provides without compromising the development of skills or the sense of academic community traditionally associated with academic governance (29).

Technical standards requirements include reliability and security standards. The e-learning system should be reviewed and monitored to ensure that it continues to meet the needs. Many studies have been conducted on the technological dimensions of e-learning, and several researchers have emphasized the important role of technology in the successful implementation of e-learning. Technology plays an important role due to its possibilities, flexibility in presentation methods, and interactions in online settings (11). The effective use of technology for providing courses to learners is essential for the success of e-learning, which makes the process as smooth as possible (28). The factors such as "infrastructure, compatibility and effectiveness of information technology, reliability, accessibility, hardware, software, interface design, support and training of information technology (for professors and students), and compatibility of technology with educational content and ease of use, which are also confirmed in various studies are located (11, 25, 26, 30-33), are related to each other.

In the process of e-learning, visual content such as educational videos and animations enables the effective increase in knowledge among the group of learners.

Thomas et al. stated that visual learning improves learning processes at several stages. Visual learners can store information in their minds for a longer period, which helps in the long-term retention of educational content. Proper communication through visual educational content helps to develop the imagination process of learners. Therefore, e-learning courses help to provide better knowledge and stimulate cognitive learning capabilities (34). According to Lowenthal and Hodges, visual learning methods and animations contribute to easier acceptance of learning methods. Therefore, the effective use of e-learning methods provides the possibility of an effective understanding of difficult subjects. The absorption of images and the introduction of graphic and image education increases the energy level of students (35). Sarrab et al. in a study stated that animated films act as a stimulus that increases the learning functions of the human brain. Using live color videos and visual metaphors in e-learning processes is successful in creating long-term effects (36).

E-learning courses allow learners to grow and provide regular assessments. Assessment helps the gradual development of students' learning skills. According to Bawa, the e-learning system provides an opportunity to assess students' performance and portfolios. In fact, the assessment of learners provides a wide range in the improvement of learning methods (37), and in addition to assessing the consideration of feedback from professors, it will help the gradual progress of the effective learning process. Ouhbi et al. in a study pointed out that in e-learning, the development and promotion of courses depend only on feedback and from the perspective of learners, which provides the possibility of improving education (38).

Technical support is part of any e-learning setting. Everything should be maintained and like any other technology, problems occur and should be solved. There are many studies about the types of support in e-learning. Cheawjindakarn et al. stated that support is a key issue. Because e-learning will not achieve its goals without counseling and support (30).

The results of the literature review show these support factors such as "online support, resources (online and offline) (39), compatibility of support services with the educational and technical needs of learners, staff accountability and support services to learner questions (25), institutional support, student support and faculty support.

Professors play one of the important roles in the effective implementation of e-learning. In fact, a direct positive relationship is between the quality of e-learning courses and the role that faculty members play in the

success of their courses. However, the implementation of e-learning in institutions without proper training creates negative experiences for the institutions, teachers, and learners (40). Several researchers have identified faculty member-related factors that have a significant effect on the successful implementation of e-learning, including "competence, either pedagogical or technical, involvement in e-learning activities, innovation, and the creation of new methods that improve the e-learning environment, identification of overload, intellectual participation, etc. by professors, the success of the institution with online learning" (41, 42).

Given the rapid development of countries around the world that increased the intensity of competition in all fields, especially in the field of learning, in the field of e-learning, efforts should be made to prepare educational organizations for any situation such as recently the world has exposed to COVID-19 pandemic, leading to the tendency of universities to use it to work in the best way. In this regard, the use of effective e-learning presentation frameworks developed in the present study can actually be considered in the policy-making of medical universities and help its effective implementation. In line with the development of this framework, it is suggested to use the opinions of medical education and e-learning experts at the international level, which can greatly help the development of these standards. Among the limitations of the present study, we can point out the small number of national experts in both fields of medical science education and e-learning, which was attempted to a large extent by using snowball sampling to select an appropriate number.

Conclusion

Using a standard framework for the implementation of e-learning helps to improve the quality of e-learning courses in medical sciences and brings more trust to internal and external stakeholders in these courses. As a result, it can be said that all these dimensions are important and have an effect on the implementation of e-learning in medical science education. A systematic understanding of these factors helps designers and developers to successfully implement e-learning courses. It is suggested to evaluate various e-learning courses in medical science education based on the framework proposed in this study, which on the one hand leads to the improvement and development of this framework, and on the other hand, is effective in assessing the quality of these courses and their distance with standards of e-learning courses in medical science education.

Supplementary material(s): is available here [To read supplementary materials, please refer to the journal website and open [PDF/HTML](#)].

Acknowledgments: We acknowledge all experts in the field of e-learning in medical sciences who helped the research team conduct this study.

Conflict of interests: This article has not been submitted to another journal or publication and is not under review, and the authors have no affiliation with any organization with direct or indirect financial interest in the topic discussed in the article.

Ethical approval: The code of ethics approved under the number (IR.SBMU.SME.REC.1400.007) was obtained from the Ethics Committee of Shahid Beheshti University of Medical Sciences.

Funding/Support: None.

References

1. Atashak M. Theoretical and applied principles of electronic learning. *Quarterly Journal of Research and Planning in Higher Education*. 2007;13(1):135-56. [In Persian]
2. Zarif Sanaee N. Assessing the criteria for the quality and effectiveness of e-Learning in higher education. *Interdisciplinary Journal of Virtual Learning in Medical Sciences*. 2010;1(3):24-32. [In Persian]
3. Alqudah NM, Jammal HM, Saleh O, Khader Y, Obeidat N, Alqudah J. Perception and experience of academic Jordanian ophthalmologists with E-Learning for undergraduate course during the COVID-19 pandemic. *Ann Med Surg (Lond)*. 2020 Nov;59:44-47. doi: 10.1016/j.amsu.2020.09.014. [PMID: 32934810] [PMCID: PMC7483021]
4. Ozkal K, Tekkaya C, Cakiroglu J, Sungur S. A conceptual model of relationships among constructivist learning environment perceptions, epistemological beliefs, and learning approaches. *Learning and individual differences*. 2009;19(1):71-9.
5. Puljak L, Čivljak M, Haramina A, Mališa S, Čavić D, Klinec D, et al. Attitudes and concerns of undergraduate university health sciences students in Croatia regarding complete switch to e-learning during COVID-19 pandemic: a survey. *BMC Med Educ*. 2020 Nov 10;20(1):416. doi: 10.1186/s12909-020-02343-7. [PMID: 33167960] [PMCID: PMC7652670]
6. Azizi S M, Farajollahi M F, Seraji F, Sarmadi M R. Synthesis Research on the Effectiveness of E-Learning in Medical Sciences Education and Its Design and Implementation Requirements. *Iran J Med Educ*. 2017; 17: 270-87. [In Persian]
7. Mukundan M, Mark B. Decentralization of Educational Planning in Kerala State in India. *Ideal and Reality in Educational Research*. 2005;26(3):23-31.
8. Moxley SE. (dissertation). Strategic planning process used in school districts in the southeastern United States. Orlando, Florida: University of Central Florida; 2003.
9. Abbasi S, Ayoob T, Malik A, Memon SI. Perceptions of students regarding E-learning during Covid-19 at a private medical college. *Pak J Med Sci*. 2020 May;36(COVID19-S4):S57-S61. doi: 10.12669/pjms.36.COVID19-S4.2766. [PMID: 32582315] [PMCID: PMC7306963]

10. Zarei S, Mohammadi S. Challenges of higher education related to e-learning in developing countries during COVID-19 spread: a review of the perspectives of students, instructors, policymakers, and ICT experts. *Environ Sci Pollut Res Int*. 2022 Dec;29(57):85562-85568. doi: 10.1007/s11356-021-14647-2. [PMID: 34100207] [PMCID: PMC8184049]
11. Selim HM. Critical success factors for e-learning acceptance: Confirmatory factor models. *Computers & education*. 2007;49(2):396-413. doi:10.1016/j.compedu.2005.09.004.
12. Fleming J, Becker K, Newton C. Factors for successful e-learning: does age matter?. *Education & Training*. 2017; 59(1): 76-89.
13. Creswell JW, Clark VLP. *Designing and conducting mixed methods research*. Los Angeles: Sage Pub; 2017.
14. Fetters MD, Curry LA, Creswell JW. Achieving integration in mixed methods designs—principles and practices. *Health Serv Res*. 2013 Dec;48(6 Pt 2):2134-56. doi: 10.1111/1475-6773.12117. [PMID: 24279835] [PMCID: PMC4097839]
15. Braun V, Clarke V. Using thematic analysis in psychology. *Qualitative research in psychology*. 2006;3(2):77-101. doi:10.1191/1478088706qp0630a.
16. Rahmani A, Vaziri Nejad R, Ahmadi Nia H, Rezaian M. Methodological Principles and Applications of the Delphi Method: A Narrative Review. *J Rafsanjan Univ Med Sci* 2020; 19 (5): 515-38. [In Persian]
17. Shafian S, Khazaeli P, Okhovati M. Sample Size Determination in Medical Education Research. *Strides Dev Med Educ*. 2022;19(1): 1-2. doi:10.22062/sdme.2023.92125.
18. Daroudi R, Zendehehd K, Sheikhy-Chaman M. Designing and validity and reliability assessment of change in employment status and income and supportive mechanisms in cancer survivors. *Iranian Journal of Cancer Care*. 2021;1(4):1-9. [In Persian]
19. Monazam M, Laal F, Sarsangi V, Fallahmadvari R, Najafi K, Fallahmadvari A. Designing and determination of validity and reliability of the questionnaire increasing the duration of using the hearing protection device by workers based on BASNEF model. *Journal of Ilam University of Medical Sciences*. 2018;25(6):21-8. doi:10.29252/sjimu.25.6.21. [In Persian]
20. Najafi M, Kohan N, Najafi M, Mohammadzadeh EH, Shirazi M. Assessment of validity and reliability of attitudes to health professionals questionnaire (AHPQ) in Iran. *Research in Medical Education*. 2015; 7(2): 21-8. doi:10.18869/acadpub.rme.7.2.21. [In Persian]
21. Lawshe CH. A quantitative approach to content validity. *Personnel psychology*. 1975;28(4):563-75. doi:10.1111/j.1744-6570.1975.tb01393.x.
22. Polit DF, Beck CT, Owen SV. Is the CVI an acceptable indicator of content validity? Appraisal and recommendations. *Res Nurs Health*. 2007 Aug;30(4):459-67. doi: 10.1002/nur.20199. [PMID: 17654487]
23. Shrout PE, Fleiss JL. Intraclass correlations: uses in assessing rater reliability. *Psychol Bull*. 1979 Mar;86(2):420-8. doi: 10.1037//0033-2909.86.2.420. [PMID: 18839484]
24. Khan BH. A framework for web-based learning. *TechTrends: Linking Research and Practice to Improve Learning*. 2000;44(3):51. doi:10.1007/BF02778228.
25. AbuSneineh W, Zairi M. An evaluation framework for E-learning effectiveness in the Arab World. In: Peterson PL, Baker E, McGaw B. *International Encyclopedia of Education*. 3rd ed. Amsterdam, Netherlands: Elsevier; 2010.
26. Bhuasiri W, Xaymoungkhoun O, Zo H, Rho JJ, Ciganek AP. Critical success factors for e-learning in developing countries: A comparative analysis between ICT experts and faculty. *Computers & Education*. 2012;58(2):843-55. doi:10.1016/j.compedu.2011.10.010.
27. Holsapple CW, Lee-Post A. Defining, assessing, and promoting e-learning success: An information systems perspective. *Decision Sciences Journal of Innovative Education*. 2006;4(1):67-85. doi:10.1111/j.1540-4609.2006.00102.x.
28. Basak SK, Wotto M, Bélanger P. A framework on the critical success factors of e-learning implementation in higher education: A review of the literature. *International Journal of Educational and Pedagogical Sciences*. 2016;10(7):2409-14.
29. Blicek Y, Ooghe I, Zhu C, Depryck K, Struyven K, Pynoo B, et al. Consensus among stakeholders about success factors and indicators for quality of online and blended learning in adult education: a Delphi study. *Studies in Continuing Education*. 2019;41(1):36-60. doi:10.1080/0158037X.2018.1457023.
30. Cheawjindakarn B, Suwannatthachote P, Theeraroungchaisri A. Critical success factors for online distance learning in higher education: A review of the literature. *Creative Education*. 2013;3(08):61. doi:10.4236/ce.2012.38B014.
31. Keshavarz M, Mirmoghtadaie Z, Nayyeri S. Design and Validation of the Virtual Classroom Management Questionnaire. 2022;23(2):120-35. doi:10.19173/irrodl.v23i2.5774.
32. Chen WS, Yao AYT. An empirical evaluation of critical factors influencing learner satisfaction in blended learning: A pilot study. *Universal Journal of Educational Research*. 2016;4(7):1667-71. doi:10.13189/ujer.2016.040719.
33. Nahardani SZ, Salami MR, Mirmoghtadaie Z, Keshavarzi MH. The Hidden Curriculum in Online Education Is Based on Systematized. *Shiraz E-Med J*. 2021; 23(4): 1-8. doi:10.5812/semj.105445.
34. Thomas PA, Kern DE, Hughes MT, Tackett SA, Chen BY. *Curriculum development for medical education: a six-step approach*. Baltimore: Johns Hopkins University Press; 2022.
35. Lowenthal PR, Hodges CB. In search of quality: Using quality matters to analyze the quality of massive, open, online courses (MOOCs). *International Review of Research in Open and Distributed Learning*. 2015;16(5):83-101. doi:10.19173/irrodl.v16i5.2348.
36. Sarab M, Elbasir M, Alnaeli S. Towards a quality model of technical aspects for mobile learning services: An empirical investigation. *Computers in Human Behavior*. 2016;55:100-12. doi:10.1016/j.chb.2015.09.003.
37. Bawa P. Retention in online courses: Exploring issues and solutions—A literature review. *Sage Open*. 2016;6(1):2158244015621777. doi:10.1177/2158244015621777.
38. Ouhbi S, Idri A, Fernández-Alemán JL, Toval A. Requirements engineering education: a systematic mapping study. 2015;20(2):119-38. doi:10.1007/s00766-013-0192-5.
39. Badrul HK. *E-Learning Quick Checklist*. Hershey, Pennsylvania: IGI Global Pub; 2005.
40. Howell SL, Saba F, Lindsay NK, Williams PB, Education H. Seven strategies for enabling faculty success in distance education. *The Internet and Higher Education*. 2004;7(1):33-49. doi:10.1016/j.iheduc.2003.11.005.
41. Abolhasani M, Vahedi M. The Investigating and Identifying Barriers to E-Learning for Students of Payame Noor University of Tabriz with Providing a Model. *Quarterly of Iranian Distance Education Journal*. 2021;3(1): 65-80. [In Persian]
42. Moore JC. *The Sloan Consortium quality framework and the five pillars*. Boston, MA: Online Learning Consortium Pub; 2005:1-9.

Identification of Residents' Stressors: A Review Study

Alireza Mirzaei¹, Sepideh Jamshidian², Fariba Haghani^{3*}

¹Ph.D. Candidate, Department of Medical Education, Medical Education Research Center, Isfahan University of Medical Sciences, Isfahan, Iran.

²Assistant Professor, Department of Medical Education, Medical Education Research Center, Isfahan University of Medical Sciences, Isfahan, Iran.

³Professor, Department of Medical Education, Medical Education Research Center, Isfahan University of Medical Sciences, Isfahan, Iran.

Received: 2023 February 20

Revised: 2023 April 28

Accepted: 2023 July 10

Published online: 2023 July 11

***Corresponding author:**

Department of Medical Education,
Medical Education Research Center,
Isfahan University of Medical Sciences,
Isfahan, Iran.

Email: fariba.haghani@gmail.com

Citation:

Mirzaei AR, Jamshidian S, Haghani F.
Identification of Residents' Stressors: A
Review Study. *Strides Dev Med Educ.*
2023 July; 20(1):58-65.
doi:10.22062/sdme.2023.198353.1176

Abstract

Background: High level of stress experienced by residents is one of the important factors of the reduction in their efficiency and the increase in their error rate and poor clinical performance.

Objectives: The present study was conducted to review, identify and categorize the most important stressors of residents.

Methods: In this narrative review study, English articles were reviewed by electronic search of Education Resources Information Center (ERIC), PubMed, ProQuest, Scopus and Google Scholar search engine over the last 10 years (2013-2022).

Results: Based on the data, 89 stressors were extracted from 12 articles, and then divided into six categories of "stressors related to care and treatment, stressors related to interpersonal and intrapersonal communication, social stressors, stressors related to course management and planning, stressors related to teaching and learning and stressors related to residents' drive and desires".

Conclusion: The identification and categorization of stressors in the present study made it possible that the planners and practitioners of residency courses can design and implement effective solutions to reduce the negative impacts of residents' stressors and, as a result, provide better conditions for their learning and training during the course.

Keywords: Stress, Stressors, Residents, Residency

Background

In most references, stress is defined as a state of imbalance between a rigorous environment and a person's ability to cope with its pressure (1). According to the definition of the World Health Organization (WHO), stress is a response that people may suffer when faced with demands and pressures that do not match their knowledge and abilities, and challenge their ability to cope (2). In fact, stress is physical or mental tension caused by physical, psychological or emotional factors and can have an external or internal origin (3). Stress-causing factors are often called stressors, and stress is the initial response of people to these factors (4). Severe stress, especially if it is chronic, may have consequences such as impaired brain function, including memory and thinking, and disruption of the brain's self-regulation system. In addition, high levels of stress can lead to physical problems such as heart palpitations, high blood

pressure, headache, vision loss, digestive problems and psychological problems such as anger, irritability, anxiety, insomnia, depression and burnout in medical professionals (5).

Education at various levels of the medical field is always accompanied by stress, and residents are among the learners who, for various reasons, in addition to the stress related to the profession, face stressors related to education and learning during their studies (6). The available evidence also shows the prevalence of stress and exposure to stressors at this level of medical education. A study in Saudi Arabia reported the level of stress (relative-very severe) of residents in more than 68% (7) and another study in Portugal reported this rate as 50% (8).

The study results of Castelo-Branco et al. showed that more than 58% of residents (9) and that of Sepehrmanesh and Ahmadvand indicated that 96% of residents had burnout symptoms (10). While other

studies have clearly shown a significant relationship between stressors and the level of depression in residents (11).

In Iran, studies on different medical departments show that 42.7% of employees have serious mental health problems and more than 51% have severe work-related stress, leading to significant absences from work (12). Also, the study results of Farhangi and Khajeh Nasiri indicated that in addition to problems such as anxiety and depression, nearly 34% of residents had severe-very severe stress (13). Bahrainian et al. also in a study concluded that 75% of residents had mild-severe stress (14).

Given that stress is common during residency is well documented in the relevant literature (15). The results of the studies show that stress, in addition to negative personal consequences (physical and psychological) for the residents themselves, has negative impacts on the interactions between the medical team and patients, learning activities, the progress of the residents' performance in various fields, and finally, the quality of patient care (9, 10, 13, 16, 17).

KEI et al., while confirming stress in residents, emphasize that doctors who work under stress can be harmful to themselves, colleagues, and patients as a result of reduced performance (18). Other studies have considered negative impacts such as anxiety, depression, drug abuse, despair and even suicide attempts in the personal dimension and cases such as burnout, reduced empathy, dysfunction and increase in medical errors in the professional dimension, caused by stress (19-21).

Stress during the residency is known as a factor affecting the efficiency, error rate, burnout and health of doctors and plays an important role in causing mental diseases (14, 22). In addition, stress can negatively affect clinical performance. Because it affects the functioning of the brain, especially disrupts the performance of tasks that require careful attention, active memory, and retrieving information from memory to make sensitive decisions (23).

Various stressors have been proposed in medical education courses from general medicine to the residency and the end of education and then employment and work for doctors (6) and researchers have categorized various factors in accordance with the research conducted. Kaufman et al. classified medical students' stressors into six categories of "factors related to performance and evaluation, time limit and workload, interpersonal and intrapersonal interactions and relationships, financial concerns, ambiguity or

feedback concerns, and others" (24). Johnson et al. mentioned four categories of stressors including "context, learning tasks, communication and clinical scenario" (25).

Although Van Kerkhoven et al. classified residents' stressors into two categories of "stressors that are directly related to clinical work and stressors that are indirectly related to clinical work" (23), Jiang et al. mentioned financial income, workload, uncertain long-term career future, insufficient family support, workplace (contact with patients), relationships with colleagues and professors (26). In a study by Ahmadiania et al., "subject-specific stressors, interpersonal and intrapersonal relationships, personal stressors and stressors related to the educational atmosphere" were also considered (27).

Although significant researches have been conducted in the field of residents' stress in other countries (20, 21, 23, 26), there have been few studies in Iran, especially on residents' stressors. On the one hand, these studies have not provided a complete classification that includes all residents' stressors, and on the other hand, different and in some cases inconsistent results have been obtained (6, 14, 28). Accordingly, reviewing the study results in order to summarize and achieve a comprehensive classification of residents' stressors is considered as a research necessity.

Given the importance and position of residency in the training of efficient doctors and their very important role in the health of patients and society, as well as the importance of addressing the issue of resident stress in the curricula emphasized by regulatory organizations such as the Accreditation Council for Graduate Medical Education (ACGME) (20, 22), the present study was conducted to identify and categorize the most important stressors of residents.

Objectives

The present study was conducted to review, identify and categorize the most important stressors of residents.

Methods

In this narrative review study, English articles were reviewed by electronic search of ERIC, PubMed, ProQuest, Scopus and Google Scholar search engine over the last 10 years (2013-2022) using the keywords "stressors", "stress*", "tension*", "nervousness*", "anxiety*", "pressure*", "residents*", "physician*", and "doctor*" and AND and OR operators during one month since 2022/02/22 to 2022/03/23.

Inclusion criteria included English language, type of articles (quantitative, qualitative, interpretative and review), access to full text and study population (residents). The language of the article other than English, the type of articles (other than quantitative, qualitative, interpretative and review articles), including proceedings, letters to the editor, lack of access to the text of the articles, not related to the topic, conducting the study in a group other than residents. and publication year outside the time period were also considered as exclusion criteria.

Articles resulting from keyword search (n=4092) were first reviewed by the first author in terms of title relevance, and 58 relevant titles were identified. After excluding duplicate titles and articles without full text, 46 abstracts were reviewed. Finally, the full text of 28 articles was reviewed by the first author and second authors, of which 12 articles were found suitable for information extraction (Figure 1).

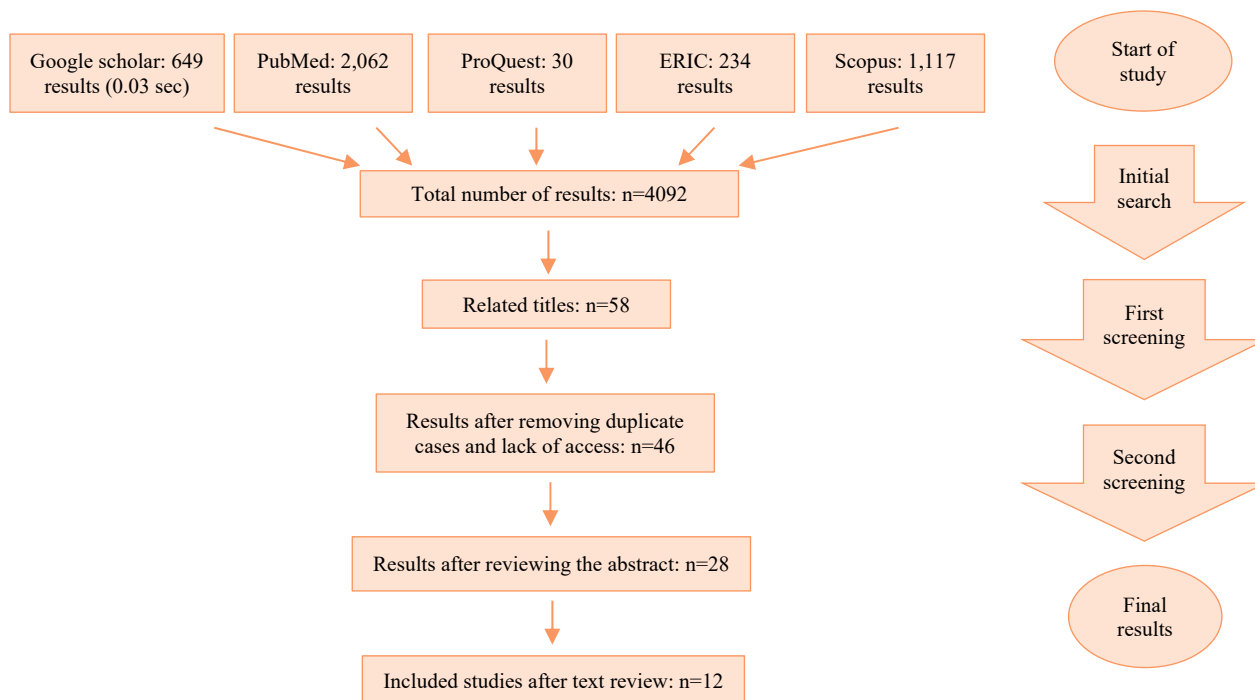


Figure 1. Flowchart of the review study of stressors of residents

Then, the information of these articles, including the title, year of publication, authors' names, type of study, the study population, and the stressors identified in the study, were recorded in the relevant columns in the Excel file (Table 1).

In this step, the obtained list of stressors of residents was discussed in a group meeting with the presence of all authors, and it was decided to use a comparative approach to categorize them. Thus, the six categories of medical students' stressors in a study by Yusoff in Malaysia (29) were used with modification. In this study, the stressors of medical students are divided into six categories of academic stressors, stressors related to interpersonal and intrapersonal, stressors related to teaching and learning, social stressors, stressors related to Drive and desire, and stressors related to group activities" (29).

Given the difference of some stressors in residents compared to medical students, in the present study, the category of "academic stressors" was changed to "stressors related to care and treatment" and, the category "stressors related to group activities" was changed to "stressors of management and course planning". During two group meetings with the presence of the authors, the stressors of the residents extracted from the 12 final articles were categorized into the six mentioned groups.

Results

The results of Table 1 show stressors of residents in the reviewed articles. Thus, the final articles are presented in the order of the year of publication. 12 final studies were conducted in Finland, Pakistan, Nepal, England, China, America, Colombia, Qatar, Portugal, Malaysia, and two in Iran.

Table 1. Stressors of residents in the reviewed articles

Results (identified stressors)	Studied group	Tool	Method	Title	Country	Reference
Managing a pediatric emergency, performing an unusual technical procedure in an acute situation, managing a patient with acute pathology, difficult communication with other health care personnel, dealing with an aggressive patient, leading challenging teamwork in an acute setting, difficulty communicating with the patient. or his relatives, pre-hospital work (with limited information, resources or people), performing a routine technical procedure in an acute situation, giving bad news, performing non-clinical work in addition to clinical work, lack or insufficient interaction with the supervisor or coworker, frequent interruptions during work, full waiting room or long waiting time, managing multiple patients at the same time, working alternating shifts, night and / or long shift	Seventy-six emergency residents	Questionnaire	Cross-sectional	Stress levels of Flemish emergency residents and the implications for clinical practice and education	Finland	Van Kerkhove et al. (23)
Long working hours, too little personal time, overwork, inadequate sleep, inadequate knowledge and skills, interaction with anxious relatives of patients, dealing with ethical dilemmas and patient mortality, conflict of organizational policies with resident program requirements and policies, increasing demand for services and administrative work, working hours more than 100 hours per week, lack of specific time between care services and training, lack of human resources, ambiguity between the expectations of professors and residents, program requirements in addition to the requirements of the accreditation and certifying organization, non-supportive attitudes of faculty members or senior residents such as giving negative feedback, using harsh or derogatory words, not providing learning opportunities for residents and harassing or intimidating attitudes towards residents, lack of quality time for self or family, lack of knowledge about organizational systems and resources	Residents of the Department of Surgery, Aga Khan University, Pakistan	Questionnaire. Focus group and survey tool for residents' preferred coping strategies	Mixed	Stress and coping among surgery residents in a developing country	Pakistan	Riaz et al. (30)
Activities Related Stressor, Academic Related Stressors, Interpersonal & Intrapersonal Related Stressors, Teaching and Learning Related Stressors, Social Related Stressors, drive & desire related stressors and group activities related stressors	Six hundred fifty-one (273 residents and 378 medical students)	MSSQ-20	Cross-sectional and questionnaire	Depression, anxiety, and burnout among medical students and residents of a medical school in Nepal: a cross-sectional study	Nepal	Pokhrel et al. (31)
Poor work-life balance, concerns about patient care, work duties (assignments, responsibilities, workload, etc.), background (level of education), poor career development, type of specialty, inappropriate workplace, financial concerns, demographic factors (gender, cultural background, cultural characteristics, etc.), perceived or reported low mental or physical health	Learners of different levels of medical field from intern to resident	-	systematic review and meta-analysis	Factors Associated with Burnout and Stress in Trainee Physicians: A Systematic Review and Meta-analysis	UK	Zhou et al. (32)
Insufficient income, workload, uncertain career future, family support, workplace (facing patients), communication with colleagues and professors	Five hundred residents in Shanghai General Teaching Hospitals	Paper questionnaire	Cross-sectional	Prevalence of stress and its determinants among residents enrolled in China Standardized Training Program for Resident Doctor (C-STRD) program: A cross-sectional study	China	Jiang et al. (26)

Results (identified stressors)	Studied group	Tool	Method	Title	Country	Reference
Stress of gender preference in some fields, the nature of the profession, lack of specialized knowledge, the occurrence of medical errors, curriculum problems, lack of effective communication, language and cultural differences, conflict between personality traits and expertise, work-life imbalance due to roles and multiple responsibilities, conditions and long working hours, ineffective support for residents	Residents of hospitals affiliated to Tehran University of Medical Sciences (Imam Khomeini, Sina, Shariati, Mohib Yas and Children's Medical Center)	Interview	Qualitative	Medical residents' viewpoint about the effective stressors on professional identity formation during residency in Tehran University of Medical Sciences: A qualitative study	Iran	Ahmadinia et al. (27)
Inadequate sleep, lack of time for personal/family life, emotional pressure caused by facing the disease and pain of patients, being away from family and friends, financial pressure, matching the residency with important life events (marriage and childbearing)	Residents and medical students	-	Review	Medical student and resident burnout: a review of causes, effects, and prevention	USA	Mian et al. (21)
Role conflict, role ambiguity and role overload	Three hundred eleven residents with different specialties in Shiraz University	Questionnaire	Cross-sectional, analytical-descriptive	Occupational stress among medical residents in educational hospitals	Iran	Ebrahimi and Kargar (28)
Giving too much autonomy and too many opportunities for participation by supervisors (too much freedom in cases where residents are not ready to accept the necessary responsibility or have not received adequate training), clinical supervisors of residents sometimes deliberately limiy opportunities to participate in patient care or independence in decision-making	Residents	Interview	Qualitative grounded	Dealing with the tension: how residents seek autonomy and participation in the workplace	Columbia	Olmos-Vega et al. (33)
Workload, workplace relationships, hospital system, patient care, general workplace, achievement stress, health/personal care, time management problems, family and family responsibilities, local context, and others (past life events, cases not controlled by a person, the words of others)	one hundred fifty residents	Open and closed answer questionnaire	Mixed	Burnout and sources of stress among medical residents at Hamad Medical Corporation, Qatar	Qatar	Abdelhamid et al. (34)
Complex patients, complex surgical interventions, predicting problems with intubation, working outside the workplace with different teams and equipment, relationships with surgeons, relationships with the anesthesia team, not having good working conditions, inability to keep yourself up to date, organizing the anesthesia department, little time or difficulty in scheduling	Seven hundred ten anesthesiologists and residents	questionnaire	Cross-sectional	Stressors in anaesthesiology: development and validation of a new questionnaire	Portugal	Lapa et al. (35)
Fear of making mistakes, time pressure and difficulty in meeting deadlines, working with incompetent and uncooperative colleagues, lack of appropriate rest rooms and other facilities for residents, lack of incentives and promotions, feeling of low income, feeling of insufficient knowledge and skills to meet work demands and goals, high workload and stress, impact of work duties on personal and family life, insufficient skills to deal with more difficult aspects of work problems, worry about financial problems, lack of support and unfair evaluation by supervisor, working outside competence, fear of contagion, lack of resources, feeling insecure, difficulty in maintaining relationship with supervisor	Two hundred five residents (medical, obstetrics, gynecology, surgery, emergency medicine, pediatrics and orthopedics)	MBI-HSS	Cross-sectional and questionnaire	Emotional Burnout, Perceived Sources of Job Stress, Professional Fulfillment, and Engagement among Medical Residents in Malaysia	Malaysia	Al-Dubai et al. (36)

MSSQ-20: Medical Student Stressor Questionnaire-20

Discussion

The results of the present study generally indicated that stress is one of the basic problems of residents and that several factors affect its occurrence (6, 10, 13, 23). The review of the obtained articles showed that despite the differences in stressors and classifications, as well as the spatial dispersion of studies, the attention of researchers in different countries, including in our country, to the issue of residents' stress is increasing in recent years (6, 27, 28).

In the present study, the stressors of the residents were extracted from the reviewed articles and classified based on the revised classification model of the stressors in the medical students' stressors questionnaire (MSSQ) (29). Accordingly, the most important stressors of residents (Table 1) were classified into six categories, which are described in detail below.

Stressors related to care and treatment

The stressors related to this category include managing emergency situations, performing an unusual technical procedure in acute situations, performing a routine technical procedure in acute situations, managing a patient with an acute and life-threatening pathology, performing non-clinical work alongside clinical work (23), excessive work or workload and high anxiety, responsibility and concern about patient care (emotional pressure caused by exposure to patients' diseases and pain/inability to treat or relieve patients' pain completely), the occurrence of medical errors (incorrect clinical procedures, fear of patient death, and fear of revealing the error), undesired workplace (involvement with patients) and the stressful nature of some fields such as surgery or gynecology (21, 23, 26-28, 30-36).

As it is found, high workload was mentioned as an important factor of stress in most of the articles.

Stressors related to interpersonal and intrapersonal communication

The most important stressors of residents in this category can be the difficulty of communicating with other health care workers (nurses, senior residents, consultants, etc.), facing aggressive patients, or the difficulty of communicating with the patient or his relatives, giving bad news, working with incompetent and uncooperative colleagues, lack of or insufficient discussion with supervisor or co-workers, frequent interruptions during work, difficulty in maintaining relationship with supervisor, harassing or intimidating attitude towards residents, lack of support and unfair evaluation by the supervisor, conflict with ethical issues, lack of effective communication (inappropriate interaction between residents, pressure caused by

professors, and lack of proper doctor-patient communication), simultaneous management of several patients, and perceived or reported low mental or physical health (23, 26-28, 30, 32, 34-36).

Social stressors

According to the results of the reviewed articles, the most important stressors in this category include pre-hospital work with limited information, resources or people, patient mortality, role ambiguity (not well-defined tasks) and role overload (a large number of tasks and daily workload for the available time and other limitations in performing heavy tasks expected and responsibility for the health of patients), role conflict (such as conflict between supervisors' duties or expectations of doctors and patients), family support responsibility, cultural differences with colleagues and patients, the impact of work duties on personal and family life, being away from family and friends, the simultaneity of residency with important life events (marriage, childbearing, etc.) and the many roles and responsibilities of residents (responsibility for society, responding to patients, living together, family affairs and the role of learners and professors) (21, 23, 26-28, 32, 34, 36).

Stressors of course management and planning

The stressors identified in this category include working in alternating shifts, night or long shifts, long working hours with no set time between care services and training, too little personal time and lack of quality time for oneself and / or family, health/personal care (inadequate sleep, weight gain and not having time for exercise, and not having a strong relationship with God), time management problems, time pressure and difficulty in meeting deadlines, working outside one's competence, lack of time for personal/family life, curriculum problems (curriculum changes, lack of curriculum supervision, and lack of knowledge of expectations), workplace conditions and hours (overcrowding and insufficient time for patient care, inadequate response to physiological needs, and changes in social and family relationships), inefficient support for residents (low income, inadequate welfare and housing, inadequate psychological support from the system and family), full waiting room or long waiting time of patients, conflict of organizational policies with residency requirements and policies (e.g., hospital expectations to continue caregiving responsibilities when teaching activities should be performed), increasing demand for services and executive work in the faculty that leaves little time for academic activity, lack of knowledge of resident systems and organizational resources, the lack of appropriate rest rooms and other facilities for residents and the difficulty

of organizing the ward (21, 23, 27, 30, 31, 34-36). The stressors related to curriculum were perhaps the most important stressors in this category and were present in most of the reviewed articles.

Stressors related to teaching and learning

The stressors in this category include undesired knowledge and skills, inconsistency and ambiguity between the expectations of professors and residents, non-supportive attitudes of faculty members or senior residents such as providing negative feedback, using harsh or derogatory words, not providing appropriate learning opportunities for residents, giving too much autonomy by supervisors, in cases where residents are not ready to accept responsibility or have not received enough training, and not providing appropriate opportunities to participate in patient care, both were residents' stressors, and success stress (expectation of success in exams, passage of time and feeling incompetent to act independently, and trying to maintain one's current level in the course), lack of incentives and promotions, insufficient skills to deal with more difficult aspects of work problems, evaluation methods [open /closed, Objective Structured Clinical Examination (OSCE), based on the workplace, etc.], obtaining poor grades in the exam, rating methods, academic schedule, large volume of material to study, difficulty in understanding the content, lack of time to do revision, the difficulty of answering questions presented by professors, exam systems (face-to-face, electronic, simulation, etc.), lack of specialized knowledge (lack of study time, fear of wrong answers to senior residents' questions and year lower) (27, 28, 30, 31, 33, 34, 36).

Stressors related to Drive and desire

In this category, the number of stressors was less than the previous five categories, but in terms of importance, they were not less important. These stressors include fear of disease spread, lack of resources, feeling of lack of safety while working in the internship period, feeling of insecurity in the future job, uncertain long-term career future, fear of making mistakes, worry about financial issues/feeling of low income, the contrast between personality traits and expertise (defective assistant recruitment regulations, disinterest in expertise) and poor career development (weak educational opportunities, professional development, and job security) (21, 26, 27, 32, 36).

The present study, as one of the first review studies on stressors of residents in Iran, can provide suitable information for future researchers and educational planners of the residency, but the focus on limited databases and only English articles was one of the

limitations of the study. So, it is suggested to pay attention to this issue in future research.

Conclusion

According to the results of the present study, many factors cause stress in residents, the most important of which are divided in six categories of "stressors related to care and treatment, stressors related to interpersonal and intrapersonal communication, social stressors, stressors related to course management and planning, stressors related to teaching and learning, and stressors related to residents' Drive and desire. Identifying and categorizing the stressors of residents makes it possible for the planners and practitioners of residency to design and implement effective solutions to reduce the negative impacts of these factors, and as a result, provide better conditions for learning and training during the course.

Supplementary material(s): is available here [To read supplementary materials, please refer to the journal website and open [PDF/HTML](#)].

Acknowledgements: The present study is taken from the doctoral thesis with No. 3400931, approved by Isfahan University of Medical Sciences. Hereby, we acknowledge all the dear ones, especially Dr. Amir Zalpour, an expert in medical librarianship and information, who cooperated in this study.

Conflict of interests: There was no conflict of interest.

Ethical approval: The present study is part of the doctoral thesis proposal approved by Isfahan University of Medical Sciences by the code of ethics IR.ARI.MUI.REC.1400.092.

Funding/Support: The present study was conducted as sponsored by Medical Education Research Center of Isfahan University of Medical Sciences.

References

1. Cho S, Hayter CS. Under pressure: A systematic review of stress and its impact among graduate students. *Science and Public Policy*. 2020;47(6):758-71. doi:10.1093/scipol/scaa053.
2. University D. Work Related Stress. Melbourne: Deakin University. [cited 2019 Sep 5]. Available from: URL: Available from: <https://www.deakin.edu.au/students/health-and-wellbeing/occupational-health-and-safety/work-related-stress>.
3. Patrick Davis C. Medical Definition of Stress. [cited 2021 Mar 29]. Available from: URL: <https://www.medicinenet.com/stress/definition.htm>.
4. Nolen Hoeksema S, Fredrickson B, Loftus G, Wagenaar W, Atkinson HS. *Introduction to psychology* 15th. 15 ed. United Kingdom: Cengage Learning EMEA; 2009.
5. Abdulghani HM, Al-Harbi MM, Irshad M. Stress and its association with working efficiency of junior doctors during three postgraduate residency training programs. *Neuropsychiatr Dis Treat*. 2015 Dec 10;11:3023-9. doi: 10.2147/NDT.S92408. [PMID: 26677329] [PMCID: PMC4677768]
6. Afkhamzadeh A, Fateh Babamiri S. Assessing the Occupational Stress and its Related Factors among Medical Residents of Educational

- Hospitals of Kurdistan University of Medical Sciences. *Journal of Hospital*. 2017;16(3):86-91. [In Persian]
7. Alosaimi FD, Almuefleh A, Kazim S, Aladwani B. Stress-coping strategies among medical residents in Saudi Arabia: A cross-sectional national study. *Pak J Med Sci*. 2015;31(3): 504-9. doi: 10.12669/pjms.313.7490. [PMID: 26150833] [PMCID: PMC4485260]
 8. Joaquim A, Custódio S, Savva-Bordalo J, Chacim S, Carvalhais I, Lombo L, et al. Burnout and occupational stress in the medical residents of Oncology, Haematology and Radiotherapy: a prevalence and predictors study in Portugal. *Psychol Health Med*. 2018 Mar;23(3):317-324. doi: 10.1080/13548506.2017.1344256. [PMID: 28661187]
 9. Castelo-Branco C, Figueras F, Eixarch E, Quereda F, Cancelo M, González S, et al. Stress symptoms and burnout in obstetric and gynaecology residents. *BJOG*. 2007 Jan;114(1):94-8. doi: 10.1111/j.1471-0528.2006.01155.x. [PMID: 17233864]
 10. Sepehermanesh Z, Ahmadvand A. Prevalence of burnout in the residents of Kashan and Isfahan Universities of Medical Sciences in 2012. *Research in Medical Education*. 2015;7(1): 27-34. [In Persian]
 11. Biaggi P, Peter S, Ulich E. Stressors, emotional exhaustion and aversion to patients in residents and chief residents-what can be done? *Swiss Med Wkly*. 2003 Jun 14;133(23-24):339-46. doi: 10.4414/smw.2003.10134. [PMID: 12923685]
 12. Ahangarzadeh Z, Rafiepoor A, Heydari M, Neyestanak AN, Hassani N. The effectiveness of taking multifaceted to stress management in the wellbeing and occupational stress of employees in a pharmaceutical company. *Journal of psychologicalscience*. 2018;17(68):427-35. [In Persian]
 13. Farhangi P, Khajehnasiri F. The Prevalence of Depression, Anxiety, and Stress Among Medical Residents: A Cross-Sectional Study in Iran. *Acta Medica Iranica*. 2020; 58(9): 445-51. doi:10.18502/acta.v58i9.4767.
 14. Bahranian SA, Ghasemi Boroumand M, Sabahi A. Investigation of stress level in a group of medical professionals and assistants in Shahid Beheshti University of Medical Sciences. *Teb Tazkiyeh*. 2005;14(3):44-9. [In Persian]
 15. Levey RE. Sources of Stress for Residents and Recommendations for Programs to Assist Them. *Acad Med*. 2001 Feb;76(2):142-50. doi: 10.1097/00001888-200102000-00010. [PMID: 11158832]
 16. Kalani S, Azad FP, Oreyzi Hr, Azizkhani R, Adibi P. Prevalence of burnout syndrome among the residents in Isfahan University of Medical Sciences, Isfahan, Iran. *Journal of Isfahan Medical School*. 2017; 35(442): 993-9. [In Persian]
 17. Mahfoozpour S, Shadmani FK, Ansarifar A. The Relationship between Occupational Stress & Related Injuries among Physician's Assistants: A Case-Control Study. *Journal of Improving Immunity and Disease Prevention*. 2014;1(4):222-7. doi:10.22037/meipm.v1i4.6098. [In Persian]
 18. Rø KEI, Gude T, Tyssen R, Aasland OG. Counselling for burnout in Norwegian doctors: one year cohort study. *BMJ*. 2008 Nov 11;337:a2004. doi: 10.1136/bmj.a2004. [PMID: 19001492] [PMCID: PMC2659953]
 19. Kalmoe MC, Chapman MB, Gold JA, Giedinghagen AM. Physician suicide: a call to action. *Mo Med*. 2019 May-Jun;116(3):211-16. [PMID: 31527944] [PMCID: PMC6690303]
 20. Yaghmour NA, Brigham TP, Richter T, Miller RS, Philibert I, Baldwin Jr DC, et al. Causes of death of residents in ACGME-accredited programs 2000 through 2014: implications for the learning environment. *Acad Med*. 2017 Jul;92(7):976-983. doi: 10.1097/ACM.0000000000001736.
 21. Mian A, Kim D, Chen D, Ward W. Medical student and resident burnout: a review of causes, effects, and prevention. *J Fam Med Dis Prev*. 2018;4(4):1-8. doi:10.23937/2469-5793/1510094.
 22. Joseph L, Shaw PF, Smoller BR. Perceptions of stress among pathology residents: survey results and some strategies to reduce them. *Am J Clin Pathol*. 2007 Dec;128(6):911-9. doi: 10.1309/41781W0JTE7DVMV. [PMID: 18024315]
 23. Van Kerkhoven J, Derwael D, Hannosset D, Wauters L, Dewolf P. Stress levels of Flemish emergency medicine residents and the implications for clinical practice and education. *Acta Clin Belg*. 2022 Jun;77(3):663-670. doi: 10.1080/17843286.2021.1946936. [PMID: 34224335]
 24. Kaufman DM, Mensink D, Day V. Stressors in Medical School: Relation to curriculum format and year of study. *Teaching and Learning in Medicine*. 1998;10(3):138-44. doi: 10.1207/S15328015TLM1003_3.
 25. Johnson NR, Pelletier A, Chen X, Manning-Geist BL. Learning in a high-stress clinical environment: stressors associated with medical students' clerkship training on labor and delivery. *Teach Learn Med*. 2019 Aug-Sep;31(4):385-392. doi: 10.1080/10401334.2019.1575742.
 26. Jiang Y, Guan Y-J, Dai D-W, Huang W, Huang ZY. Prevalence of stress and its determinants among residents enrolled in China standardized training program for resident doctor (C-STRD) program: a cross-sectional study. *PLoS One*. 2019;14(1):e0207258. doi: 10.1080/10401334.2019.1575742. [PMID: 30907690]
 27. Ahmadiania F, Rad E, Fata L, Khakbazan Z. Medical residents' viewpoint about the effective stressors on professional identity formation during residency in Tehran University of Medical Sciences: A qualitative study. *Journal of Research in Medical and Dental Science*. 2019;7(1):80-7.
 28. Ebrahimi S, Kargar Z. Occupational stress among medical residents in educational hospitals. *Ann Occup Environ Med*. 2018 Aug 8;30:51. doi: 10.1186/s40557-018-0262-8. [PMID: 30101032] [PMCID: PMC6083531]
 29. Yusoff MSB, Rahim AFA, Yaacob MJ. The development and validity of the Medical Student Stressor Questionnaire (MSSQ). *ASEAN Journal of Psychiatry*. 2010;11(1):231-5. doi: 10.1037/t15334-000.
 30. Riaz Q, Ali SK, Khan MR, Alvi AR. Stress and coping among surgery residents in a developing country. *J Pak Med Assoc*. 2021 Jan;71(1(A)):16-21. doi: 10.47391/JPMA.522. [PMID: 33484511]
 31. Pokhrel NB, Khadayat R, Tulachan P. Depression, anxiety, and burnout among medical students and residents of a medical school in Nepal: a cross-sectional study. *BMC Psychiatry*. 2020 Jun 15;20(1):298. doi: 10.1186/s12888-020-02645-6. [PMID: 32539732] [PMCID: PMC7294639]
 32. Zhou AY, Panagioti M, Esmail A, Agius R, Van Tongeren M, Bower P. Factors associated with burnout and stress in trainee physicians: a systematic review and meta-analysis. *JAMA Netw Open*. 2020 Aug 3;3(8):e2013761. doi: 10.1001/jamanetworkopen.2020.13761. [PMID: 32809031] [PMCID: PMC7435345]
 33. Olmos-Vega FM, Dolmans DH, Vargas-Castro N, Stalmeijer RE. Dealing with the tension: how residents seek autonomy and participation in the workplace. *Med Educ*. 2017 Jul;51(7):699-707. doi: 10.1111/medu.13326. [PMID: 28436048]
 34. Abdelhamid A, Jess G, Evelyn Y H, Abdullatif AK, Banan AA, Carma L B. Burnout and sources of stress among medical residents at Hamad Medical Corporation, Qatar. *East Mediterr Health J*. 2017 Feb 21;23(1):40-5. doi: 10.26719/2017.23.1.40. [PMID: 28244060]
 35. Lapa TA, Carvalho SA, Viana JS, Ferreira PL, Pinto-Gouveia J. Stressors in anaesthesiology: development and validation of a new questionnaire. *Eur J Anaesthesiol*. 2016 Nov;33(11):807-815. doi: 10.1097/EJA.0000000000000518. [PMID: 27428260]
 36. Al-Dubai SAR, Ganasegeran K, Perianayagam W, Rampal KG. Emotional burnout, perceived sources of job stress, professional fulfillment, and engagement among medical residents in Malaysia. *ScientificWorldJournal*. 2013 Nov 7;2013:137620. doi: 10.1155/2013/137620. [PMID: 24367238] [PMCID: PMC3842044]

Evaluation of the Clinical Learning Environment (CLE) Using the Postgraduate Hospital Educational Environment Measure (PHEEM) in Viewpoint of Dental Residents: A Multicenter Study in Iran

Zahra Salari¹, Azadeh Horri¹, Amin Tahmasbi², Raziye Shojayeepour¹, Fatemeh Jahanimoghadam^{3*}

¹Assistant Professor, Oral and Dental Diseases Research Center, Kerman University of Medical Sciences, Kerman, Iran.

²Dentist, Kerman University of Medical Sciences, Kerman, Iran.

³Associate Professor, Social Determinants on Oral Health Research Center, Kerman University of Medical Sciences, Kerman, Iran.

Received: 2022 November 12

Revised: 2023 April 28

Accepted: 2023 June 13

Published online: 2023 June 21

***Corresponding author:**

Social Determinants on Oral Health Research Center, Kerman University of Medical Sciences, Kerman, Iran.
Email: fatemehjahani4@gmail.com

Citation:

Salari Z, Horri A, Tahmasbi A, Shojayeepour R, Jahanimoghadam F. Evaluation of the Clinical Learning Environment (CLE) Using the Postgraduate Hospital Educational Environment Measure (PHEEM) in Viewpoint of Dental Residents: A Multicenter Study in Iran. *Strides Dev Med Educ.* 2023 June; 20(1):66-74. doi:10.22062/sdme.2023.198063.1137

Abstract

Background: Continuous improvement of the quality of education requires continuous evaluation of the clinical learning environment (CLE) and identification of university students' perceptions and expectations. To this end, higher education must improve its quality and increase student satisfaction for its long-term success and survival.

Objectives: The present study aimed to investigate and compare dental residents' attitudes toward the quality of the CLE.

Methods: The participants in this cross-sectional descriptive study were all dental residents (n = 251) at three dental schools in Tehran, Mashhad, and Kerman who were studying in the academic year 2022-2023. The residents were selected using the census method. The Postgraduate Hospital Educational Environment Measure (PHEEM) was used to examine the quality of the learning environment in three areas: perception of autonomy (POA), perception of teaching (POT), and perception of social support (PSS). The collected data were analyzed using descriptive statistics independent samples t-test, correlation analysis, and linear regression analysis with SPSS software at a P value of less than 0.05 was considered statistically significant.

Results: The mean scores for POA, PSS, and POT assessed by dental residents at Tehran, Mashhad, and Kerman universities were 108.54, 100.61, and 97.42 (out of 152), which were within the acceptable range. In addition, 44.88% of the dental residents had a good assessment of the CLE. Furthermore, all dental residents reported poor or negative attitudes toward POA. In addition, 34.76% of dental residents were positive about SSP and 50.70% of them had very positive attitudes toward POT.

Conclusion: Although a majority of dental residents had positive views about the learning environment and its different educational and social aspects, they had negative assessments of the perception of autonomy (POA) as one of the essential factors in the learning environment. Thus, more attention should be paid to dental residents' perception of autonomy to promote the educational and social quality of dental schools.

Keywords: Perception of Autonomy, Educational Needs, Dental Residents, Educational Assessment

Background

Following new approaches, continuous improvement of quality requires continuous evaluation of education and identification of university students' perceptions and expectations (1). Students, employees, faculty members, community members, and industries are the main stakeholders of higher education. Furthermore, the attitudes of students as the main stakeholders can play a significant role in improving the quality of services. An

analysis of the gap between students' expectations and perceptions of educational services can contribute to developing effective programs to improve the quality of educational services (2). Thus, the higher education system can fulfill its functions and goals if it has a high level of educational quality (3). As a result, there is a need for more studies to explore and find ways to increase the quality of educational services. Currently, Iranian universities and higher education institutions need to

move towards qualitative development instead of quantitative development. The learning environment is one of the important determinants of student behavior and is associated with their achievements, satisfaction, and success. Accordingly, assessing various aspects of learning environments can contribute to the further development of educational services and interpretation of the educational programs (4-6). Besides, an awareness of students' attitudes toward teachers and the learning environment can be effective in improving the quality of such environments (7). Assessing students' attitudes and understanding the quality of the learning environment can provide acceptable indicators of the desirability of the learning environment and educational programs (5). Boor et al. stated that the learning environment has a significant effect on the quality of students' learning outcomes and their future success (8). Other studies have also reported the impact of the learning environment on the quality of learners' life and academic achievement (9-11). Successful learning depends on many factors, but a basic step is to engage learners in educational activities and the learning process, which is influenced by learner motivation and perception, which in turn depends on the learners' previous experiences, learning styles, and the environment where learning takes place (11). The learning environment involves all the physical, psychological, emotional, cultural, and social factors that affect the learner's growth and development in an educational institution (9, 11). Bloom defines the educational or learning environment as the conditions, external stimuli, and forces which may be physical, social, as well as intellectual that challenge the individual and influence students' learning outcomes (12). Moreover, the negative clinical training environment will have a significant impact on the quality and safety of patient care and the quality of life of students. Thus, a supportive educational clinical environment will not exist by itself but requires active maintenance and continuous evaluation (13, 14). In recent decades, the dominant approach to learning has changed from information processing theories to postgraduate hospital educational environment measure (PHEEM) placement theories, which do not consider the learning process apart from the context or place where this process happens. Learners, teachers, physical facilities, culture, and relationships governing the learning environment affect thinking and learning processes and the knowledge acquired in the environment (15, 16). Measuring the learning environment from the perspective of students plays a key role in creating and improving the learning environment. The learning environment is one of the important aspects of the medical education program. Many universities in the world use the PHEEM tool and its results as an

indicator of the effectiveness of the educational program in the quality management process in their annual evaluation (17, 18). There are 11 measurement tools to evaluate the clinical educational environments in different stages. However, Dundee Ready Educational Environment Measure (DREEM) and PHEEM provide more reliable results than the other tools. Having a suitable index like PHEEM to measure the performance of educational environments and colleges, it is possible to find effective solutions for planning to reduce weaknesses and maintain and enhance strengths by knowing the opportunities and threats ahead. Thus, the evaluation of an educational environment can pave the way for improving the quality of the environment and, subsequently, the quality of the learning process. Medical and dental students have special characteristics due to the type of their workplace and learning environment. Thus, more attention should be paid to their needs when developing medical or dental curricula. Paying attention to the educational needs of students and assessing their expectations and satisfaction with educational programs in an educational environment can reflect the efficiency of educational programs. To make constructive changes, it is necessary to have descriptive information about the current situation and students' evaluation of the learning rate in their courses. Such information can contribute to improving strengths and eliminating weaknesses and enhancing students' satisfaction with their field of study (19). According to the studies carried out in Iran, 19 faculties offer educational courses for dental residents. Taking into account the effective distribution of faculties in Iran as well as the number of specialized courses offered, the faculties of Kerman, Tehran, and Mashhad were selected in this study.

To achieve effective clinical education, it is necessary to continuously evaluate the quality of educational programs, identify their strengths and weaknesses, evaluate the quality of educational services, and measure their efficiency operationally according to the defined standards. In addition, since the assessment of dental residents is of special importance in patient management and the quality of care provided by them, and in most cases, dental residents initiate diagnosis and treatment for patients, the present study aims to examine dental residents' attitudes toward clinical learning environment (CLE) in dental schools of Kerman, Tehran, and Mashhad Universities of Medical Sciences. The insights from this study can contribute to developing some strategies to improve the quality of educational programs provided for dental residents.

Objectives

The present study aimed to investigate and compare dental residents' attitudes toward the quality of the clinical learning environment.

Methods

Using the PHEEM questionnaire, this cross-sectional (descriptive-analytical) study examined the clinical learning environment (CLE) in dental departments (prosthodontics, orthodontics, restorative, endodontics, pediatrics, periodontics, maxillofacial surgery, pathology, radiology, oral diseases, and community-based dental education (CBDE)) in dental schools of Kerman, Tehran, and Mashhad universities of medical sciences. The participants were selected using the census method from the dental residents ($n = 251$) studying in the aforementioned dental schools. The data were collected using the PHEEM questionnaire, which has been used in several valid studies (20-22). This instrument is most widely used to evaluate the CLE in dental assistance programs. In the present study, a modified version of PHEEM was used. PHEEM was developed by Roff et al. (2005) based on a five-point Likert scale from totally agree to totally disagree (20). The inclusion criteria were dental residents who did not have any educational problems as confirmed by faculty managers and educational officials and had passed their courses according to the faculty schedules. Dental residents with educational or moral problems reported by the disciplinary committee, as well as those dental residents who did not complete their courses following the educational calendar were excluded from the study. Necessary instructions were provided to all the dental residents about the objectives of the study and the research procedure. The residents were also assured that all their data would remain confidential and will not be disclosed, and will only be used for statistical analysis. An informed consent form was also signed by all participants. The protocol for this study was approved by the ethics committee of Kerman University of Medical Sciences with the code of ethics IR.KMU.REC.1401.473.

The data in this study were collected using a demographic information form (gender, marital status, academic year, and being native or non-native). The Persian version of Postgraduate Hospital Educational Environment Measure (PHEEM) whose psychometric properties have been confirmed in different settings (23, 24).

The PHEEM questionnaire has three subscales: perception of autonomy (POA), perception of teaching (POT), and perception of social support (PSS) in the clinical environment. POA is evaluated with 14 items. However, item 7 (There is certain degree of racial/ethnic/cultural prejudice in this post) was

removed because all the dental residents in the schools were of the same race, and item 11 was removed because there was no paging system for dental residents in the dental school and the students were residents in the related department. The questionnaire was administered to 30 dental residents and its reliability was confirmed using Cronbach's alpha coefficient of 0.94.

The dental residents' perception of teaching (POT) was evaluated with 15 items, but item 20 was only asked of students of dental surgery as there is no on-call system in dentistry.

The dental residents' perception of social support (PSS) was evaluated with 11 items. The total score on PHEEM ranges from 0 to 152, and the respondent's scores are interpreted as unfavorable (0 to 38), slightly favorable (39-76), favorable (77-114), and very favorable (115-152) (22). The interpretation of the PHEEM scores for the three subscales is shown in Appendix 1.

The collected data were summarized using descriptive statistics including mean, standard deviation, frequency, and percentage. Afterward, the data were analyzed using independent samples t-test, correlation analysis, and linear regression analysis with SPSS software (Version 20, IBM Corporation, Armonk, NY) at the significance level of less than 0.05 ($P < 0.05$).

Results

Of the 300 questionnaires, the data from 251 respondents (83.66%) were evaluated. Besides, 26 students were not willing to cooperate in this study and 23 questionnaires with incomplete responses were excluded from the study.

The participants were 251 dental residents. A total of 103 residents (41%) were from Tehran University, 83 residents (33.1%) from Mashhad University, and 65 students (25.9%) from Kerman University. Moreover, 42.7% of the participants were first-year dental students, 34.4% were second-year students, 18.8% were third-year students, and 4.2% were fourth-year students. Table 1 shows other demographic characteristics of the participants:

Table 1. The participants' demographic characteristics

Variables	Categories	Frequency (%)
Gender	Male	122 (48.6%)
	Female	129 (51.4%)
Marital status	Married	101 (40.3%)
	Single	150 (59.7%)
Place of residence	Native	164 (65.2%)
	Non-native	87 (34.8%)

Although the dental residents who studied at Tehran University obtained higher scores on the PHEEM questionnaire and its three subscales, there was no significant relationship between the dental residents of different universities. The findings showed that all

dental residents had very poor or negative attitudes toward POA. Furthermore, 34.76% of dental residents had very good, 29.05% had good, 23.33% had moderate, and 12.86% had poor attitudes toward PSS. The data also

revealed about half of the dental residents (50.70%) showed very positive attitudes, 28.64% had positive attitudes, 19.72% had moderate attitudes, and 0.94% had poor attitudes toward POT.

Table 2. The relationship between gender and the three subscales

Scale	Gender	Mean (SD)	Mean difference	%95 confidence interval		P-value
				Lower boundary	Upper boundary	
POA	Male	23.80 (1.02)	2.37	1.43	3.85	0.0001
	Female	21.43 (2.54)				
POT	Male	50.32 (6.13)	11.87	8.30	15.45	0.0001
	Female	38.45 (11.91)				
PSS	Male	37.83 (6.03)	12.44	8.74	16.14	0.0001
	Female	25.39 (12.33)				
Total	Male	124.25 (14.91)	27.99	19.07	36.91	0.0001
	Female	96.26 (29.20)				

POA: Perception of autonomy; POT: Perception of teaching; PSS: Perception of social support

In addition, 35.12% of the dental residents had very positive attitudes toward the CLE, 44.88% had positive attitudes, 16.10% had moderate attitudes, and only 3.90% had poor attitudes toward the CLE.

According to the findings, male dental residents scored significantly higher than female dental residents (Table 2) and native dental residents gained higher scores on the three subscales compared to non-native dental residents (Table 3), but there was no significant relationship between marital status and the three subscales. Moreover, first-year dental residents obtained higher scores than the students at higher levels.

An analysis of the Pearson correlations between the three subscales (POA, POT, and PSS) revealed a positive significant relationship with the three subscales ($P = 0.0001$) as shown in Table 4.

Finally, multiple regression analysis was performed to examine the simultaneous effect of the variables on the score for each subscale and PHEEM. The linear regression analysis showed significant relationships between the total PHEEM score and the academic year ($B = -11.5$; $P = 0.001$), POA and the academic year ($B = -2.87$; $P = 0.001$), and PSS and the academic year ($B = -4.28$;

$P = 0.001$). These findings indicated that the students in lower academic years obtained higher POA, PSS, and PHEEM scores. Besides, the academic year ($B = -4.35$; $P = 0.001$) and the place of residence had also a significant impact on POT scores, and native students obtained higher POT scores ($B = -3.27$; $P = 0.050$). However, the results of the multiple regression analysis did not confirm the findings of the univariate analyses on gender, and although male dental residents had significantly higher scores in the univariate analysis

(Table 2), the multiple regression analysis indicated gender had no significant effect on the POA, POT, PSS, and PHEEM scores (Table 5).

Discussion

The results of the present study showed that all dental residents had very poor or negative attitudes toward POA. Moreover, 34.76% of the dental residents reported very positive attitudes toward PSS and 50.70% of them reported very positive attitudes toward POT. This finding indicated that the dental residents were satisfied with the educational and social aspects of the clinical learning environment (CLE), and the quality of educational and social aspects of dental schools can be improved by taking into account dental residents' perspectives as confirmed by Nahar et al. (22) and Alimohammadi (25). Nahar et al. reported a mean PHEEM score of 44. Furthermore, they found that 35.5% of the dental residents had very positive attitudes toward PSS, and half of them had a positive assessment of POT and poor attitudes toward POA (22). Alimohammadi reported that dental residents had the highest and lowest levels of satisfaction with POT and PSS, respectively (25). The data in the present study also showed that 44.88% of dental residents had positive attitudes toward the CLE and only 3.90% had a poor assessment of the CLE, as reported in previous studies in the literature (Badsar et al.; Dehghanzadeh et al.; Al-Hazimi et al.; Placa et al.) (7, 26, 27, 28).

Badsar et al. evaluated the CLE of dental residents using the PHEEM questionnaire and reported that the students had relatively positive attitudes toward the clinical environment (26).

Table 3. The relationship between place of residence and the three subscales

Scale	Place of residence	Mean (SD)	Mean difference	%95 confidence interval		P-value
				Lower boundary	Upper boundary	
POA	Native	23.17 (1.10)	4.67	3.89	5.45	0.0001
	Non-native	18.50 (1.54)				
POT	Native	51.12 (6.63)	8.06	5.09	11.04	0.0001
	Non-native	43.06 (6.95)				
PSS	Native	38.14 (7.19)	7.99	4.59	11.38	0.0001
	Non-native	30.15 (8.54)				
Total	Native	125.87 (16.58)	19.41	11.92	26.90	0.0001
	Non-native	106.46 (17.72)				

POA: Perception of autonomy; POT: Perception of teaching; PSS: Perception of social support

Table 4. The correlations between the three subscales

Subscales	Pearson Correlation	POA	POT	PSS
POA	r	0.959	1	0.969
	P value	0.0001	-	0.0001
POT	r	0.959	1	0.969
	P value	0.0001	-	0.0001
PSS	r	0.935	0.969	1
	P value	0.0001	0.0001	-

POA: Perception of autonomy; POT: Perception of teaching; PSS: Perception of social support

Table 5. The results of multiple regression analysis for the effect of independent variables on POA, POT, and PSS subscales

Variable	POA				POT				PSS				PHEEM			
	B	SE	t	P value	B	SE	t	P value	B	SE	t	P value	B	SE	t	P value
Gender*	0.16	0.51	0.32	0.750	0.33	0.98	0.33	0.740	-0.06	0.86	-0.07	0.950	0.43	2.10	0.21	0.840
Marital status**	0.37	0.53	0.71	0.480	0.31	1.01	0.30	0.760	-0.08	0.88	-0.09	0.930	0.61	2.15	0.28	0.780
Academic year***	-2.87	0.42	-6.83	0.001	-4.35	0.81	-5.40	0.001	-4.28	0.70	-6.10	0.001	-11.51	1.72	-6.59	0.001
Place of residence****	-0.28	0.83	-0.34	0.740	-3.27	1.59	-2.06	0.050	-1.93	1.38	-1.40	0.170	-5.48	3.39	-1.62	0.120
Faculty*****	0.44	0.54	0.82	0.420	0.11	1.03	0.10	0.920	1.53	0.89	1.71	0.100	2.07	2.19	0.94	0.350

POA: Perception of autonomy; POT: Perception of teaching; PSS: Perception of social support; SE: Standard error

B: Regression coefficient; t: t statistics

*Male to female; **married to single; ***higher academic levels to first academic level; ****Non-native to native; *****Tehran to Kerman and Mashhad schools

Dehghanzadeh et al. also reported dental residents' relatively positive assessment of the CLE (27). Similar to the present study, Al-Hazimi et al. reported that 51% of students had a good perception of the CLE (28). Although the present study showed that dental residents at Tehran University had more positive attitudes toward POA, PSS, and POT compared to the students at Kerman and Mashhad universities, no significant difference was observed between the students' attitudes at these three universities. This finding also confirms that although dental residents at Tehran University had more favorable attitudes toward the CLE, there was no significant relationship between the residents' perception of autonomy, perception of teaching, and perception of social support, the clinical learning environment, and the university. Accordingly, it can be argued that dental residents had more positive attitudes toward Tehran University due to its longer history, its location in the capital of the country, and better facilities and services compared to other universities. The results

of the multiple regression analysis did not confirm the results of the univariate analysis on gender, and gender did not have a significant effect on the POA, PSS, POT, and PHEEM scores. This finding was in line with the results reported by Alimohammadi (25), Badsar et al. (26), and Jalilian et al. (21), but contrary to the findings reported by Rasulabadi et al. (29). Following the present study, Najafi et al. (30) and Arasteh and Baniyadi (31) showed no significant difference between male and female students' satisfaction with the CLE. Thus, it can be argued that gender has no effect on students' perceptions of social and educational aspects of the CLE and is not a factor in improving or declining educational advantages. Rasulabadi et al. reported a significant difference between male and female students' expectations ($P < 0.001$) (29). These contradictory findings can be attributed to the cultural difference between the studied populations. Furthermore, the findings from the present study showed that the first-year dental residents obtained higher POA, PSS, and

POT scores than the students at higher academic levels. The results of the linear regression analysis showed a significant relationship between the PHEEM score, the academic year, and POQ, and between the academic year and PSS. Thus, we can argue that first-year students are more motivated and have more positive attitudes toward the CLE, but as students get to know the environment, they become more familiar with its problems. This finding was consistent with the results reported by Jain et al. (32) but contradictory to the findings reported by Badsar et al. In fact, Jain et al. compared dental residents' perceptions of the educational climate in the faculty in the preclinical and clinical programs and found that the students in both programs had the lowest assessment of flexibility (the opportunity for students to adjust the learning environment). Generally, the students completing the clinical program had more negative attitudes toward the learning environment than the students in the preclinical program (32). Badsar et al. measured medical interns' perceptions of the CLE using the PHEEM questionnaire and the interns had a relatively positive evaluation of the environment. There was a difference between senior and younger interns, but it was not significant (26). Dehghanzadeh et al. reported that dental residents had relatively favorable attitudes toward the CLE. Moreover, the dental residents in the higher year reported better evaluations compared to the lower-year students (27). Alimohammadi examined dental residents' perceptions of the CLE and found no relationship between dental residents' age, academic year, and satisfaction. Their findings also indicated that native dental residents scored significantly higher in all subscales than non-native dental residents (25). The results of the linear regression analysis in the present study showed a significant difference between the PHEEM and POT scores, the academic years, the place of residence, and native students who scored higher than non-native students. Following this finding, it can be suggested native students have more positive attitudes toward their entire academic studies due to less engagement with student problems and they also live with their families and have more amenities. Dehghanzadeh et al., assessed dental residents' perceptions of the CLE and found that the students had relatively favorable attitudes toward the environment, but a significant difference was observed between different groups of students (27). To make constructive changes, it is necessary to have descriptive information about the current situation and students' evaluation of the learning rate in their courses. Such information can contribute to improving strengths and eliminating weaknesses and enhancing students' satisfaction with

their field of study (19). Quality in higher education is related to the achievement of objectives and the achievement or verification of generally accepted standards. Thus, paying attention to the quality of higher education is essential to prevent wasting human capital, material, and financial resources and create coordination between the development of educational systems and their efficiency. Given the growing number of universities in Iran, it is necessary to have a framework to improve and guarantee the quality of universities. Quality is an important issue for educational institutions and service improvement is one of the most important functions of any scientific and academic institution (1, 33).

Studies in North America show that the quality of the learning environment where learning takes place is a predictor of the quality of care provided by graduates for the years after graduation and affects the patterns of prescribing and patient management and the use of healthcare resources (34). Evidence shows that professional satisfaction and patient care will improve if there is encouragement and especially effective supervision and education in the CLE for medical students. Conversely, a negative learning environment may be detrimental to interns and team morale, potentially jeopardizing the multiparty working relationship (35). Moreover, autonomy is one of the recurring subjects with an increasing sense of autonomy, which leads to greater student satisfaction with the clinical learning environment (CLE) (35).

Sawatsky et al. examined the tension between autonomy and supervision through social cognitive theory and emphasized that to create the best learning environments for the formation of the professional identity in physicians, educators should consider a balance between autonomy, supervision, and patient safety (36). One of the important goals of higher education and the Ministry of Health is to train medical staffs that have the necessary ethical, scientific, and practical competencies. Therefore, it is very important to evaluate qualitative indicators effective in improving the quality of education. Accordingly, examining the quality of educational environments from the perspective of dental residents as effective executors and stakeholders in using healthcare and educational environments can help identify strengths and weaknesses and contribute to reforming and improving educational programs and goals (37). The present study evaluated the quality of educational services only in terms of five dimensions and it is possible to evaluate other variables as well. Moreover, among the recipients of academic services, only the attitudes of students were assessed, and the attitudes and views of administrators, teaching staff, faculty members, and professors can also

be assessed in future studies. One of the limitations of survey studies is the use of self-instruments that lead to response bias and errors. Another limitation of the present study was the unwillingness of some of the dental residents to complete the questionnaires accurately. However, the researchers tried to encourage students by providing necessary instructions about the objectives and significance of the study. Finally, qualitative evaluation methods need to be used in universities where the quality of educational services is poor to identify the weaknesses and strengths in offering educational services and continuously improve the quality of services.

Conclusion

The insights from this study can enhance the awareness of educational managers and curriculum planners of the clinical learning environment (CLE) and its influencing factors and help them to know about students' attitudes toward the preferred learning environment so that they can bridge the gap between the actual and preferred learning environments to increase the CLE and students' satisfaction. Overall, given the importance of preclinical and clinical education for dental students in preparing them to start working in the healthcare system, it is essential to pay attention to the quality of educational programs for these students and their satisfaction with these programs. Since the best criterion for measuring the efficiency and quality of education is to measure the feedback received from students, the present study assessed dental residents' perceptions of and satisfaction with the CLE, and the results showed that an increase in the clinical experience led to a decrease in student satisfaction mostly due to students' exposure to clinical cases and a change in their attitudes toward clinical practice. Thus, university officials need to revise clinical programs with a focus on the clinical application of the subjects covered in the programs and create a shift in students' perspectives from theory to practice. Thus, revising clinical programs can enhance students' satisfaction and increase the efficiency of these programs. Moreover, given that the students had a more positive assessment of the dental school at Tehran University compared to other schools, university officials need to hire more academic staff and take effective measures to improve physical facilities and human resources.

Supplementary material(s): is available here [To read supplementary materials, please refer to the journal website and open [PDF/HTML](#)].

Acknowledgements: The authors would like to express their gratitude to the Vice-Chancellor for Research and Technology of Kerman University of Medical Sciences.

Conflict of interests: The authors declared no conflict of interest in the present study.

Ethical approval: All research procedures were approved with the code IR.KMU.REC.1401.473 by the Ethics Committee of Kerman University of Medical Sciences.

Funding/Support: The current study was carried out based on research project number 950261 approved and financed by the Vice-Chancellor for Research and Technology of Kerman University of Medical Sciences.

References

1. Stasiak-Betlejewska R, Kaye M, Dyason MD, Stachová K, Urbancová H. The services quality level assessment in the technical university with servqual method applying. *Journal on Efficiency and Responsibility in Education and Science*. 2014 Dec 31;7(3-4):53-8. doi: 10.7160/eriesj.2014.070302.
2. Heidari Sureshjani N, Naderi N, Rezaei B, Khashmin MM. Assessing the quality of educational services of post graduated studies based on Servqual model from the view points of the students at Razi University of Kermanshah. *Higher Education Letter*. 2016;9(35):7-26. [In Persian]
3. Khandan M, Nouhi E, Sabzevari S. Quality assessment of educational services in nursing and midwifery school of Kerman based on SERVQUAL model. *Iranian Journal of Medical Education*. 2015; 15(2): 251-262. [In Persian]
4. Gooneratne IK, Munasinghe SR, Siriwardena C, Olupeliyawa AM, Karunathilake I. Assessment of psychometric properties of a modified PHEEM questionnaire. *Ann Acad Med Singap*. 2008 Dec;37(12):993-7. doi:10.47102/annals-acadmedsg.V37N12p993. [PMID: 19159030]
5. Mahrous M, Al Shorman H, Ahmad MH. Assessment of the educational environment in a newly established dental college. *Journal of Education and Ethics in Dentistry*. 2013; 3(1):6-13. doi:10.4103/0974-7761.126935.
6. Kamal S, Mamata H. Assessment of the learning environment in prosthodontic department based on dental college learning environment survey by the graduates of a dental institute in India. *J Educ Eval Health Prof*. 2014 Dec 22;11:34. doi: 10.3352/jeehp.2014.11.34. [PMID: 25540978] [PMCID: PMC4309930]
7. Placa R, Zangrando M, Ana A, Greggi S, Rezende M, Damante C. Evaluation of a Brazilian postgraduate dental program by the Dundee Ready Educational Environment Measure. *International Education Studies*. 2015; 8(11):34-9.
8. Boor K, Scheele F, van der Vleuten CPM, Scherpbier AJJA, Teunissen PW, Sijtsma K. Psychometric properties of an instrument to measure the clinical learning environment. *Med Educ*. 2007 Jan;41(1):92-9. doi: 10.1111/j.1365-2929.2006.02651.x. [PMID: 17209897]
9. Tokda Y, Goto E, Otaki J, Jacobs J, Omata F, Shapiro M, et al. Educational environment of university and non-university hospitals in Japan. *International Journal of Medical Education*. 2010; 1:10-14. doi: 10.5116/ijme.4ba1.4034.
10. Khan JS. Evaluation of the educational environment of postgraduate surgical teaching. *J Ayub Med Coll Abbottabad*. 2008 Jul-Sep;20(3):104-7. [PMID: 19610531]

11. Days K. Creating and sustaining effective learning environments. All Ireland Society for Higher Education (AISHE-Journal). 2009; 1(1): 1-13.
12. Bloom BS. Stability and change in human characteristics. 2nd ed. New York: John Wiley & Sons; 1964:18-20.
13. Sellberg M, Palmgren PJ, Möller R. A cross-sectional study of clinical learning environments across four undergraduate programs using the undergraduate clinical education environment measure. *BMC Med Educ.* 2021 May 5;21(1):258. doi: 10.1186/s12909-021-02687-8. [PMID: 33952210] [PMCID: PMC8097825]
14. Quigley D, Loftu L, McGuire A, O'Grady K. An optimal environment for placement learning: listening to the voices of speech and language therapy students. *Int J Lang Comm Dis.* 2020;55(4):506-19. [https://doi:10.1111/1460-6984.12533](https://doi.org/10.1111/1460-6984.12533).
15. Durinig SJ, Artino AR. Situativity theory: a perspective on how participants and the environment can interact: AMEE guide no. 52. *Med Teach.* 2011; 33(3):188-99. doi: 10.3109/0142159X.2011.550965. [PMID: 21345059]
16. Soemantri D, Herrera C, Riquelme A. Measuring the educational environment in health professions studies: a systematic review. *Med Teach.* 2010;32(12):947-52. doi: 10.3109/01421591003686229. [PMID: 21090946]
17. Riquelme A, Herrera C, Aranis C. Psychometric analyses and internal consistency of the PHEEM questionnaire to measure the clinical learning environment in the clerkship of a Medical School in Chile. *Med Teach.* 2009 Jun;31(6):e221-5. doi: 10.1080/01421590902866226. [PMID: 19811154]
18. Taguchi N, Ogawa T, Sasahara H. Japanese dental trainees' perceptions of educational environment in postgraduate training. *Med Teach.* 2008;30(7):e189-93. doi: 10.1080/01421590802158385. [PMID: 18777418]
19. Changiz T, Sarvarian M. Attitude evaluation of medical students towards their jobs at the first and the end of internship period. *Virtual.* 2001; 1(1):94. [In Persian]
20. Roff S, McAleer S, Skinner A. Development and validation of an instrument to measure the postgraduate clinical learning and teaching educational environment for hospital-based junior doctors in the UK. *Med Teach.* 2005 Jun;27(4):326-31. doi: 10.1080/01421590500150874. [PMID: 16024415]
21. Jalilian S, Pazouki A, Ahmadi S, Bahador H, Pishgahroudsari M, Akbarilake M. Application of the Persian version PHEEM in assessment of laparoscopic training courses in minimally invasive surgery research center of Rasoul-Akram hospital. *Razi Journal of Medical Sciences.* 2015;22(138):99-108. [In Persian]
22. Nahar N, Talukder HK, Hossain Khan T, Mohammad S, Nargis T. Students' perception of educational environment of medical colleges in Bangladesh. *Bangabandhu Sheikh Mujib Medical University (BSMMU) Journal.* 2010; 3(2): 97-102. doi:10.3329/bsmmuj.v3i2.7060
23. Shokoohi Sh, Emami AH, Mohammadi A, Ahmadi S, Mojtahedzadeh R. Psychometric properties of the Postgraduate Hospital Educational Environment Measure in an Iranian hospital setting. *Med Educ Online.* 2014 Aug 8;19:24546. doi: 10.3402/meo.v19.24546. [PMID: 25109351] [PMCID: PMC4127829]
24. Jalili M, Mortaz Hejri S, Ghalandari M, Moradi-Lakeh M, Mirzazadeh A, Roff S. Validating modified PHEEM questionnaire for measuring educational environment in academic emergency departments. *Arch Iran Med.* 2014 May;17(5):372-7. [PMID: 24784868]
25. Ali Mohammadi S. (dissertation). Residents' viewpoint on the status of residency training environment in teaching hospitals of Gilan University of Medical Sciences. Gilan: Gilan University of Medical Sciences; 2012:8-10. [In Persian]
26. Badsar A, Taramsari MR, Hoseinpour J, Jahromi SK. Postgraduate Trainees' perception of the clinical learning environment at an Iranian Medical Sciences University. *Procedia Soc Behav Sci.* 2012; 46:1084-90. doi:10.1016/j.sbspro.2012.05.252.
27. Dehghanzadeh A, Makoei R, Ghaffari R, Amini A, Ahmadi S, Vahedi A. (dissertation). Evaluation and comparison of clinical educational environments from residents' viewpoints in teaching hospitals of Tabriz University of Medical Sciences. Tabriz: Tabriz University of Medical Sciences; 2014:14-6. [In Persian]
28. Al-Hazimi A, Al-Hyiani A, Roff S. Perceptions of the educational environment of the medical school in King Abdul Aziz University, Saudi Arabia. *Med Teach.* 2004 Sep;26(6):570-3. doi: 10.1080/01421590410001711625. [PMID: 15763838]
29. Najafi R, Khorasani A, Mohammadi R, Galavi M. Assessing the quality of educational services based on SERVQUAL model. *Journal of Educational Measurement & Evaluation Studies.* 2014;6(4):11-27. [In Persian]
30. Rasoul Abadi M, Shafeian M, Gharibi F. Assessment of educational services quality by SERVQUAL model: Students' Viewpoints of Kurdistan University of Medical Sciences. *Scientific Journal of Kurdistan University of Medical Sciences.* 2013; 18:104-12. [In Persian]
31. Arasteh H, Baniasadi A. Students' academic satisfaction of the first graduate-oriented master's degree: a case study. *Journal of Educational Planning Studies.* 2013; 1(2): 5-25. [In Persian]
32. Jain L, Jain M, Mathur A, Paiwal K, Duraiswamy P, Kulkarni S. Perceptions of dental students towards learning environment in an Indian scenario. *Dent Res J (Isfahan).* 2010 Summer;7(2):56-63. [PMID: 22013458] [PMCID: PMC3177369]
33. Akhavan Kazemi M. Sustainable political development and excellent education. *Journal of Higher Education Research and Planning.* 2005;1:13-32. [In Persian]
34. Nordquist J, Hall J, Caverzagie K, Snell L, Chan MK, Thoma B, et al. The clinical learning environment. *Med Teach.* 2019 Apr;41(4):366-372. doi: 10.1080/0142159X.2019.1566601. [PMID: 30880530]
35. Elzain M, Moran L, McCarthy G, Hyde S, McFarland J. Evaluation of postgraduate educational environment of doctors training in psychiatry: a mixed method study. *BioRxiv.* 2022;02.24.481497. doi: 10.1101/2022.02.24.481497.
36. Sawatsky AP, Santivasi WL, Nordhues HC, Vaa BE, Ratelle JT, Beckman TJ, et al. Autonomy and professional identity formation in residency training: A qualitative study. *Med Educ.* 2020 Jul;54(7):616-27. doi: 10.1111/medu.14073. [PMID: 31991484]
37. Horri A, Jahanimoghadam F, Poureslami HR, Najafpour F. The Opinion of Dental Students of Kerman Iran Regarding their Achievement Level in Learning Objectives of Pediatric Dentistry Courses. *Strides Dev Med Educ.* 2014;11 (3): 378-86.

Appendix 1. PHEEM Score Interpretation

Scales	Scores	Interpretation
Perception of autonomy (POA)	0-12	Very poor
	13-124	Negative view of one's role
	25-36	More positive perception
	37-42	Excellent
Perception of teaching (POT)	0-15	Poor
	16-30	Need retraining
	31-45	Moving right direction
	46-60	Excellent
Perception of social support (PSS)	0-11	Non-existent
	12-22	Not pleasant
	23-33	More pros than cons
	34-44	Good support

Defining the Roles of the Indicators of Collaborative Management in Implementing Health Care policy: The Grounded Theory

Mahtab Ghanbarnejad¹, Zahra Shokoh^{2*}, Mohsen Zayanderoodi³, Amin Nikpour³, Saeed Sayadi²

¹PhD Student, Department of Management, Kerman Branch, Islamic Azad University, Kerman, Iran.

²Assistant Professor, Department of Management, Kerman Branch, Islamic Azad University, Kerman, Iran.

³Associate Professor, Department of Management, Kerman Branch, Islamic Azad University, Kerman, Iran.

Received: 2023 March 15

Revised: 2023 April 20

Accepted: 2023 July 11

Published online: 2023 July 11

*Corresponding author:

Department of management, Kerman Branch, Islamic Azad university, Kerman, Iran.

Email: shokoh.azaduniversity@gmail.com

Citation:

Ghanbarnejad M, Shokoh Z, Zayanderoodi M, Nikpour A, Sayadi S. Defining the Roles of the Indicators of Collaborative Management in Implementing Health Care Policy: The Grounded Theory. *Strides Dev Med Educ.* 2023 July; 20(1):75-85. doi:10.22062/sdme.2023.198425.1190

Abstract

Background: Implementation of health care strategies (including the implementation of decisions) is one of the most valuable and complex stages of strategic planning, which is realized through collaboration.

Objectives: This study aimed to define the roles of distinct elements of collaborative management in implementing health care strategies.

Methods: This research was conducted based on the qualitative method of Grounded theory with the constructionist approach of Charmaz to answer the question pertaining to the research objectives. The sampling method was snowballing, and information from 40 semi-in-depth semi-structured interviews based on a primary and centralized approach was analyzed. A 3-dimensional approach was used for data consolidation.

Results: From the participants' viewpoint, the inflexibility of managers and staff and the deviation between personal and organizational goals and endeavors are the major hindrances to implementing collaborative management. Moreover, the participants emphasized the importance of a comprehensive and documented strategic plan for implementing strategic health care roadmaps. They believed that effective implementation of collaborative management could lead to desirable personal growth, organizational growth, and monitoring and problem-solving outcomes. However, managers' resistance and lack of monitoring were reported as negative outcomes that should be addressed accordingly.

Conclusion: Implementing collaborative management in health and promoting it in collaboration with different stakeholders can provide a suitable foundation for implementing this management style. Moreover, expanding knowledge, training, and monitoring the health care system are proposed as key elements.

Keywords: Collaborative Management; Implementation of Strategic Planning; Health Care Strategic Planning

Background

In recent years, prompt public strategic planning has revolutionized, and public strategic planning has become more complex (1). Implementation of strategic planning is primarily defined as interaction and coordination (2, 3) and, practically, the collaboration between external and internal elements of the government body (4). On the other hand, the separation between politics and management has always been a controversial and undefined issue (5, 6). The traditional approach to management has caused the implementation of strategic planning to become a missing link (4). Today, the new approach to policy-making by policy-makers

and its implementation by government managers is not a hierarchical relationship, includes mutual negotiation and collaboration (7), and can be considered as a facilitated interaction and collaboration between elected and governmental managers and has resulted in the dichotomy's evolution (1).

Several studies have been conducted to assess the effective implementation of strategic planning in health, including a study by Masoumi et al conducted to develop a template for assessing the effective implementation of health care policies. Their results demonstrated that the influential factors in implementing policies included popular culture, construction, awareness raising, strategy quality, style

and implementation method, laws and legislations, budget allocation, competent human resources, and environment (8). Livani et al investigated key requirements of implementing strategic planning of medical tourism in Golestan Province, reporting 5 major factor categories: organizational design, capacity building, the quality of services, strategic planning system, and advertisement and branding (9).

Suppose the collaboration of stakeholders (those who are influential and the influenced ones) is not considered in strategic planning. This can lead to the inefficiency of strategies in addressing shortcomings. However, their contribution can lead to sharing knowledge and useful information, as well as establishing a foundation for long-term improvement and achieving the desired goals (10).

Recently, collaborative management has been hailed as an effective approach to minimizing conflicts (11). As a desired and efficient system, this management system has passed several theoretical and practical tests and is currently completely implemented in developing and developed countries (12). Euler and Heldt proposed that collaborative management can effectively lead to the democratization of processes and higher decision-making qualities beyond collaboration and the promotion of self-organization strategies (13). Collaborative management and democracy in work can promote the performance of employees. In this regard, several studies have demonstrated that collaborative management can minimize absenteeism and reduce the request to change the workplace (14, 15). Based on a meta-analysis, Petty et al demonstrated a significant relationship between staff job satisfaction and performance in collaborative management (16).

Collaboration is essential in organizations. The decisions made in organizations today are more complex and interlinked and demand teamwork. Moreover, staff contribution is not only confined to utilizing their information, but using the knowledge and experience of staff as advisory positions are crucial in any organization (17). Despite wide acceptance, there are several oppositions to collaborative management. Generally, research findings demonstrate that productivity increases by 30% to 40% with the collaboration of the employees. This approach is very popular in developed countries. Besides increasing productivity, this approach can promote 2 humane values: freedom and autonomy (18, 19). Considering the complete implementation of the strategic plans in health care, as well as the effect of multifactorial elements (such as different complexities in their implementation), it is necessary that involved teams need to collaborate for their effective implementation more than ever.

Currently, although the importance of benefitting from the expert opinion and those who are prominent in health care in this field is clear, there is no template involving all necessary dimensions and elements. The objective of the current study was to reflect the participants' opinions in defining the role of collaborative management in implementing health care strategies and defining a paradigm based on their input in the health system.

Objectives

This study aimed to define the roles of distinct elements of collaborative management in implementing health care strategies.

Methods

This qualitative research was based on the background theory. The primary objective of the background research theory is an in-depth analysis of individuals' or groups' occupational behaviors, ideas, and attitudes. This can lead to better recognition of phenomena, dimensions, and related elements. In contrast to research methods designed to describe phenomena, the primary objective of the background theory is the development of theory (20). The rationale for using this approach in the current study was to illuminate defining elements and dimensions effective in implementing strategic planning in health care. This study was conducted based on the participants' experience in their fields of activities in the health care system. Moreover, the research question "Which influential elements can be effective in collaborative management in implementing strategic health planning?" was considered. The current research was designed and implemented based on the background theory with Charmaz's constructionist approach (21).

The field of study was the Kerman University of Medical Sciences and the Islamic Azad University of Kerman in Iran. Inclusion criteria were having experience and managerial positions in health care (including middle- and high-ranking managers). Moreover, they agreed to be interviewed, and written informed consent was obtained. Based on the qualitative research method, the sampling commenced with a targeted sampling and was continued based on the targeted snowballing sampling approach. It is noteworthy that in the analysis process, based on the theoretical sampling for addressing the identified gaps, several managers of the eighth region of Sistan and Baluchestan, and Kerman Provinces education were added to the study. Data gathering was continued until theoretical saturation was achieved.

Data Collection

Data were collected through 40 semi-in-depth and semi-structured interviews (23 face-to-face and 17 online interviews), as well as through a review of overarching documents in the health care system's strategic planning field. The interviews were conducted in person or online using WhatsApp in Kerman. The interviews lasted 35 to 55 minutes. After analyzing the first interview, 12 participants were interviewed for a second time. Participants' views were initially collected through open questions. Then, the explanations of the interviewees' advantages and disadvantages, dimensions, influential and influenced circumstances, processes, backgrounds and frameworks, and requirements for the implementation of collaborative management in line with implementing health care strategies, organizations, and the involved units and their responsibilities were obtained through closed questions; the interviewees were given the opportunity for complementary explanations. Concurrent with data gathering and data analysis, notes and field notes played a key role in identifying the elements of collaborative management in implementing health care strategic plans.

The data were analyzed using Charmaz's constructionist approach (21). The analysis process was started by scripting the interviews and observations and continued by entering the information into Word software 2019 (Microsoft, Washington, US). Then, the interviews were reviewed line-by-line, and the primary free codes were extracted from them. These primary free codes were written in conceptual and meaning subgroups. Gradually, the recorded codes were expanded, and with the addition of each interview and observation, more diverse subgroups were formed. Subsequently, in the centralized coding stage, the researchers classified the subgroups under the main categories. Then, the results were presented to the interviewees to ensure all necessary amendments were made. Ultimately, in the last stage of data analysis, using fixed comparison methods, the collaborative management elements influential in the effective implementation of health care strategic plans in 5 dimensions, including 12 main areas, 42 subareas, and 396 free codes, were identified (Figure 1).

Validity and Reliability of the Study

The researchers used 5 criteria of Guba and Lincoln (credibility, transferability, confirmability, and dependability) to strengthen the data (22). In any subject, long-term collaboration is a suitable validation method. Analysis of the members is another suitable data validation approach. Therefore, the researcher sent the scripted interviews to the interviewees using

email or WhatsApp to ensure accurate descriptions and similar comprehension of the concepts. Using a 3-dimensional approach in data collection (which included interviews, observations, field notes, and documents) increased the credibility of the research. Sampling with maximum diversity (age, gender, education, and related management experiences) was used to maximize the findings' validity and develop more expanded information. For data analysis, first, the first researcher scripted, coded, and evaluated the interviews. Then, a second researcher analyzed these items independently. Next, a third researcher coded and analyzed the data as an expert in qualitative research.

Results

Forty participants participated in the interview; 38 were faculty members of medical universities, 14 were professors, 11 were associate professors, 10 were assistant professors, and 2 were non-faculty members. Twenty-four participants were male, and 16 (40%) were female. The mean age of the male and female participants was 46.0% and 36.5%, respectively. Moreover, 38 were married, and 2 were single. The participants' educational background was diverse and included medical doctorate, pharmacy, dentistry, different branches of management, policy-making, pathology, economy, nursing, and medical engineering.

As tabulated in Table 1, 396 free codes, 42 subcategories, and 12 major categories were extracted.

Causal Conditions

Considering data analysis, 2 major categories of facilitators and inhibitors of the implementation were categorized as the causal subgroups (influential in the major category). There is a constellation of factors that lead to the effective implementation of collaborative management and facilitates its implementation. On the other hand, the resistance of managers and staff in implementing this approach, deviation of the goals and personal and organizational efforts, neglecting employment of clinicians when necessary, misunderstanding among the employees, and so on were obstacles hindering the implementation of collaborative management.

Participant 2 stated, "*The current complex situation faced by the Ministry of Health and Medical Education is among factors that demand the contribution of diverse teams with unique skills.*"

Also, participant 1 claimed that:

We should be realistic and flexible. Today, rigid and mechanical organizations cannot meet new demands. Considering future scenarios, it is necessary to be flexible based on the organization's strategic plan type

and characteristics. We need to exploit the input of internal and external stakeholders and the latest technologies.

Participant 4 said, “*The collaborative approach, which has different applications for financial, human, and information resources, should be exploited from higher to lower levels, but there are problems that managers do not accept.*”

Strategies

Particular actions and interactions are necessary for implementing collaborative management. The first step for its implementation in health care organizations is to create the context. According to the analysis of interviews, “*the provision of executive, information, communication, and cultural prerequisites*” are among the subcategories identified in the provision of the context for implementing collaborative management.

In this regard, participant 13 said, “*For implementing the plan, we need to employ skilled and experienced personnel, and without effective laws and legislations, it cannot be realized, as in that case, it has no robust foundation.*” Participant 10 stated, “*We need to identify successful models to exploit their experiences.*”

The second stage in implementing collaborative management in health care organizations is the design and development of a comprehensive and documented plan for implementation of the collaborative management plan with subcategories of “*designing strategies and legislations, designing of educational content for implementation, designing organization communications, designing a style for collaboration, designing the executing section, and the principles of collaboration principles design.*”

Participant 13 claimed that “*Short-term political considerations can undermine the implementation. Long-term overarching policies governing all strategies should not be conflicting, and they need to be in the same direction.*”

Also, participant 10 said:

Based on the existing context, the best content should be included in the best process, and the

achievement of the best outcomes follows. Similar to the current situation in which, although we know what we desire, it is still elusive.

Effective implementation using an expert team is one of the most important categories and the third identified stage in the achievement of collaborative management, which can be realized.

“*Proper classification, the contribution of experts in the implementation, proposing strategies and their implementation, transferring responsibility, executive content, forging communications based on collaboration, implementation process, assigning the collaborating units, and holding meetings.*”

Participant 8 stated that:

Project groups and target groups should be designed, and the opportunity for collaboration and contribution and consultation should be provided, communication should be facilitated, job security should be provided, and obligations and commitments of collaboration need to be provided. The requirements need to be documented, and the decision-making process should be designed to allow the contribution of all. Ideas and opinions should be accepted and assessed.

Participant 11 added, “*We need to employ experts in implementing this plan; generally, contributions that exclude experts and elites will be of no use.*”

Proper evaluation of the implementation and necessary amendments for completion of the process and its continuation is necessary, and the fourth recognized stage. “*Evaluation, giving and receiving feedback, implementation of the amendments, and support for repeat and repeated actions*” are subcategories related to this major category.

Participant 3 said, “*After execution, we can seek the opinions of the executors and stakeholders and observe the deficiencies from their viewpoints; after that, we should make necessary amendments,*” and participant 12 stated that “*If we can have ongoing evaluation along with the amendments, we can achieve our goals sooner.*”

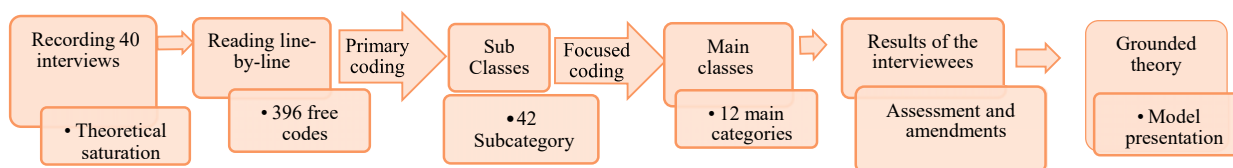


Figure 1. The coding process of the research based on Charmaz's approach

Table 1. Free Codes, Subcategories, and Main Categories of the Present Study

Classification	Main category	Subcategories	Free code samples
Causal conditions	Implementation facilitator	Executive necessities	The necessity of the contribution of several teams, the necessity of realization of social justice and intersectional collaborations and accountability, the number of skills and resources, and the failure to perform the tasks individually
		Inclination and ability to apply the collaborative approach	The ability, knowledge, and motivation for benefiting from the collaborative approach, the collaboration extent (complete or partial), preference of the common benefit over personal gain, collaboration attitude, inclination and willingness of the employees to collaborative management
	Obstacles to implementation	Executive obstacles	Resistance of managers and staff to implementation of this approach, lack of favorite outcomes without effective management and order, lack of exploiting treatment personnel when necessary
		Conflicts of interest	Lack of mutual understanding, resistance in conflict with their interests, not alignment of goals and personal and organizational endeavors
Strategies	Providing the background for implementation	Provision of the implementation requirements	Generation of resources, infrastructure, and promotion of collaborative culture, recruitment of personnel and resources, transfer of power and authority according to the duties, and endorsement of legal requirements
		Provision of information requirements	Sound comprehension of the issue, the current environment, and situation, recognition of the obstacles to cooperation, following successful models, availability of precise and comprehensible information needed for decision-making, science survey, building dialogue, and holding training classes
		Provision of communication requirements	Team formation, seeking the contribution of the staff through building confidence and trust in them, provision of opportunity for cooperation and expression of ideas, communication channels, overcoming obstacles to innovation and frank expression of ideas, amendments of management styles, and rigid and dictatorial management
		Provision of cultural requirements	Provision of necessary cultural background, synchronization of values and generation of positive thinking, generation of collaboration attitude for capacity-building and synchronization of potentials (intrinsic and extrinsic), avoiding politicizing, and preserving group integrity
	Designing the implementation style	Designing strategies and legislation	The intelligent design of strategies, documentation and conveying the content of the strategic plan and enclosed executive plans, the proposal of the implementation strategy for a collaborative approach, designating the reference for resolving obscurities, and passing supportive laws
		Designing the educational content for implementation	Proposing targeted training programs, proposing educational material related to different levels based on the educational needs and objectives
		Designing organizational communications	Designing proper constructions and official and unofficial communications inside and outside the organization, networking, dispute-resolving structures (consultation council, system, and committee proposals), building collaboration among layers and in all levels, the method of job allocation and follow-up, and having a cooperation cycle
		Designing collaboration style	Designing the structure of the contribution of the employees, style, levels, boundaries, and collaboration guidelines based on macro-level legislations or internal guidelines
		Designing executive section	Designing monitoring and evaluation and provision of resources and authorities based on individuals' responsibilities
		Proportionate grouping	Team-working of intersectional councils, the foundation of associations and assemblies, voluntary autonomous contribution and councils, formation of skilled groups, and public opinion systems
	Proper implementation	Employing experts in the implementation	Benefitting from commonsense through interaction and conversation of the implementation stakeholders and recruitment of facilities
		Proposing strategies and implementing them	Announcement of strategies and implementation methods and reporting implementation indicators according to situations and necessities

Table 1. Free Codes, Subcategories, and Main Categories of the Present Study (continue)

Classification	Main category	Subcategories	Free code samples
Strategies	Proper implementation	Transferring responsibility	External allocation and transferring parts of services to the private sector
		Implementation content	Addressing ambiguities and conflicts, including the opinions of the executors in the endorsement stage
		Forging collaboration-oriented communications	Formation of multifaceted communication and implementation of collaborative management based on the implementation situation
		Implementation process	Pilot implementation, assessment of proposals, and selection of necessary instruments based on the consensus, collaborative and interactive decision-making, the effort to decrease appointments in executive matters, and external allocation of tasks
		Designating collaborative sections	Health care and rehabilitation service providers, private and public medical council organizations (pharmacy, laboratory, equipment, and disposables), nursing council organizations, judiciary arm, welfare committee, Afghan refugees affairs organization, charities, science-based corporations, broadcasting organizations, NGOs, and stakeholder groups
		Holding meetings	Face-to-face or virtual meetings, open polls, and development of websites
		Evaluation	Monitoring and regulating implementation, monitoring bottlenecks and reporting of monitoring, assessment of pitfalls and proposing solutions, and implementation of long-term and annual self-evaluation
		Giving and receiving feedback	Contributions compared to the previous year to demonstrate the vastness of learning, verbal or written polls, and proposal-collecting systems
		Executing amendments	Ongoing monitoring of problems during the process and making necessary amendments, confrontation with the lack of cooperation and underperforming, and alignment of efforts and activities in the achievement of the objectives
		Support for reattempt and another try	Support of organizations of proposals and even potential shortcomings, recording successful experiences, and monetary and other forms of reward
Background situations	Environmental facilities and situations	Status of existing information	Lack of access to information and managers, deficiency or lack of clear indicators, and the ambiguity of executive style
		Status of existing facilities	Access to financial and human resources, appropriate time and place, the number of advisory councils, and the number of cooperation contracts
		Environmental situation	Economic, social, and political technologies and supportive legislation
	Environmental culture	Organizational culture	Acceptance of the strategic plan, the extent of stability of policies and flexibility in the management style and manner, the general inclination of the organization for implementation of collaborative approach, not just articulating it, transparency and unambiguity, and organizational atmosphere
		Employees' culture	Employees' characters (commitment, motivation, and skills), view on collaborative management, interest, and responsibility, voluntary contribution of staff, and accepting criticisms, innovation, creativeness, high-risk tolerance
	Current communication situation	Resistance of the staff and managers, lack of a common communication language, conflicts of interest, and excessive attention to own interest	
Mediating conditions	Implementation method	Implementation speed	Follow-up of authorities for implementation of this approach, realism, and necessary flexibility
		Implementation method	Team formation and team matching, order of meetings and the style of their management, the potential of implementation for strategic plans
	Documentation style	Incompatibility of documentation and implementation	Lack of executive guarantee for some strategies and the distance between executors and strategic planners
		Strategic planning	Evidence-based design of strategies, transparency, precision, updated, excitable, and the convergence of strategies

Table 1. Free Codes, Subcategories, and Main Categories of the Present Study (continue)

Classification	Main category	Subcategories	Free code samples
Outcomes	Positive outcomes	Organizational excellence	Reducing the distance between the executors and strategic planners, productivity, promotion of the collaboration culture, accelerating implementation, enhancing organizational commitment, preparedness, and potential of the system for solving distinct problems
		Personal excellence	Promotion of self-esteem, responsibility, the commitment of employees, job satisfaction, promoting motivation, learning from others' experiences, expansion of communicational skills and internal synergy, and inducing a sense of ownership in individuals
		Problem-finding and solving	Evaluation of the situation from different perspectives, minimizing the possibility of ignoring the identification of problems, solutions, and problem-solving, lengthy and difficult decision-making but rapid execution, division of risks, and increasing courage in dealing with problems
	Negative outcomes	Managers' resistance	Managers' resistance, a misconception of some managers from collaborative management and considering them as meddling, and time-consuming meetings
		Lack of control	Unrealistic expectations of employees, excessive meddling, lack of confidentiality, and time-consuming and resource-draining

Background Conditions

Special environmental conditions can influence strategies. Two major categories of “facilities and environmental conditions and environmental culture” were defined in this context. Three subcategories of “current information situation, the condition of the current facilities, and the condition of the environment for the environmental conditions subcategories” were identified.

Participant 14 said, “The current economic and social conditions do not allow us to implement flexible projects, particularly because there are no proper laws and legislations in this regard.”

The identified subcategory related to the major category of environmental culture was “organizational culture, employee’s culture, and the current communication conditions.”

Participant 1 stated, “The organizational atmosphere that facilitates collaboration or has a successful experience in collaboration, the reward participants receive, and the motivation that is generated are among influential background factors.” Participant 19 said, “The style and manner of thinking of managers and health care personnel are very important. Considering experiences and evidence is very important; we should have a systemic view and be holistic.”

Mediating Conditions

These are general conditions that influence strategies. Two major categories of “documentation style (with subcategories of documentation gap and implementation

and strategic planning) and implementation method (with subcategories of implementation type and speed)” were identified in this line.

Participant 9 said, “In implementing projects, meetings should be well-organized, meetings should be held promptly, and the teams should match one another, and managers should follow the implementation process.” Further, participant 4 believed that “If there are no discussions and interactions, there would not be any consensus. Every person performs individually; we need to work like clockwork, synchronized and timely.”

Outcomes

Outcomes, positive or negative, are apparent following implementing strategies. Subcategories of “organizational excellence, personal excellence, and problem finding and its solving” were recognized as the major category of the positive outcome, and the subcategory of “executive limitations” was recognized as the major category of the negative outcome.

Participant 22 stated, “We move from personal and individual decision-making toward group decision-making and, practically, a larger group endeavors to continue that path.”

Participant 5 said, “The most important outcomes are the breadth of experiences and increasing decision-making quality. Evaluation of the problems would be easier.”

Further, participant 32 believed, “One of the major drawbacks is being unfamiliar to the staff.”

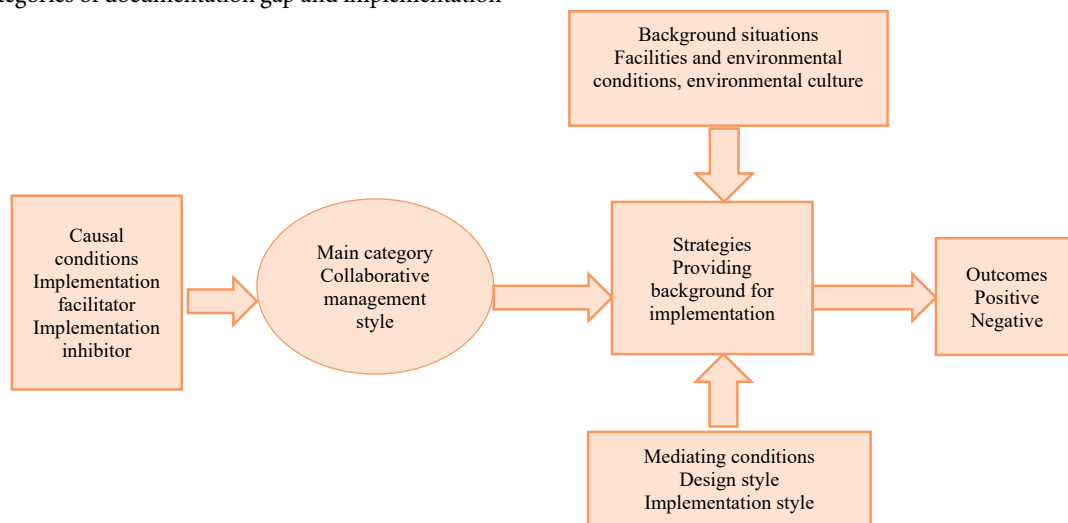


Figure 2. The paradigm template (model) of the collaborative management style

They lack the experience and skills, their compliance is poor, and they resist. Our organization has no ideal model, and the implementation is not coordinated.”

Generally, the conceptual model derived from the results of the interviews is demonstrated in Figure 2.

Discussion

This article identified distinct elements of collaborative management in line with implementing health care strategies based on the participants' views. Regarding identified strategies for implementing collaborative management, "provision of implementation background, designing execution methods, proper implementation, evaluation, and amendment" were more prominent. The provision of environmental conditions and preparation of the environmental culture were effective and influential factors in implementing collaborative management, including some influential mediating factors, the implementation method, and documentation style. From the interviewees' viewpoints, proper implementation of collaborative management can lead to individuals' positive growth, organizational growth, and problem-finding and problem-solving. However, the resistance of managers and lack of monitoring were mentioned as negative outcomes in this research, which should be noted.

The findings of the current study in terms of causal conditions indicated that there was a subcategory called "executive barriers" under the main category of implementation barriers with the title of "executive barriers," which is consistent with the results of Kostka et al (23). The results regarding the subcategory of "provision of basic requirements for implementation of strategies" included the provision of implementation, information, communication, and cultural backgrounds, which are consistent with the outcomes of Iyanda and Bello; they investigated the pathology of implementation of general strategies in Nigeria and discussed obscurity of the goals, ambiguity, and lack of suitable technology for implementation, lack of coordination, and corruption as the implementation obstacles (24). Wildavsky and Pressman believe that the successful implementation of strategies depends on the coordination between different organizations involved in implementation, and any lack of coordination can lead to implementation failure (25). The participants believed that subcategories of "evaluation, receiving, and providing feedback, implementation of amendments, support for reattempt and repeat" were related to the basic category of evaluation and amendment.

Executive necessities, inclination, and ability to use the collaboration approach were the subcategories of the major category of implementation facilitators. Factors that prevented the implementation of collaborative management were believed to belong to the subcategory of implementation inhibitors. These findings were

consistent with the results of Jabbarzadeh Karbasi and Mazloomi (26) and Asadi et al (27).

The results of the current study in the category of background conditions and subcategories of facilities and environmental conditions are in line with the results of Bahadori et al (28) and Livani et al (9). Moreover, in the subcategory of culture, the results are in line with the studies by Masoumi et al (8) and Khodabakhshi et al (29). In the outputs of the analysis of the interviews, 2 categories in the interfering factors (mediating), including implementation style and documentation style, were identified. These results were similar to those of studies conducted by Xiu et al (30), Zabetpoor et al, and Khanifar et al (31, 32). The participants believed that the implementation of health care strategic plans could be categorized into 4 groups: "provision of the background for implementing health care strategies, designing the method of implementation of the strategic plan, proper implementation of the strategic plan, and amendment of strategic plans," which are consistent with the results of Iyanda and Bello (24), Livani et al (9), and Khanifar et al (32).

Outcomes related to implementing the collaborative management plan were divided into positive and negative groups. Based on the participants' opinions, significant parts of the outcomes of implementing collaborative management were positive outcomes in the subcategories of "organizational excellence, personal excellence, and problem finding and solving it." Promotion of quality in the achievement of goals and improving productivity, facilitation of better coordination, increasing output in works, lowering the costs, productivity, and expanding the collaboration culture in the organization, employees harder work for achieving organization goals, perseverance of the staff, and continuation of the implementation agreed upon are only 1 section of the organizational outcomes of implementing the collaborative management plan that the interviewees expressed. Promoting employee respect and self-esteem were the most repeated codes in this subcategory.

One of the other personal benefit outcomes related to implementing collaborative management were increasing teamwork and contribution, commitment and job satisfaction, collaboration and development of a sense of cooperation and commitment to work, attention to the needs of the employees for respect, generation of the sense of ownership in the employees and foster their collaboration in this manner, using the maximum potentials and their commitment, and increasing the effect of effectiveness and the employee's satisfaction.

Compared with dictatorial management, finding and solving problems through the collaborative management approach are very different. Therefore, their outcomes can be very different, too. From the interviewees' viewpoints, an issue is dealt with from various perspectives in the collaborative management approach. Consequently, problems are dealt with more in-depth and can be precisely addressed and solved. Increased coordination in solving problems, capacity building for tolerating shortcomings, better recognition of the elements of the issue, dividing the risk and decision-making among all, considering different opinions in decision-making, and exploiting the benefits of collaborative decision-making were other outcomes related to finding and addressing problems. These results are consistent with those reported by Kohtamäki et al (33), Elbanna and Fadol (34), and Masoumi et al (8).

Negative outcomes related to implementing the collaborative management approach are outcomes that re-execution of them would cast doubt on them. These outcomes were categorized under the subcategory of "executive limitations" and "resistance of managers and lack of monitoring" were its subcategories. The novelty of this approach for the employees, lack of experience and skills of the employees and managers for implementation of this style, the meddling of the staff in all affairs, time-consuming meetings, and provocation of unrealistic expectations in the staff were among the outcomes that prevented the implementation of collaborative management. These subcategories are also mentioned in the research conducted by Masoumi et al (8) and Rajaei et al (35), demonstrating consistency in the results. Consequently, implementing collaborative management in line with health care strategies is reliant on the development of suitable systems for preparing executive necessities and enhancing the inclination and potential of implementation of a collaborative approach. Moreover, overcoming executive obstacles and conflicts of interest can be helpful in this regard.

Conclusion

For implementing collaborative management in health care and promoting the related cultures, effective collaboration with different stakeholders in health care organizations, which can provide a suitable foundation for benefiting from this management style and recruitment of all resources and forces, can lead to improved productivity. In the next steps, expanding knowledge and learning necessary skills for management are necessary. Ultimately, monitoring the performance of the health care system and comparing

the outputs with other management styles and timely intervention can play an effective role in the implementation of collaborative management.

Supplementary material(s): is available here [To read supplementary materials, please refer to the journal website and open [PDF/HTML](#)].

Acknowledgements: The authors thank all participants and colleagues who contributed to this work.

Conflict of interests: The authors declare none. The authors declare that they have no conflict of interests.

Ethical approval: The current study was extracted from a doctorate thesis with code IR.KMU.REC.1401.461 endorsed by the Islamic Azad University, Kerman branch. The researchers obtained written informed consent from all participants to adhere to ethical principles in this research. They ensured the confidentiality of the information and deleted the recorded files after reviewing their content.

Funding/Support: None.

References

- Demir T, Reddick CG. Understanding shared roles in policy and administration: An empirical study of council-manager relations. *Public Administration Review*. 2012;72(4):526-35. doi:10.1111/j.1540-6210.2011.02551.x.
- Hjern B, Porter DO. Implementation Structures: A New Unit of Administrative Analysis. In: Holzner B, Knorr KD, Strasser H. *Realizing Social Science Knowledge*. Institut für Höhere Studien — Institute for Advanced Studies IHS-Studies. Heidelberg, Germany: Physica, Heidelberg; 1983: 265-77. <https://doi.org/10.1007/978-3-662-41492-7>.
- Peters BG. Implementation structures as institutions. *Public Policy and Administration*; 2014;29(2):131-44. doi: 10.1177/0952076713517733.
- Hupe P, Hill MJ. *Implementing public policy: An introduction to the study of operational governance*. London: SAGE Pub; 2021:1-100.
- Demir T, Nyhan RC. The politics-administration dichotomy: An empirical search for correspondence between theory and practice. *Public Administration Review*. 2008;68(1):81-96. doi:10.1111/j.1540-6210.2007.00839.x.
- Hartlapp M. Regulating Social Policy in the EU and Mercosur: Patterns and Developments in Social Security and Related Areas. In: Bianculli AC, Hoffmann AR. *Regional Organizations and Social Policy in Europe and Latin America*. Palgrave Macmillan, London: Development, Justice and Citizenship Series; 2016. https://doi.org/10.1057/9781137490353_5.
- Sowa JE, Lu J. Policy and management: Considering public management and its relationship to policy studies. *Policy Studies Journal*. 2017;45(1):74-100. doi:10.1111/psj.12193.
- Maesoumi Z, Sanei M, Hematian H. A model for effective implementation of health policy in Iran. *Management Strategies in Health System*. 2019; 4(2): 125-35. doi: 10.18502/mshsj.v4i2.1408.
- Livani H, Farhadi Mahalli A, Matoufi A. Key Requirements Affecting the Implementation of Medical Tourism Policies in Gorleston Province. *Tourism Management Studies*. 2022;17(58):199-233. [In Persian]

10. Sheikhbagloo Z, Teymournejad K, Abbaszade Sohroon Y. Development and validation of a stakeholder participation model in public policy-making in the Food and Drug Administration of the Ministry of Health Public Policy In Administration. *Public Policy In Administration*. 2022;12(4):47-57. [In Persian]
11. Raufirad V, Khalili R, Endress B, Bagheri S, Jafari M. Technology Factors Influencing People's Participation in Sustainable Natural Resources Management: A Case Study in Central Iran. *Journal of Agricultural Science and Technology*. 2017;19(6):1267-77.
12. Bagheri M, Mirdamadi SM, Hosseini SJF, Lashgarara F. Designing a structural model of participatory management for the development of sustainable urban green spaces. *Bulgarian Journal of Agricultural Science*. 2020;26(1):53-60.
13. Euler J, Heldt SJ. From information to participation and self-organization: Visions for European river basin management. *Sci Total Environ*. 2018 Apr 15;621:905-914. doi: 10.1016/j.scitotenv.2017.11.072. [PMID: 29223121]
14. Eby LT, Freeman DM, Rush MC, Lance CE. Motivational bases of affective organizational commitment: A partial test of an integrative theoretical model. 1999;72(4):463-83. doi: 10.1348/096317999166798.
15. Pierce JL, Rubinfeld SA, Morgan S. Employee ownership: A conceptual model of process and effects. *Academy of Management Review*. 1991;16(1):121-44. doi: 10.2307/258609.
16. Petty MM, McGee GW, Cavender JW. A meta-analysis of the relationships between individual job satisfaction and individual performance. *Academy of management Review*. 1984;9(4):712-21.
17. McElvaney EJ. The benefits of promoting employee ownership incentives to improve employee satisfaction, company productivity and profitability. *Int Rev Bus Res Pap*. 2011;7(1):201-10.
18. Akel AM, Siegel JG, Journal OD. Participative management: Thoughts and prescriptions. *Leadership & Organization Development Journal*. 1988;9(5):4-5.
19. Kearney RC, Hays SW. Labor-Management Relations and Participative Decision Making: Toward a New Paradigm. In: Stupak L. *Handbook of Public Quality Management*. New York: Routledge; 2019:532-44.
20. Corbin J, Strauss A. *Basics of qualitative research: Techniques and procedures for developing grounded theory*. Housand Oaks, CA: Sage Pub; 2014.
21. Charmaz K. *Constructing grounded theory: A practical guide through qualitative analysis*. Housand Oaks, CA: Sage Pub; 2006.
22. Guba EG, Lincoln YS. Competing paradigms in qualitative research. In: Denzin NK, Lincoln YS. *Handbook of qualitative research*. Housand Oaks, CA: Sage Pub; 1994:105.
23. Kostka G. Barriers to the implementation of environmental policies at the local level in China. 2014; 7016. [cited 2014 Aug 8]. Available from: URL: http://aals1.s3.amazonaws.com/pdfs/link_036_025.pdf.
24. Ahmed IK, Dantata BS. Problems and Challenges of Policy Implementation for National Development. *Research on Humanities and Social Sciences*. 2016; 6(15): 60-5.
25. Pressman JL, Wildavsky A. *Implementation*. Berkeley. CA: University of California Press; 1984.
26. Jabarzadeh Karbasi B, Mazlumi N. Effect of Participatory strategic planning and strategic flexibility on the implementation of the strategy in small and medium industries %J *Strategic Management Studies of National Defence Studies*. 2019;9(34):241-13.
27. Asadi M, Hadi Peykani M, Rashidpur AJ. Presentation of an Effective Public Policy Implementation Model in the Ministry of Economic Affairs (Case Study: Islamic Republic of Iran Customs Administration). *Journal of Public Administration*. 2018;9(4):591-614. doi: 10.22059/JIPA.2018.252928.2221. [In Persian]
28. Bahadori Y, Salajeghe S, Mahdizadeh S, Nikpour A. Investigating the role of e-government in the implementation of quality oil export policies of the Ministry of Oil of the Islamic Republic of Iran By providing an optimal model. *Political Science Quarterly*. 2020;16(52):73-96. [In Persian]
29. Khodabakhshi N, Amini Sabeg Za-A, Hosseini MG, Sadeh E. The Construction and Personal Experience of Professors and Experts in Rural Cooperatives Policy on Successful Implementation of Rural Cooperative Policies in association with Resistance Economy. *Journal of Community Development (Rural and Urban Communities)*. 2018;9(1):121-44. doi: 10.22059/JRD.2018.65563. [In Persian]
30. Xiu L, Liang X, Chen Z, Xu W. Strategic flexibility, innovative HR practices, and firm performance: A moderated mediation model. *Personnel Review*. 2017; 46(7): 1335-57. doi: 10.1108/PR-09-2016-0252.
31. Zabet Poor H, Amin idokhti AA, Mohammad Rezaee A, Salehi Omran I. Studying Effective and Contextual Factors for Implementation Policies of Higher Education in Iran. *Journal of Iranian Higher Education*. 2018;10(2):21-46. [In Persian]
32. Khanifar H, Alvani SM, Haji Molla Mirzaee H. Designing Cultural Policy Implementation Model for Islamic Republic of Iran and Comparing It with Other Models. *Journal of Organizational Culture Management*. 2015;13(3):713-37. [In Persian]
33. Kohtamäki M, Kraus S, Mäkelä M, Rönkkö M. The role of personnel commitment to strategy implementation and organisational learning within the relationship between strategic planning and company performance. *International Journal of Entrepreneurial Behavior & Research*. 2012; 18(2): 159-78. doi: 10.1108/13552551211204201.
34. Elbanna S, Fadol Y. An Analysis of the Comprehensive Implementation of Strategic Plans in Emerging Economies: The United Arab Emirates as a Case Study. *European Management Review*. 2016;13(2):75-89. doi:10.1111/emre.12068.
35. Rajaei Z, Daneshfard K, Faghihi A. Policy Making in the Field of Administrative Integrity System. 2018;10(38):5-34. [In Persian]

Integration of Collaborative Learning with Patient Care in Home-Based Settings

Leili Yekefallah¹, Fatemeh Samiee², Abbas Allami³, Afsaneh Yakhforoshha^{4*}

¹Ph.D. in Nursing, Associate Professor, Social Determinants of Health Research Center, Faculty of Nursing and Midwifery, Qazvin University of Medical Sciences, Qazvin, Iran.

²MD. Clinical and Anatomical Pathologist, Professor, Department of Pathology, Faculty of Medicine, Qazvin University of Medical Sciences, Qazvin, Iran.

³MD, Professor, Department of Infectious Diseases, Faculty of Medicine, Qazvin University of Medical Sciences, Qazvin, Iran.

⁴Ph.D. in Medical Education, Assistant Professor, Department of Medical Education, Faculty of Medicine, Qazvin University of Medical Sciences, Qazvin, Iran.

Received: 2023 June 08; Revised: 2023 June 28; Accepted: 2023 July 23; Published online: 2023 July 23

*Corresponding author: Department of Medical Education, Faculty of Medicine, Qazvin University of Medical Sciences, Qazvin, Iran. Email: a.yakhforoshha@qums.ac.ir

Citation: Yekefallah L, Samiee F, Allami A, Yakhforoshha A. Integration of Collaborative Learning with Patient Care in Home-Based Settings. Strides Dev Med Educ. 2023 July; 20(1):86-87. doi: 10.22062/sdme.2023.198703.1230.

Keywords: Integration, Home Based Care, Collaborative Learning

Dear Editor,

Health education institutes should provide effective programs to prepare healthcare professionals who can deliver safe and high-quality care in the future. Thus, integration of the health service system and the health education system is required to provide students with the opportunity to translate theory into practice when delivering care to patients and communities (1). One approach that was reported as a promising modality of health care delivery as well as a novel educational approach for bridging the gap between education and clinical practice through experiential learning is home-based care (HBC) (2).

Accordingly, we designed and implemented the HBC team concurrently when the Covid-19 pandemic started. Our medical team was composed of members/learners from different health professions including attending emergency, along with internal, and infectious disease residents, physicians, and nurses. We wanted to take advantage of the opportunity and utilize these settings for educational purposes and provide patient-centered care in the community. Thus, four students from medical and nursing, volunteering to participate, were invited to participate in each home visit. Each student team was supervised by internal or

infectious disease residents who had previous experience as educators through the supervision of students from their field.

Before the home visit, students received a half-day training by residents to familiarize themselves more with the objective of the experience, as well as detailed information about the patient with Covid-19, and who was responsible for what during the visit. During the home visit, students were responsible for performing history-taking and relevant examinations. After the home visit, students participated in small groups to discuss the case, report team findings, and write reflective essays.

To indicate the view of participants, we performed a semi-structured interview with students, patients, and residents. Most participants were satisfied with their HBC experience. Students reported that HBC was useful for improving performance and providing them with a precise perception of other's professional roles. Residents were confident in delivering education to develop the student's abilities to be involved in patient care. Patients felt that the care team was listening to their concerns and they could share their perspectives.

In line with our study, a study in Sweden (2020) also indicated the effect of home visits on 109 learners from six different educational programs who studied together

medical including nursing, physiotherapy, occupational therapy, speech therapy, and dietician. The students stated that home visits improved their understanding of teamwork and collaboration. In addition, all patients were satisfied with the students' home visits and felt that they had been listened to. The supervisors pointed out this opportunity can be an appreciated and effective learning activity (3). In another study, Hiroaki Nagano and colleagues showed that using home visits for medical students and resident doctors in Okinawa, Japan could help learners recognize the value of patient-centered care, inter-professional collaboration care, and reconceptualize the meaning of medical practice as well as their professional identity as physicians (4).

Conflict of interests: Authors mention that there is no conflict of interests in this study.

Ethical approval: Not applicable.

Funding/Support: Not applicable.

References

1. Ploylearmsang Ch, Tongsiri S, Pirikannont M, Srisaknok T. Effects of home-based care inter-professional education on students' outcomes: Maharakham University Experiences. *Med Sci Educ.* 2021 Feb 19;31(2):677-685. doi: 10.1007/s40670-021-01244-8. [PMID: 33643683] [PMCID: PMC7894233]
2. Yoshimura M, Saiki T, Imafuku R, Fujisaki K, Suzuki Y. Experiential learning of overnight home care by medical trainees for professional development: an exploratory study. *Int J Med Educ.* 2020 Jul 24;11:146-154. doi: 10.5116/ijme.5f01.c78f. [PMID: 32712596] [PMCID: PMC7870453]
3. Toth-Pal E, Fridén C, Torres Asenjo S, Olsson CB. Home visits as an interprofessional learning activity for students in primary healthcare. *Prim Health Care Res Dev.* 2020 Dec 10;21:e59. doi: 10.1017/S1463423620000572. [PMID: 33298216] [PMCID: PMC7737173]
4. Nagano H, Obara H, Takayama Y. A brief home-based palliative care learning experience for medical students and resident doctors in Okinawa, Japan. *PLoS One.* 2019 Jun 25;14(6):e0218780. doi: 10.1371/journal.pone.0218780. [PMID: 31237900] [PMCID: PMC6592560]

A Comparative Study of Geriatric Nursing Curriculum in Iran and Rory Meyers College of Nursing, United States of America

Maryam Houshmand¹, Leslie-Faith Morrirt Taub², Fon Sim Ong³, Ameneh Yaghoobzadeh^{4*}

¹Master of Sciences in Nursing, School of Nursing, Arak University of Medical Sciences, Arak, Iran.

²PhD. ANP-C, GNP-BC, CDE, CBSM, CME (DOT), FAANP, Clinical Associate Professor, Senior Fellow Hartford Institute, NYU Rory Meyers College of Nursing, New York University, USA.

³Emeritus Professor of Marketing, Nottingham University Business School, University of Nottingham Malaysia, Malaysia.

⁴PhD. in Nursing, Department of Medical-Surgical Nursing, School of Nursing, Arak University of Medical Sciences, Arak, Iran.

Received: 2023 March 30

Revised: 2023 June 16

Accepted: 2023 July 10

Published online: 2023 July 12

*Corresponding author:

Department of Medical-Surgical Nursing, School of Nursing, Arak University of Medical Sciences, Arak, Iran.

Email: a.yaghoobzadeh@yahoo.com

Citation:

Houshmand M, Morrirt Taub LF, Sim Ong F, Yaghoobzadeh A. A Comparative Study of Geriatric Nursing Curriculum in Iran and Rory Meyers College of Nursing, United States of America. *Strides Dev Med Educ.* 2023 July; 20(1):88-95. doi:10.22062/sdme.2023.198429.1199

Abstract

Background: Continuous quality improvement in nursing education is crucial to ensure that the curriculum is benchmarked against international standards and best practices, while remaining relevant to the local community. Comparing current programs using a comparative approach is one of the evaluation techniques used.

Objectives: The main objective of this paper is to compare the geriatric nursing program's curriculum at the master's level between Iran and the USA (specifically, the Rory Meyers College of Nursing).

Methods: This descriptive-comparative study utilized Bereday's model to assess the geriatric nursing curricula. The primary method of inquiry was through secondary sources, primarily information gathered from web pages. Similarities were identified, and comparisons were made using Bereday's Model.

Results: We discovered several differences and only a few similarities between the two curricula. However, it's important to interpret the results with caution since these two countries have different macroenvironments and varying stages of the aging process, which significantly influence the need for geriatric medicine and nursing care.

Conclusion: This study can be valuable for countries that are starting to experience population aging, as it allows them to learn from well-established programs, avoid potential pitfalls, and gain insights into best practices to enhance their preparedness for advancements in nursing care.

Keywords: Geriatric Nursing Curriculum; Aging; Comparative Study; Bereday's model; Iran; USA

Background

Educational systems and universities play a crucial role in providing specialized and essential knowledge to students, thereby facilitating societal progress towards universal development (1, 2). Curriculum design entails planned strategies that enable learners to master content and engage in optimal pedagogical approaches. Faculties responsible for education develop curricula that outline the overall framework (3). In the field of nursing studies, curriculum design holds significance for advancing increasingly multidisciplinary areas of study. The National Institute of Nursing Research's strategic plan, "Bringing Science to Life," sets research priorities aimed at advancing nursing science and healthcare by integrating biological and behavioral sciences,

leveraging new technologies, promoting health equity, and nurturing future nursing scientists (4). Emerging areas of nursing science highlight significant health priorities, such as addressing the growing burden of chronic diseases linked to demographic changes and an aging population (5). Geriatric nursing, as a subspecialty in nursing education, was approved by the High Council for Planning Medical Science in Iran in 2010 to address the healthcare needs of the expanding older population.

Geriatric nursing programs in Iran are tailored to address the demographic shifts. Based on the population census, older adults aged 60 and over constitute eight percent of the total Iranian population (3, 6). In other words, 5.5 million individuals in Iran are 60 years old and above. This trend is expected to continue, leading to

a significant increase in the number of older adults in Iran by 2030 (6). The implementation of the geriatric nursing educational program is expected to meet the needs of older adults in the Iranian community (3). The first group of students was enrolled in the geriatric nursing program at Tehran University of Medical Sciences in 2011.

Expanding and continuously improving nursing education aims to raise standards by developing competency-based nursing curricula linked to health promotion and disease prevention (1, 7, 8). Continuous quality improvement in nursing education is crucial to ensure that the curriculum aligns with international standards and best practices, while also remaining relevant to the local community. Comparative evaluation of current programs is among the techniques used to assess programs (6). Each university's education system reflects an investment in enhancing human skills. By benchmarking successful educational systems in other countries, it becomes possible to consider the adoption of best practices from similar programs, thereby strengthening one's own curriculum. Exploring the experiences of developed countries in geriatric nursing, while considering Iran's cultural, political, economic, and social context, enables a reflective examination of the challenges facing Iran's higher education system and the enhancement of its curricula (9, 10).

Several models allow for comparative curriculum studies, such as the Enterprise Subject Area Model (ESAM) and Bereday's Four Steps of Comparison Model. The model utilized in this paper is Bereday's (1865) model, which encompasses description, interpretation, juxtaposition, and comparison (6). Bereday's model is well-established in comparative education studies published in English (10-12) and is widely recognized in international literature (10). Therefore, conducting a review and benchmarking of the geriatric nursing program's curriculum in Iran, introduced in 2011, is timely.

Objectives

In this paper, Bereday's comparative model is employed to compare the geriatric nursing curriculum at the master's degree level between Tehran University and New York University. New York University is chosen as an exemplar due to its emphasis on geriatrics in university education and its alignment with licensure, accreditation, and certification bodies in the United States, all aimed at meeting society's demand for a workforce well-versed in caring for older adults (13).

Methods

One of the research methods used to modernize curricula is comparative studies. The model employed in this study is the one proposed by Bereday (14). This method examines the content and effectiveness of educational systems and compares programs through four stages: description, interpretation, juxtaposition, and comparison. While this method identifies similarities, it also highlights opposing and contradictory points among different educational systems and assesses their quality. It has been found useful in natural and medical sciences, as well as anthropology (15).

In the descriptive stage, each educational program will be described in more detail. In the interpretation phase, the information gathered in the first stage will be analyzed and interpreted, considering its potential to enhance existing curricula. Description and interpretation contain implicit assumptions about education within national contexts. Moreover, these two parts are closely linked to the idiographic phenomenon of each country (10). The information obtained from the previous steps will be classified and synthesized to create a framework for a clear understanding of the program and to identify potential further developments in geriatric programs. Subsequently, juxtaposition and comparison will be conducted. The geriatric nursing curricula selected for comparison are from two different universities: Tehran University of Medical Sciences and New York University's Rory Meyers College of Nursing. The curriculum specifications of these universities, including mission and program objectives, program length, number of courses, student admission requirements, course titles, and graduate employment opportunities, will be described, analyzed, and interpreted. After juxtaposition, the comparison will be presented.

Results

A master's program in geriatric nursing educates nurses to provide health, rehabilitation, and social care within the framework of comprehensive policies aimed at promoting the health of the older population. In general, geriatric nursing programs train graduates to integrate advanced knowledge of geriatric nursing with other related disciplines and specialties. They are expected to possess the competence to apply geriatric nursing theories in problem-solving using evidence-based decision-making. Additionally, graduates are trained to deliver prevention and rehabilitation services in the care of older adults, families, and the community. They are expected to be able to identify the biological,

psychological, social, and cultural needs of older adults by utilizing principles of effective human communication. Moreover, they have a responsibility to improve the quality of healthcare and specialized rehabilitation services for this demographic. Geriatric nursing is an integral part of the nursing profession, the healthcare system, the community, and the global community (16). Since the introduction of the master's program in geriatric nursing, numerous students and geriatric nurses have graduated in Iran, although the exact numbers are unknown.

Geriatric Nursing Program at Iranian Universities

The specifications of the geriatric nursing program at the master's degree level in Iranian universities are presented below.

Mission: The increasing life expectancy and prevalence of acute and chronic illnesses among older adults in society have led to a growing need for trained individuals capable of providing nursing services for this population. Furthermore, the rising demand for care and rehabilitation centers necessitates the education of skilled professionals in geriatric nursing. Currently, not a single nurse is trained in geriatric care within the centers of the Ministry of Health and Medical Education, the Ministry of Welfare, and the Welfare Organization. Therefore, there is a lack of competent personnel to plan and provide the necessary nursing services for older adults (16).

The primary mission of geriatric nursing graduates is to reduce mortality and morbidity associated with aging by developing specialized care structures, advancing nursing care, and further training graduates with essential skills and competencies. The objectives in the field of aging and geriatric nursing aim to ensure long-term survival, independence, and self-reliance for older adults. Moreover, the increasing number of older adults necessitates the creation and development of healthcare and social care specifically tailored to this population, both nationally and globally. Additionally, there is a crucial need to deliver community-based health services, particularly home care nursing services, to older adults with acute and chronic physical, psychological, and social problems. This is of paramount importance in the training of master's-prepared geriatric nurses (16).

Vision: Training nurses in the field of geriatric nursing aims to achieve the following outcomes:

- Development of centers for older adults, providing support and care for clients with disabilities.

- Enhancement of nurses' clinical knowledge and skills related to aging in alignment with global and regional standards.

- Development of best practices in geriatric care within the community.

- Continuous updating of nurses' knowledge and skills in the field of aging through continuing education.

- Improvement of the quality of healthcare services for older adult clients and their families.

- Enhancement of knowledge and capabilities of geriatric and family counselors for active participation in society.

- Collaboration with other countries in the region to address the specific needs of the aging population (16).

Aims: The program's aims can be described through the following points. Upon completion of the program, students will be able to:

- Assist older adults in achieving maximum performance competencies and capabilities for themselves and their families.

- Support older adults in achieving, maintaining, and enhancing their quality of life to the greatest extent possible.

- Ensure the provision of necessary resources for older adults and their families to adapt to life changes resulting from the aging process and disabilities.

- Facilitate the social participation of older adults within the community.

- Contribute and collaborate with academic institutions in developing educational content, including conferences, workshops, and short-term courses on aging-related topics.

- Engage in cooperative efforts and participate in research to improve the delivery of health services for older adults.

- Identify the need for research on aging-related issues.

- Contribute to the creation and development of research initiatives aimed at enhancing the provision of health services for older adults.

- Participate in the establishment and growth of research centers focused on improving health, care, and rehabilitation in the field of aging (16).

- Graduates of this program have roles in nursing care, education, and research.

a. Care

- Demonstrate commitment and responsibility in fulfilling functional roles.

- Observe and enforce ethical codes while safeguarding the rights of older adults and their families.

- Collaborate and cooperate with healthcare team members in providing nursing care and services to older adult patients.

- Evaluate and prioritize the needs of older adults and their families in delivering nursing care.

- Communicate effectively with older adults, their families, and other team members.

Make appropriate referrals to the healthcare system when necessary.

Collaborate with other members of the geriatric health team in delivering services (16).

b. Education

Provide training and counseling to older adults, their families, and the community in the three levels of prevention.

Utilize new information and knowledge to improve the provision of nursing services for older adults.

Contribute to the development and selection of up-to-date and authoritative educational materials related to aging.

Collaborate with academic institutions in designing training content.

Organize workshops, conferences, and short-term programs on age-related subjects (16).

c. Research

Collaborate and actively participate in the implementation and development of geriatrics research.

Study the needs of older adults and contribute to research projects on aging-related issues.

Utilize new tools and technologies to conduct research in various areas of older adults' health.

Publish research findings on aging in the form of articles and conference results.

Contribute to the establishment and growth of research centers focused on improving health, care, and rehabilitation in the field of aging.

Apply evidence-based research findings to enhance nursing services in the field of aging.

Engage in research aimed at providing community-based health services tailored to the needs of older adults (16).

Student admission requirements and procedure: Students must meet the following requirements, in addition to general qualifications:

Hold a bachelor's degree in Nursing approved by the Ministry of Health and Medical Education.

Qualify for the entrance examination by participating in the graduate baccalaureate nursing exam.

Have good physical and mental health (16).

Course specifications: The duration and structure of the program are based on the regulations for graduate master's degrees approved by the Supreme Council for Medical Science Planning (16).

The total credits required for the program are 32, which include seven core credits, 21 specialized credits, and four credits for the dissertation. Students are also expected to complete four credits of compensatory courses, covering computer skills, statistics, and advanced research methodology. The modules covered

in the program include nursing ethics and professional relationships, nursing theories and models, clinical nursing management, teaching methods and educational planning, geriatric epidemiology, assessment of the health status of older adults, geriatric pharmacology and supplements, healthy and active aging, geriatric nursing 1, 2, and 3 (covering physical and functional disorders, psychological status, and social problems of older adults), geriatric care structures and systems, computer systems and medical informatics, statistics and advanced research methodology, and the dissertation (16).

The learning methods employed in the program include student-centered approaches such as problem-solving, combined methods, discussions, and promotion of critical thinking. Both theoretical and practical modules will be evaluated (17).

Geriatric Education and Practice in the United States

In 1965, Loretta Ford, a nurse, and pediatrician Henry Silver partnered to create the first pediatric nurse practitioner master's program in the US at the University of Colorado to address the need for primary care providers in rural Colorado (18).

Due to the shortage of healthcare providers with expertise in caring for the growing geriatric population, the Advanced Practice Registered Nurse and the National Council of State Boards of Nursing APRN Advisory Council introduced the LACE model in 2008. This model aimed to standardize the licensure of NPs, the accreditation of educational programs, the education of various types of NPs, national certification practice requirements, and the need for an increased number of providers capable of caring for geriatric patients (APRN Consensus Work Group and National Council of State Boards of Nursing APRN Advisory Committee, 2008).

As of 2018, there were 49.2 million older adults in the US, with the number expected to increase to over 80 million by 2050 (American Geriatric Society, 2018; Ortman, Velkoff, and Hogan, 2014). The number of full-time practicing certified Geriatricians in 2017 was 3,590, with an expected 45% increase in demand by 2025 (American Geriatric Society, 2018). The LACE model defined six population foci for NPs and Clinical Nurse Specialists, with Family Nurse Practitioners and Adult-Gerontology Primary Care and Acute Care NPs trained in addressing the needs of the geriatric population. Currently, there are over 248,000 NPs in the US, with 91.3% of them trained to care for older adults (19). Nurse Practitioners are clinicians trained at the master's level to diagnose and treat acute and chronic conditions, order lab work and diagnostic tests, prescribe

medications and other treatments, provide patient education and counseling, with a focus on health promotion and disease prevention. They work in various healthcare settings, including clinics, hospitals, emergency rooms, urgent care sites, private physician or NP practices, and nursing homes (20).

Mission: "At NYU Rory Meyers College of Nursing, we generate knowledge through research in nursing, health, and interdisciplinary science. We educate leaders in nursing to advance healthcare locally and globally. We provide innovative and exemplary healthcare. And we shape the future of nursing through leadership in healthcare policy" (NYU Mission, n.d.).

Vision: "A global leader in advancing health for all people where they live, play, learn, and work" (NYU Vision, n.d.).

Aims: New York University houses the Hartford Institute for Geriatric Nursing (HIGN) since 1996. In fact, HIGN is a leader in developing and researching gerosensitive care in the community within primary care, home health, hospice, and social services agencies. One of their well-known models of care is the Nurses Improving Care for Health Systems Elders (NICHE) program, which provides online training for hospital and long-term care leaders with the goal of improving geriatric care (Brown, 2016). Master students entering the AGPCNP (Adult-Gerontology Primary Care Nurse Practitioner) program may have been employed in one of the 700 acute care facilities that have engaged HIGN to train their employees in evidence-based inpatient geriatric care. Consult Geri, a clinical website of HIGN, provides evidence-based assessment tools for students and clinicians to screen patients for typical geriatric syndromes (Consult Geri, n.d.). Within this rich environment, the Adult-Gerontology Primary Care Program educates masters-prepare providers to be able to provide health promotion advice and care, diagnose illness, and treat acute and chronic conditions. In New York, these providers must meet the requirements set by the New York State Office (NYS) of the Professions (NYSED.gov, n.d.). In July 2015, NYS passed the NP modernization act that allows NPs with 3,600 hours of experience to practice without a collaborative agreement with a physician (New York State Assembly Bill number A04846, 2013). Twenty-one states and the District of Columbia now permit NPs full practice authority to evaluate patients, diagnose, order, and interpret diagnostic tests, and initiate and manage treatments—including prescribing medications and controlled substances—under the exclusive licensure authority of the state board of nursing (21).

Student admission requirements and procedure:

Students create online applications on an NYU Meyers Graduate program website, and they enter their transcripts, two professional letters of reference, a personal statement, New York Registered Nurse license, and a general questionnaire into the student admission program. This application process allows international students and students from other states to apply to this graduate program with only the internet as a requirement. Admission is academically competitive to this "private university in the public's service".

Course Specifications: Fifty-one credit hours are required for completion of the NYU Meyers graduate program. The twelve credits of core courses include statistics for the health professions, research in nursing, nursing issues and trends within the healthcare delivery system, and population-focused care. The fifteen advanced core courses include advanced Pathophysiology, clinical pharmacotherapeutics across the lifespan, advanced physical assessment across the lifespan, contemporary Clinical Practice: Advanced Practice Roles, and one elective course. Elective courses offered include substance abuse theory, advanced holistic nursing foundations, nursing informatics, an introduction to palliative care, and fundamentals of quality improvement and financial management for nurse leaders. The 24-credit population component for the adult-gerontology primary care NP students includes health promotion across the lifespan, common health problems of adults and older adults and a seminar inclusive of 16 clinical practice hours, geriatric syndromes and seminar inclusive of 125 clinical hours, mental health across the lifespan of adults and older adults, adult-gerontology primary care II and the adult-gerontology primary care practicum II inclusive of 250 clinical hours, and adult-gerontology primary care III and the adult-gerontology primary care practicum III inclusive of 250 clinical hours. Clinical practice hours, a total of 641 hours of direct primary care in physician's offices, hospital outpatient clinics, nursing homes, homeless shelters, and mobile vans in community venues. Students also have 31 simulation hours in a state-of-the-art simulation lab in physical assessment and common health problems, where they practice delivering care in a supervised environment with formative and summative evaluations of their care by faculty.

Learning methods: Case-based learning provides students with the opportunity to follow a patient through multiple visits as a disease process evolves. This allows students to assess the necessary changes in history, physical examination, diagnosis, care plan, and

the potential need for specialty referral or a transfer to an acute care facility or nursing home. Through this approach, students are introduced to the complexities of caring for older adults with multiple comorbid conditions and polypharmacy, as well as the importance of palliative and end-of-life care. The ability to think critically and apply evidence-based principles is assessed through quizzes and exams, and students are expected to apply their didactic learning in real-world clinical settings, refining their knowledge and skills under the guidance of physicians and NPs. Workshops are conducted to teach joint injection and basic suturing techniques, and students undergo an embedded online ECG course over two semesters to develop proficiency in reading 12-lead ECGs and identifying arrhythmias. As part of their program, students are required to complete a capstone paper over three semesters. This involves formulating a PICO question and conducting a literature review to evaluate the current evidence. This process enables students to assess the levels of research and critique existing studies using the online critical appraisal skills program (CASP, 2018), with the ultimate goal of creating a publishable article.

Discussion

Curriculum evaluation can be conducted in different ways, and comparing curricula with each other is one of the available methods. The programs can be compared using various approaches. The comparative approach is commonly used in social sciences to compare different cultures or countries, examining multiple aspects. Curricula are usually developed and presented in response to the needs of society, with the expectation that graduates will meet these needs. In this section, we attempt to apply the remaining three of the four stages of the employed method: interpretation, juxtaposition, and comparison. At the outset, readers must interpret the findings based on the country differences (economic, social, technological, and demographic maturity) and the environments in which each university operates. We will now proceed to conduct a juxtaposition and comparison of the two programs.

The description provided above regarding the two programs at the master's level reveals that the program in Iran is new, having been introduced in 2011, while the program in New York is well-established. It is evident that the program offered by the University in New York fulfills all elements of quality assurance with a well-established curriculum that adopts a holistic pedagogical approach, promoting higher-order learning and lifelong learning. We are unable to identify many similarities between the programs, other than the shared

objective of providing care for the elderly population by adopting the best practices and integrating research to continuously improve care and services for older adults. Another similarity lies in the methods of assessment, as both programs employ summative and formative assessment methods. While both programs have a mission and vision statement, the mission and vision statement of New York University's Meyers College of Nursing program is clear and easily understandable, providing a strategic direction for program success. On the other hand, the mission of the Iranian University is overly complex, making it difficult to discern its primary focus and strategic direction. Additionally, it may be time to refresh the mission and vision statement, which was developed in 2010.

Again, it is challenging to find many associations between the two programs other than their aim to provide care and meet the nursing needs of older adults, as explained earlier. However, within each program, it is evident that New York University's Meyers College of Nursing program demonstrates a clear alignment in terms of curriculum, pedagogy, and assessments, which can be attributed to the clear vision and mission statement that drives curriculum design. The pedagogy and courses effectively address different levels of learning, providing the necessary training to prepare graduates to serve the older population. Notably, the practical training component involves 641 hours of direct primary care in various settings, such as nursing homes, homeless shelters, and mobile vans. Please refer to the [Appendix](#) for a summary comparison of the two programs.

In the program in Iran, the vision and mission statement is lengthy and complicated, leading to confusion and a lack of a clear and unidirectional strategy. Some of the program's aims are not framed using adjectives that allow for measurement. Without measurability, it becomes difficult to assess whether graduates possess the intended profile outlined in the program. Additionally, the program aims are not sufficiently clear in terms of whether they are for students or for the care receivers (older adults) (see, for example, aim number 1). While the entry requirement is clear, and the fulfillment of credit requirements is well explained, information on the pedagogy and methods of assessment is lacking, making it difficult to interpret and compare the effectiveness of the assessment methods in developing higher-order learning skills. Furthermore, the program lacks the practical training component found in the US program, where there is a strong emphasis on skill development through practical and simulation-based approaches.

In conclusion, the US program, represented by New York University's Meyers College of Nursing, has made significant advancements in addressing aging issues and produces competent graduates in geriatric care. While the introduction of a geriatric nursing care program in Iran is a positive step, improvements are needed, such as incorporating practical and simulation lab training and fostering a culture of continuous improvement to further develop the program at Tehran University of Medical Sciences.

Conclusion

The US is at the forefront in addressing aging issues, thanks to advancements in the medical field, and the program at New York University's Meyers College of Nursing produces competent graduates in geriatric care. Iran's introduction of a geriatric nursing care program is a positive step, but there is room for improvement, particularly in areas such as practical and simulation lab training, as well as fostering a culture of continuous improvement for the further development of the program at Tehran University of Medical Sciences.

Acknowledgements: We highly appreciate the cooperation of Professor Eileen Sullivan-Marx and Professor Tara A. Cortes, New York University Meyer's College of Nursing, who make available data about the geriatric nursing curriculum.

Conflict of interests: The authors declared no conflict of interest.

Ethical approval: None.

Funding/Support: This research received no funding.

References

- Borzou SR, Oshvandi K, Cheraghi F, Moayed MS. Comparative study of nursing PhD education system and curriculum in Iran and John Hopkins school of nursing. *Educ Strategy Med Sci*. 2016;9(3):194-205. [In Persian]
- Kermansaravi F, Navidian A, Yaghoubinia F. Nursing students' views of nursing education quality: a qualitative study. *Glob J Health Sci*. 2015 Jan 13;7(2):351-9. doi: 10.5539/gjhs.v7n2p351. [PMID: 25716411] [PMCID: PMC4796347]
- Sadooghiasl A, Navab E, Negarandeh R, Nikbakht Nasrabadi A. A Comparative Study of the Geriatric Nursing Curriculum in Iran and USA. *Iranian Journal of Nursing Research*. 2017;12(3):51-7. doi: 10.21859/ijnr-12037. [In Persian]
- Wyman JF, Henly SJ. PhD programs in nursing in the United States: visibility of American Association of Colleges of Nursing core curricular elements and emerging areas of science. *Nursing outlook*. 2015;63(4):390-7. *Nurs Outlook*. 2015 Jul-Aug;63(4):390-7. doi: 10.1016/j.outlook.2014.11.003. [PMID: 26187078]
- Klijs B, Nusselder WJ, Looman CW, Mackenbach JP. Contribution of chronic disease to the burden of disability. *PLoS One*. 2011;6(9):e25325. doi: 10.1371/journal.pone.0025325. [PMID: 21966497] [PMCID: PMC3178640]
- Sadat-Aghahosseini S, Navab E, Sadooghiasl A. A comparative study on curriculum of geriatric nursing master's degree in Iran and Ireland. *Nursing Practice Today*. 2016;3(1):19-25.
- Gray-Miceli D, Wilson LD, Stanley J, Watman R, Shire A, Sofaer S, et al. Improving the quality of geriatric nursing care: Enduring outcomes from the geriatric nursing education consortium. *J Prof Nurs*. 2014 Nov-Dec;30(6):447-55. doi: 10.1016/j.profnurs.2014.05.001. [PMID: 25455325]
- Hsieh P-L, Chen C-M. Nursing Competence in Geriatric/Long Term Care Curriculum Development for Baccalaureate Nursing Programs: A Systematic Review. *J Prof Nurs*. 2018 Sep-Oct;34(5):400-411. doi: 10.1016/j.profnurs.2018.05.006. [PMID: 30243697]
- Jalali R, Rigi F, Parizad N, Amirian Z, Borzou SR. Comparison of Undergraduate Nursing Education in Iran and George Washington University. [*Educ Res Med Sci*. 2016;5(2):64-73.
- Adick C. Bereday and Hilker: origins of the 'four steps of comparison' model. *Comparative Education*. 2018;54(1):35-48. doi: 10.1080/03050068.2017.1396088.
- Bray M. *Methodology and focus in comparative education*. Boston, USA: CERC, HKU & Kluwer Academic Pub; 2005:239-52. doi: 10.1007/1-4020-4449-6_15.
- Phillips D, Schweisfurth M. *Comparative and international education: An introduction to theory, method, and practice*. 2nd ed. London: Bloomsbury; 2014.
- APRN Joint Dialogue Group. *Consensus Model for APRN Regulation: Licensure, Accreditation, Certification & Education*. 2008. [cited 2008 July 7]. Available from: https://www.nursingworld.org/~4aa7d9/globalassets/certification/apr_n_consensus_model_report_7-7-08.pdf.
- Bereday GZ. *Comparative method in education*. New York: Holt, Rinehart and Winston; 1964.
- Bray M, Adamson B, Mason M. Different models, different emphases, different insights. In: *Comparative Education Research: Approaches and methods*. Cham: Springer International Pub; 2014: 417-36. doi:10.1007/978-3-319-05594-7_15.
- Ministry of Health and Medical Education. Higher Council for Planning Medical Sciences. The training program of master degree in geriatric nursing Tehran, Iran. Tehran: Ministry of Health and Medical Education; 2010. [In Persian]
- Erlen JA. Moral distress: a pervasive problem. *Orthopaedic Nursing*. 2001;20(2):76-80. doi: 10.1097/00006416-200103000-00015.
- Brom HM, Salsberry PJ, Graham MC. Leveraging health care reform to accelerate nurse practitioner full practice authority. *J Am Assoc Nurse Pract*. 2018 Mar;30(3):120-30. doi: 10.1097/JXX.000000000000023. [PMID: 29757880] [PMCID: PMC6800077]
- AANP. NP Facts. [cited 2022 Nov 8]. Available from: <https://www.aanp.org/images/documents/about-nps/npfacts.pdf>.
- AANP. What is an NP? [cited 2022 Nov 8]. Available from: <https://www.aanp.org/all-about-nps/what-is-an-np#license-and-practice-locations>.
- American Association of Nurse Practitioners (n.d.). [cited 2022 Nov 8]. Available from <https://www.aanp.org/legislation-regulation/state-legislation/state-practice-environment/66-legislation-regulation/state-practice-environment/1380-state-practice-by-type>.

Appendix. Comparison of the Master in Geriatric Nursing in Iran and the US

	Tehran University of Medical Science, Iran	New York University Meyer's College of Nursing, US
Vision	Complex	Clear
Mission	Complex	Clear
Program Aims	Many and some are not measurable	Well-structured and can be measured
Graduate Profile	None	None
Entry requirement	Clear	Clear
Credit Specifications and Courses	32 credits Clear with theory-focused courses and lack practical training	51 credits Clear with well-structured courses for learning at all levels, including clinical practice hours and training in simulation labs
Pedagogy	A bit limited	Varied
Assessment Methods	Both summative and formative assessment methods can be observed	Both summative and formative assessment methods can be observed

Association Between Mindfulness and Work-Life Balance in Medical Faculty: Sleep Quality as a Mediator

Kobra Akhoundzadeh¹, Zahra Abedini², Hoda Ahmari Tehran³, Ashraf Khoramirad⁴

¹PhD. in Physiology, Assistant Professor, Department of Physiology, Qom University of Medical Sciences, Qom, Iran.

²PhD. in Nursing, Assistant Professor, Department of Nursing, Qom University of Medical Sciences, Qom, Iran.

³PhD. in Medical Education, Assistant Professor, Department of Medical Education, Spiritual Health Research Center, Qom University of Medical Sciences, Qom, Iran.

⁴PhD. in Health Psychology, Assistant Professor, Department of Psychology, Qom University of Medical Sciences, Qom, Iran.

Received: 2023 February 05

Revised: 2023 July 09

Accepted: 2023 July 11

Published online: 2023 July 12

*Corresponding author:

Department of Nursing, Qom University of Medical Sciences, Qom, Iran.

Email: akhorami@muq.ac.ir

Citation:

Akhoundzadeh K, Abedini Z, Ahmari Tehran H, khoramirad A. Association Between Mindfulness and Work-Life Balance in Medical Faculty: Sleep Quality as a Mediator. *Strides Dev Med Educ.* 2023 July; 20(1):96-102. doi:10.22062/sdme.2023.198313.1168

Abstract

Background: Achieving the balance between work and life is a serious challenge for faculty members. The present investigation aimed to examine the association between trait mindfulness and work-life balance among faculty members and determine the importance of sleep quality in this relationship.

Objectives: This study aimed to evaluate the association between mindfulness, work-life balance, and sleep quality in medical faculty members.

Methods: The present cross-sectional study determined the association of mindfulness and work-life balance with sleep quality among 255 medical faculty members using the Work-Life Balance Perceptions Questionnaire, Pittsburgh Sleep Quality Index, and Five Facet Mindfulness Questionnaire. Data analysis was carried out through SPSS software (version 20) and Amos software (version 20). The data were analyzed using structural equation modeling.

Results: A positive correlation was observed between mindfulness and work-life balance ($r = 0.25, P = 0.04$). A negative correlation was noticed between impaired sleep quality with mindfulness ($r = -0.27, P = 0.03$) and work-life balance ($r = -0.31, P = 0.02$). Sleep quality played a mediating role in the association between mindfulness and work-life balance.

Conclusion: This study supports the advantages of mindfulness in work-life balance. The enhancement of mindfulness in medical faculty members helps improve their sleep quality and can be effective in enhancing their work-life balance.

Keywords: Mindfulness; Work-Life Balance; Sleep Quality; Medical Faculty

Background

Faculty members have a wide range of inherent roles in their job, including teaching, consulting, research, and services (1). On average, faculty members work more than 56 hours a week (2) and often have to work overtime due to university requirements (1, 3-6). The nature of the work and the numerous demands that faculty members face in their job, some of which have been mentioned above, severely affect their work-life balance (7). Based on Grant-Vallone and Ensher's study (2017), faculty members are of the opinion that work-life balance is always in decline and might not be achievable (8). One of the health-related factors among faculty members that affects work-life balance and is affected by it is sleep quality. A previous study showed

that work-life balance, independently of other variables, was related to sleep quality (9).

Crain et al. demonstrated sleep quantity and quality as significant predictors of work-life balance. They demonstrated that the loss of sleep and sleep disorders affect basic behavioral patterns, which have negative effects on family health and interpersonal communication (10). Studies have shown that faculty members often have to work late at home, and their minds are busy with work issues even when they go to bed, disrupting their sleep quality (4, 11, 12).

To date, the significance of sleep quality and work-life balance for employees' well-being has been well documented, and numerous organizational policies are designed and implemented to help individuals to manage work and family demands (13). In this context,

individual cognitive tactics have been paid less attention in the literature, and solely a few investigations have considered the spontaneous behaviors and individual actions that employees perform to achieve work-life balance. However, the impacts of individual cognitive initiatives and strategies to achieve the balance between work and non-work roles are undeniable (9, 10, 14).

One of the cognitive strategies that its positive effects on clinical and nonclinical outcomes have been confirmed in a substantial body of literature is mindfulness (15, 16). Mindfulness is a clear consciousness of what is happening inwardly and is the awareness of outside (e.g., sounds) and inside (e.g., emotions) present-instant states and events nonjudgmentally, leading to developing a lasting and nonreactive awareness that can release individuals from auto-thinking, habits, and unhealthy behavior patterns, thereby playing an important role in behavioral regulation (17). In addition, mindfulness can bring health and happiness by adding clarity and vitality to the experience (18).

One theory that supports the hypothesis of the impact of mindfulness on work-life balance and sleep quality is the boundary theory. This theory explains that individuals establish boundaries that separate the areas of work and home and then use behavioral, temporal, and communication strategies to manage boundaries (19). Mindfulness helps employees set boundaries (when their minds engage with work-related thoughts) by restoring awareness to the present, thereby getting rid of those thoughts (20).

Another theory on which the present study is based is the role-balance theory (21). According to this theory, mindfulness positively affects work-life balance. Work-life balance is associated with the full performance of each role while the person is performing it. According to this approach, the mindful person can pay full attention to the current role without automatically thinking of another thing. Therefore, if a person has high mindfulness characteristics, he/she is better able to focus on the current role alone without thinking about another role, which in turn increases his/her ability to balance work and life (22). Additionally, distancing from automatic thinking as a feature of mindfulness helps a person get rid of day work-related experiences and stresses in bed earlier and leads to better sleep (23). Abundant evidence has demonstrated the link between trait mindfulness and sleep quality (14, 23-25). Since faculty members are a major resource in academic institutions, understanding the factors affecting their work-life balance and sleep quality is essential.

Objectives

This study aimed to evaluate the association between mindfulness, work-life balance, and sleep quality in medical faculty members.

Methods

Participants: This cross-sectional study investigated trait mindfulness, work-life balance, and sleep quality of the faculty members working at Qom University of Medical Sciences, Qom, Iran, in 2020. Sampling was performed through the census method. The sample size was determined to be 193 with respect to the minimum correlation coefficient between the study variables (approximated at 0.2 by a similar study) (17). In order to prevent the possible loss of samples and the likelihood of not completing questionnaires, they were presented to all faculty members of the university who have been working in the research environment at least 44-54 hours a week in the past year and agreed to participate in the study.

Measures

Work-Life Balance Perceptions Questionnaire: Work-Life Balance Perceptions Questionnaire designed by Allen et al. (2010) was employed for the measurement of work-life balance. This questionnaire includes five items, such as I am able to balance work demands and the wishes of my family, I experience a high level of work-life balance, I am struggling with the balance between work and life, and I am satisfied with the balance I have got between my family life and work life. A 5-point Likert is used to score the responses from “strongly opposed” to “fully agree”. The minimum and maximum scores of the questionnaire were 1 and 5 (26). In the present study, the questionnaire was translated into Persian by the method of translation and back-translation. Then, to standardize and validate the questionnaire, the content validity ratio (0.67) and content validity index (0.76) were determined with 20 members of the nursing, public health, medical, and psychology faculties. The reliability was confirmed with Cronbach’s alpha 0.78.

Pittsburgh Sleep Quality Index: The Pittsburgh Sleep Quality Index (PSQI) is among the greatest instruments for the measurement of sleep quality. The questionnaire was designed in 1989 by Dr. Boyce et al. at the Pittsburgh Psychiatric Institute (27). The original version of the questionnaire has nine items; however, since the fifth item includes 10 subcategories, the whole questionnaire has 19 items scored on a 4-point Likert scale between 0-3. The questionnaire comprises seven components, namely subjective sleep quality, sleep delay (sleep latency), sleep duration, sleep efficiency (habitual sleep

efficiency), sleep disturbances, usage of sleeping medications, and daily dysfunction. The scores of each component range from 0 to 3. The sum of the seven components' scores indicates a universal PSQI score ranging from 0 to 21. Higher scores are indicative of lower sleep quality. The PSQI questionnaire has been widely employed to evaluate the sleep quality of nonclinical populations and patients with psychiatry. Moreover, the PSQI questionnaire has been a valid and reliable measure of sleep quality (28, 29). The questionnaire's internal consistency was obtained by the use of Cronbach's alpha 0.83. The Iranian version had validity and reliability of 0.86 and 0.891, respectively (30). In this investigation, Cronbach's alpha was calculated at 0.88.

Five Facet Mindfulness Questionnaire: Five Facet Mindfulness Questionnaire (FFMQ) with 39-item was designed by Baer et al. to measure mindfulness. The FFMQ has five dimensions, including mind awareness (8 items), description (8 items), conscious performance (8 items), lack of judgment about internal experiences (8 items), and lack of response to internal experiences (7 items) (31). Average scores are calculated by summing the responses and indicating the agreement level with each subscale (1=rarely true, 5=always true) with a total score range of 39-195. A higher score is indicative of someone who is more mindful in everyday life. An investigation in Iran has confirmed FFMQ's validity and reliability (32). The current investigation corroborated its reliability by Cronbach's alpha of 0.88.

Ethical Considerations

The admission of samples was completely voluntary. The current study received the approval of the Ethics Committee of Qom University of Medical Sciences (IR.MUQ.REC.1395.103). Information was collected and stored confidentially and was used only for research purposes.

Statistical Analysis

Statistical analysis was performed on 255 questionnaires that were fully answered. Initially, Pearson's test was used due to the normal distribution of the data. The Pearson correlation coefficient was carried out to test the associations between the study's latent variables.

Then, to analyze the mediation effect, a two-step procedure was employed, which was introduced by Anderson and Gerbing (33). The first step in this procedure is testing the measurement model of the three latent variables to demonstrate the level to which each of the three latent variables was indicated by its indicators. In the second stage, in the case of the acceptance of the confirmatory measurement model in the final step, the

structural model was tested. The mediation analysis was performed in Amos software (version 20) through the maximum likelihood estimation. In the two steps mentioned above, the adequacy of the model was evaluated using four indices, namely the ratio of the chi-square statistic to the degrees of freedom, the Root Mean Square Error of Approximation (RMSEA), the comparative fit index (CFI), and the Tucker-Lewis Index (TLI). According to Barrelt (2007) (34), a model was deemed to be a good fit if the Chi-square statistic divided by degree of freedom was below 3, RMSEA was below 0.08, and both CFI and TLI were above 0.9. Moreover, the level of significance was regarded as < 0.05.

Results

The study population (n = 255) consisted of 57% female, 57.3% married, 34.5% with master's degrees, 59.7% with Ph.D., and 6.6% specialists, with a mean age and work experience of 35.58 ± 7.61 and 10.51 ± 7.14 years, respectively.

Descriptive Data and Correlation Coefficients

The mean scores of sleep quality, work-life balance, and mindfulness were 5.29 ± 2.6, 133.88 ± 4, and 103.29 ± 13.92, respectively. Table 1 tabulates the correlation coefficients of the study variables. The results showed a positive correlation between work-life balance and mindfulness (r = 0.25, P = 0.041). Nevertheless, a negative correlation was noticed between sleep quality with mindfulness (r = -0.27, P = 0.031) and work-life balance (r = -0.31, P = 0.021). Since a higher score is indicative of lower sleep quality in the sleep quality questionnaire, the results indicated that higher mindfulness is associated with better sleep quality. The same applies to the association between sleep quality and work-life balance, in the sense that there is an association between better sleep quality and better work-life balance.

Table 1. Descriptive Data and Linear Correlations of Study Variables

Variable	1	2	3
Sleep quality	1		
Work-life balance	-0.317*	1	
Mindfulness	-0.273*	0.254*	1

*P < 0.05

Measurement Model

In this study, confirmatory factor analysis (CFA) was employed to evaluate the fit of the measurement model to the study data. A satisfactory fit was observed through the first test of the measurement model (the Chi-square statistic divided by degree of freedom = 1.74;

RMSEA = 0.061; CFI = 0.89; TLI = 0.91). There was significance regarding all the factor loadings for the indicators on the latent variables ($P < 0.05$), indicating that all the latent variables were well-characterized by their observed variables.

Structural Model

Structural equation modeling was utilized to assess the mediating impact of sleep quality. Initially, the direct impact of mindfulness on work-life balance was checked without a mediator.

Table 2. Path Coefficient and T-test Statistic of Main Hypothesis of Research Conceptual Model

First hypothesis	Path	Path coefficient	T-test statistic	Conclusion
First	Mindfulness Work-life balance	0.26	1.625	Unacceptable

As a result, the first hypothesis was not acceptable.

Now, the hypothesis related to the mediator variable is evaluated. The Sobel test was used to check the status of this variable. At the significance level of 0.05, if the value obtained from the analysis of this test is higher than 1.96, the hypothesis is significant and acceptable. This test was used for the significance of the mediating role of one variable in the association between the two other variables.

Second Hypothesis: There is a significant association between mindfulness and work-life balance through the mediation of sleep quality. The Sobel test was used to investigate the effect of sleep quality as a mediating variable on the association between mindfulness and work-life balance. The value of this test for this study was 6.28, which showed that sleep quality as a mediating variable had a positive and remarkable effect on the association between mindfulness and work-life balance (Table 3).

As Figure 1 shows, all the path coefficients except the path from mindfulness to work-life balance were statistically significant. In addition, the findings revealed a good fit of the model (the Chi-square statistic divided by degree of freedom = 1.55; RMSEA = 0.05; CFI = 0.93; TLI = 0.91).

Discussion

In this study which was done on 255 faculty members of two medical universities (Islamic Azad University of Qom and Qom University of Medical Sciences), the findings showed that trait mindfulness was associated with work-life balance and sleep quality, as the more mindful faculty members reported more work-life balance and better sleep quality. Other findings showed that sleep quality had a mediating role in the association between mindfulness and work-life balance. The aforementioned findings are consistent with Allen et al.'s findings, who stated that more mindfulness was associated with more outstanding work-life balance and better sleep quality.

First Hypothesis: There is a significant association between mindfulness and work-life balance. According to Table 2, the CFA of the first hypothesis of the conceptual model can be examined. At a 0.05 level of significance, the value of the t-test statistic must be higher than 1.96 to be acceptable. For the first hypothesis, the standard path coefficient between mindfulness and work-life balance was 0.26, which was not significant ($\beta = 0.26$, $P = 0.06$).

In Allen et al.'s study, sleep quality was identified as a mediator in the association between mindfulness and work-life balance (14).

In addition, the findings are consistent with Michel et al.'s findings which showed that participants who did mindfulness practices showed better psychological disconnection from work. Michel et al. concluded that practicing mindfulness is an effective way to deal with work-associated cognition, emotions, and discharged energy levels and helps obtain work-life balance (20). Other studies demonstrated that better sleep quality is associated with more outstanding work-life facilitation and less work-life conflict (14, 34).

The above-mentioned findings are confirmed by boundary theory assumptions; accordingly, for the reduction of undesirable psychological preoccupation with occupational concerns, it is necessary for employees to find the most suitable way to divide home and work-life sections (19). Mindfulness enables individuals to fully immerse themselves in each role when engaged in it (35, 36). This feature can facilitate establishing and managing boundaries between life and work domains and makes individuals be able to get away from work stress and relax their brains during sleep time. Therefore, having a good sleep will give them better energy to do things tomorrow.

A previous study has shown that struggling with work-associated issues, stresses, and worries during the non-work period damages family roles and hurts the work-family balance (20). Moreover, the automatic activity of negative thoughts and feelings when going to bed is one of the leading causes of insomnia (37).

Other studies have suggested that even a minimum of mindfulness meditation can help tranquilize hyperactive minds and enhance sleep (38). In explanation, pre-sleep ruminations and preoccupations also increase an individual's allostatic load, and poor sleep quality has destructive effects on the basic patterns of behavior that, in turn, can negatively impact

interpersonal relationships and family health (39). For instance, skipping only one night of sleep results in neurological changes that compromise the brain’s ability to fulfill tasks and manage emotions, leading to more impulsive reactions to negative experiences (40). Another study has confirmed that mindfulness allows every activity to be done with full attention and

concentration at the allotted time, and the mind gets rid of dealing with several issues simultaneously (14, 41), which is an excellent way to deal with long working hours and excessive variety of tasks that resulted in reduced hours spent with family, loss of leisure times, and poor sleep quality in faculty members (1, 20).

Table 3. Sobel Test Statistic Related to Mediator Variable

Second hypothesis	Path	β	Standard deviation	Sobel test statistic	Conclusion
Second	Indirect effect Mindfulness Work-life balance	0.14	0.20	6.2833	Acceptable

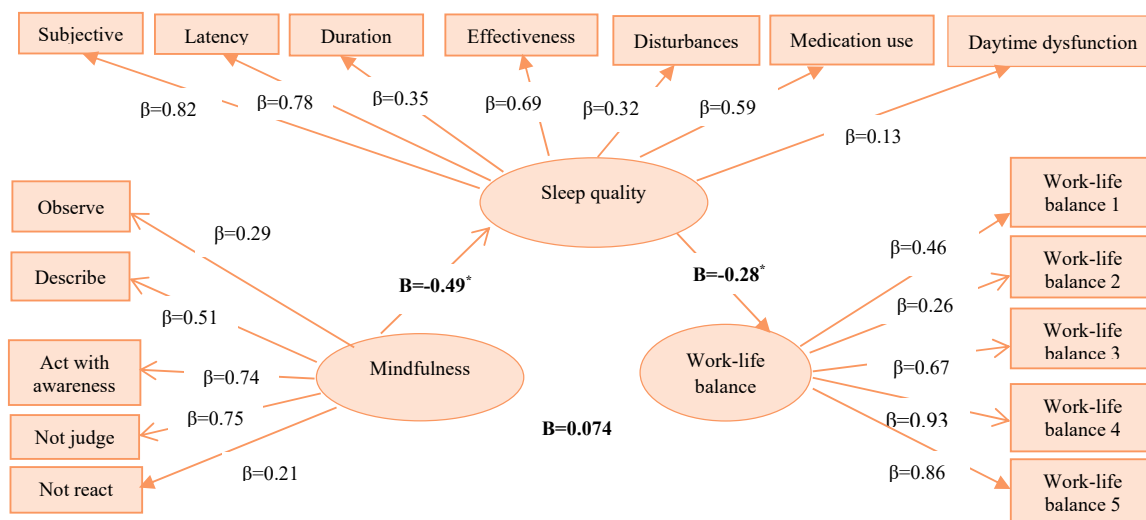


Figure 1. Calculations of Standardized Parameters of Final Structural Model (*P<0.05)

Limitations: There are several limitations in the current investigation. The cross-sectional method limits the proof of causal relationships between variables. Therefore, future intervention studies are recommended to assess causal relationships. This study was performed on a sample of medical faculty members which reduces the possibility of generalization to other populations. Future studies are proposed on individuals with diverse occupations.

The method of data collection was self-report. Therefore, using more objective methods, such as actigraphy, adds to the validity of the findings. Interventional research is proposed to investigate the impact of mindfulness-based interventions on the enhancement of sleep quality and work-life balance of faculty members.

The findings of the current paper have several critical applied uses for organizations. Currently, most work-life balance interventions for faculty members have focused on organizational policies. According to the present study’s

findings, considering individual interventions, such as mindfulness-based interventions, might have excellent results in sleep quality and work-life balance.

Conclusion

Faculty members with higher mindfulness have better sleep quality and more work-life balance. Sleep quality can mediate the association between mindfulness and work-life balance. As a result, improving mindfulness through proper mindfulness training might help enhance sleep quality and increase work-life balance among medical faculty members.

Acknowledgements: The authors sincerely acknowledge all the faculty members who participated in this study.

Conflict of interests: There was no conflict of interest declared by the authors.

Ethical approval: This study was approved by the Ethics Committee of Qom University of Medical Sciences (IR.MUQ.REC.1395.103).

Funding/Support: This study was carried out with the financial support of Qom University of Medical Sciences.

References

- Owens J, Kottwitz C, Tiedt J, Ramirez J. Strategies to attain faculty work-life balance. *Building Healthy Academic Communities Journal*. 2018;2(2):58-73. doi:10.18061/bhac.v2i2.6544.
- Steinberg MP, Kraft MA. The sensitivity of teacher performance ratings to the design of teacher evaluation systems. *Educational Researcher*. 2017;46(7):378-96. doi:10.3102/0013189X17726752.
- Bentley PJ, Kyvik S. Individual differences in faculty research time allocations across 13 countries. *Research in Higher Education*. 2013;54(3):329-48. doi:10.1007/s11162-012-9273-4.
- Curnalia RM, Mermer D. Renewing our commitment to tenure, academic freedom, and shared governance to navigate challenges in higher education. *Review of Communication*. 2018;18(2):129-39. doi:10.1080/15358593.2018.1438645.
- Merillat L, Scheibmeir M. Developing a quality improvement process to optimize faculty success. *Online Learning*. 2016;20(3):159-72. doi:10.24059/olj.v20i3.977.
- Seirup HJ, Tirotta R, Blue E. Online education: Panacea or plateau. *Journal for Leadership and Instruction*. 2016;15(1):5-8.
- Eagan K, Stolzenberg EB, Lozano JB, Aragon MC, Suchard MR, Hurtado S. Undergraduate teaching faculty: The 2013–2014 HERI faculty survey. Los Angeles: Higher Education Research Institute, UCLA; 2014.
- Grant-Vallone EJ, Ensher EA. Re-crafting careers for mid-career faculty: A qualitative study. *Journal of Higher Education Theory and Practice*. 2017;17(5): 10-24.
- Kim S, Kim Y, Lim S-S, Ryoo J-H, Yoon J-H. Long commute time and sleep problems with gender difference in work-life balance: A cross-sectional study of more than 25,000 workers. *Saf Health Work*. 2019 Dec;10(4):470-475. doi: 10.1016/j.shaw.2019.08.001. [PMID: 31890330] [PMCID: PMC6933265]
- Crain TL, Hammer LB, Bodner T, Olson R, Kossek EE, Moen P, et al. Sustaining sleep: Results from the randomized controlled work, family, and health study. *J Occup Health Psychol*. 2019 Feb;24(1):180-97. [PMID: 29809024] [PMCID: PMC6261705]
- Netemeyer RG, Boles JS, McMurrin R. Development and validation of work-family conflict and family-work conflict scales. *Journal of applied psychology*. 1996;81(4):400. doi:10.1037/0021-9010.81.4.400.
- Kinman G, Jones F. Effort-reward imbalance, over-commitment and work-life conflict: testing an expanded model. *Journal of Managerial Psychology*. 2008; 23(3): 236-51. doi:10.1108/02683940810861365.
- Brady JM, Hammer LB, Mohr CD, Bodner TE. Supportive supervisor training improves family relationships among employee and spouse dyads. *J Occup Health Psychol*. 2021 Feb;26(1):31-48. doi: 10.1037/ocp0000264. Epub 2020 Oct 29. [PMID: 33119332]
- Allen TD, Kiburz KM. Trait mindfulness and work-family balance among working parents: The mediating effects of vitality and sleep quality. *Journal of vocational behavior*. 2012;80(2):372-9.
- Parsons CE, Crane C, Parsons LJ, Fjorback LO, Kuyken W. Home practice in mindfulness-based cognitive therapy and mindfulness-based stress reduction: a systematic review and meta-analysis of participants' mindfulness practice and its association with outcomes. *Behav Res Ther*. 2017 Aug;95:29-41. doi: 10.1016/j.brat.2017.05.004. [PMID: 28527330] [PMCID: PMC5501725]
- McClintock AS, Rodriguez MA, Zerubavel N. The effects of mindfulness retreats on the psychological health of non-clinical adults: A meta-analysis. *Mindfulness*. 2019;10(8):1443-54. doi:10.1007/s12671-019-01123-9.
- Reina CS. A multidimensional conceptualization of mindfulness at work: Development and initial validation of the work mindfulness scale. In: Dhiman SK. *The Routledge Companion to Mindfulness at Work*. Edition no. New York: Routledge; 2020: 54-80. doi:10.4324/9780429244667-4.
- Coo C, Salanova M. Mindfulness can make you happy-and-productive: A mindfulness controlled trial and its effects on happiness, work engagement and performance. *Journal of Happiness Studies*. 2018;19(6):1691-711.
- Ashforth BE, Kreiner GE, Fugate M. All in a day's work: Boundaries and micro role transitions. *Academy of Management review*. 2000;25(3):472-91. doi:10.2307/259305.
- Michel A, Bosch C, Rexroth M. Mindfulness as a cognitive-emotional segmentation strategy: An intervention promoting work-life balance. *Journal of occupational and organizational psychology*. 2014;87(4):733-54. doi:10.1111/joop.12072.
- Marks SR, MacDermid SM. Multiple roles and the self: A theory of role balance. *Journal of Marriage and the Family*. 1996; 58(2):417-32. doi:10.2307/353506.
- Raza B, Ali M, Naseem K, Moeed A, Ahmed J, Hamid M. Impact of trait mindfulness on job satisfaction and turnover intentions: Mediating role of work-family balance and moderating role of work-family conflict. *Cogent Business & Management*. 2018;5(1):1542943. doi:10.1080/23311975.2018.1542943.
- Ding X, Wang X, Yang Z, Tang R, Tang Y-Y. Relationship Between Trait Mindfulness and Sleep Quality in College Students: A Conditional Process Model. *Front Psychol*. 2020 Sep 29;11:576319. doi: 10.3389/fpsyg.2020.576319. [PMID: 33132983] [PMCID: PMC7550415]
- Deng X, Liu X, Fang R. Evaluation of the correlation between job stress and sleep quality in community nurses. *Medicine (Baltimore)*. 2020 Jan;99(4):e18822. doi: 10.1097/MD.00000000000018822. [PMID: 31977875] [PMCID: PMC7004582]
- Howell AJ, Digdon NL, Buro K, Sheptycki AR. Relations among mindfulness, well-being, and sleep. *Pers Individ Differ*. 2008;45(8):773-7. doi:10.1016/j.paid.2008.08.005.
- Allen TD, Johnson RC, Saboe KN, Cho E, Dumani S, Evans S. Dispositional variables and work-family conflict: A meta-analysis. *Journal of vocational behavior*. 2012;80(1):17-26. doi:10.1016/j.jvb.2011.04.004.
- Buysse DJ, Reynolds CF, Monk TH, Berman SR. The Pittsburgh Sleep Quality Index: a new instrument for psychiatric practice and research. *Psychiatry Res*. 1989 May;28(2):193-213. doi: 10.1016/0165-1781(89)90047-4. [PMID: 2748771]
- Winsky-Sommerer R, de Oliveira P, Loomis S, Wafford K, Dijk D-J, Gilmour G. Disturbances of sleep quality, timing and structure and their relationship with other neuropsychiatric symptoms in Alzheimer's disease and schizophrenia: insights from studies in patient populations and animal models. *Neurosci Biobehav Rev*. 2019 Feb;97:112-137. doi: 10.1016/j.neubiorev.2018.09.027. [PMID: 30312626]
- Barros MBdA, Lima MG, Ceolim MF, Zancanella E, Cardoso TAMdO. Quality of sleep, health and well-being in a population-based study. *Rev Saude Publica*. 2019 Sep 30;53:82. doi: 10.11606/s1518-8787.2019053001067. [PMID: 31576942] [PMCID: PMC6763282]
- Moghaddam JF, Nakhaee N, Sheibani V, Garrusi B, Amirkafi A. Reliability and validity of the Persian version of the Pittsburgh Sleep Quality Index (PSQI-P). *Sleep Breath*. 2012 Mar;16(1):79-82. doi: 10.1007/s11325-010-0478-5. [PMID: 21614577]

31. Baer RA, Smith GT, Hopkins J, Krietemeyer J, Toney L. Using self-report assessment methods to explore facets of mindfulness. *Assessment*. 2006 Mar;13(1):27-45. doi: 10.1177/1073191105283504. [PMID: 16443717]
32. Dehghani M, Esmaeilian N, Akbari F, Hassanvand M, Nikmanesh E. Evaluating the psychometric properties and factorial structure of the five dimensional mindfulness questionnaire. *Thoughts and Behavior in Clinical Psychology*. 2014;9(33):77-87.
33. Anderson JC, Gerbing DW. Structural equation modeling in practice: A review and recommended two-step approach. *Psychological bulletin*. 1988;103(3):411. doi:10.1037/0033-2909.103.3.411.
34. Shiffer D, Minonzio M, Dipaola F, Bertola M, Zamuner AR, Dalla Vecchia LA, et al. Effects of clockwise and counterclockwise job shift work rotation on sleep and work-life balance on hospital nurses. *Int J Environ Res Public Health*. 2018 Sep 18;15(9):2038. doi: 10.3390/ijerph15092038. [PMID: 30231514] [PMCID: PMC6164402]
35. Liu S, Xin H, Shen L, He J, Liu J. The influence of individual and team mindfulness on work engagement. *Front Psychol*. 2020 Jan 21;10:2928. doi: 10.3389/fpsyg.2019.02928. [PMID: 32038356] [PMCID: PMC6985205]
36. Montani F, Vandenberghe C, Khedhaouria A, Courcy F. Examining the inverted U-shaped relationship between workload and innovative work behavior: The role of work engagement and mindfulness. *Human Relations*. 2020;73(1):59-93. doi:10.1177/0018726718819055.
37. Fernández-Mendoza J, Vela-Bueno A, Vgontzas AN, Ramos-Platón MJ, Olavarrieta-Bernardino S, Bixler EO, et al. Cognitive-emotional hyperarousal as a premorbid characteristic of individuals vulnerable to insomnia. *Psychosom Med*. 2010 May;72(4):397-403. doi: 10.1097/PSY.0b013e3181d75319. [PMID: 20368477]
38. Schwind JK, Beanlands H, McCay E, Wang A, Binder M, Aksenchuk S, et al. Mindful practices to support university faculty sense of wellbeing and enhance their teaching-learning scholarship: a mixed-method pilot study. *Journal of Further and Higher Education*. 2022;46(2):159-71. doi:10.1080/0309877X.2021.1895092.
39. Zhang MX, Wu AM. Effects of smartphone addiction on sleep quality among Chinese university students: The mediating role of self-regulation and bedtime procrastination. *Addict Behav*. 2020 Dec;111:106552. doi: 10.1016/j.addbeh.2020.106552. [PMID: 32717501]
40. Anderson C, Platten CR. Sleep deprivation lowers inhibition and enhances impulsivity to negative stimuli. *Behav Brain Res*. 2011 Mar 1;217(2):463-6. doi: 10.1016/j.bbr.2010.09.020. [PMID: 20888369]
41. Wadhwa C, Satpathy J. Traversing 'work-life equilibrium' with 'mindfulness'. *International Journal of Technology and Globalisation*. 2020;8(3-4):211-25. doi:10.1504/IJTG.2020.112177.

Is Using Blended Learning of Lab Skills by a Modest Augmented Reality-Based Educational Booklet Beneficial to Pharmacy Students?

Zohrehsadat Mirmoghtadaie¹, Tahereh Hosseinabadi², Fatemeh Tavakoli³, Maryam Tabarzad^{4*}

¹PhD. of Medical Education, Assistant Professor, Virtual School of Medical Education and Management, Shahid Beheshti University of Medical Sciences, Tehran, Iran

²PhD. of Pharmacognosy, Assistant Professor, Department of Pharmacognosy, Pharmacy School, Shahid Beheshti University of Medical Sciences, Tehran, Iran

³MSc. of Analytical Chemistry, Laboratory Expert, Department of Pharmacognosy, Pharmacy School, Shahid Beheshti University of Medical Sciences, Tehran, Iran

⁴PhD. of Pharmaceutical Biotechnology, Assistant Professor, Protein Technology Research Center (PTRC), Shahid Beheshti University of Medical Sciences, Tehran, Iran

Received: 2023 February 20

Revised: 2023 June 28

Accepted: 2023 July 10

Published online: 2023 June 12

***Corresponding author:**

Protein Technology Research Center (PTRC), Shahid Beheshti University of Medical Sciences, Tehran, Iran.
Email: m_tabarzad@sbmu.ac.ir

Citation:

Mirmoghtadaie Z, Hosseinabadi T, Tavakoli F, Tabarzad M. Is Using Blended Learning of Lab Skills by a Modest Augmented Reality-Based Educational Booklet Beneficial to Pharmacy Students? Strides Dev Med Educ. 2023 July; 20(1):103-109.
doi:10.22062/sdme.2023.198379.1182

Abstract

Background: Using augmented reality (AR) in blended learning in the higher education system has exhibited promising results.

Objectives: In this study, the effect of using a simple AR-based booklet was evaluated on the learning and practical skills of pharmacy students during a pharmacognosy lab-based course.

Methods: A pre-test/post-test controlled trial was designed. The traditional educational booklet was revised by adding experimental videos using QR-code as a simple AR technology. The students' laboratory skills were scored according to a checklist developed by professionals. The paired t-test was used to compare the mean differences between the pre-test and post-test scores in each group, and ANCOVA was used to compare the mean differences in the post-test scores between the two groups. After adjusting for pre-test scores, ANOVA was used to compare the scores of practical skills between all six groups participating in the lab course.

Results: The mean pre-test scores were not significantly different between the control and intervention groups. No significant differences were noticed between the two groups regarding post-test grades. Generally, the students' practical skills significantly improved; however, changes were more obvious in some indicators, including the number of blatant mistakes, troubleshooting questions, misidentification of materials, and improper use of equipment. The students were well satisfied with the new educational booklet.

Conclusion: Although AR makes the learning process an interactive, multi-sensory, and enjoyable experience for students, this novel-designed educational booklet for lab courses needs improvements by using more advanced AR technologies in order to completely fulfil the learning objectives of students.

Keywords: Augmented Reality; Learning; laboratories; Professional Competence; Education

Background

Along with the rapid development of technology and Internet-based education, electronic learning methods (e-learning) have expanded, shifting traditional classes to virtual learning environments. A new method of education, called blended education, was introduced by Marsh and others in 2003 as the second generation of virtual education, comprising a combinatorial approach of electronic and face-to-face teaching strategies,

thereby using a combination of student-centered and teacher-centered methods. This approach tries to combine the principles of cognitive learning and collective constructivism and bring together the educational system's elements of awareness, ability, and creativity. The use of this educational method in the electronic education system has several advantages, such as achieving high-quality learning, flexibility in organizing and presenting educational materials by

professors, improving the learning process by creating a series of mental challenges, engaging learners in the organization of educational affairs, explicit explaining the educational content and assessment criteria (1-3).

After the rapid movement toward distance learning in the spring of 2020 due to the COVID-19 pandemic, lab-course education demanded the employment of new alternatives. Although traditional practical learning seems to remain the main part of educating lab courses, with the progress in the world of online and electronic learning, e-learning is increasingly employed to deliver these courses, bringing challenges that need to be addressed. Due to the necessity of the minimum attendance to educational laboratories in special conditions (e.g., the COVID-19 pandemic), the effective learning of practical skills by students is compromised during lab-based courses, especially among pharmacy students. So, adjoining new electronic technologies to the educational content of practical courses can help solve these problems. Blended education (traditional-electronic) can profoundly boost the achievement of learning objectives and learners' enthusiasm (4).

Objectives

In this study, an educational booklet was designed for the lab-based course of pharmacognosy for pharmacy students with the help of simple augmented reality (AR). This novel booklet was used to deliver educational content during one academic semester. Finally, the effects of this method on the level of satisfaction and learning of practical skills by students were investigated.

Methods

Study Features and Educational Materials: This was an interventional and educational scholarship study with a controlled pre-test/post-test design. The lab-based pharmacognosy course was delivered to pharmacy students studying in their 7th semester as a pilot for one semester. The new booklet was designed based on a traditional booklet; however, several experiments were recorded in the form of educational micro-learning videos (about 5-minute length), displaying how the experiments were performed. The simplest form of augmented reality was applied, i.e., short movies and related photos were annexed to the booklet using QR codes. The educational videos were uploaded to the cloud space of a Gmail account, and the related URLs were applied to generate QR codes by <https://www.qr-code-generator.com/>.

Research Entry and Exit Criteria: All the students who registered for the lab-based pharmacognosy course in the second semester of the academic year 2021-2022

were eligible to enter the study. The students were adolescents between the age of 21 and 22 years old. The aims of the study were explained to them, and those who agreed and gave informed consent were admitted to the study. Exclusion criteria included failure to participate in one of the tests (i.e., pre-test or post-test) or deliver the tasks assigned (i.e., logbook preparation). In addition, students who had not studied the educational booklet before initiating the lab course were excluded. The consort flow chart of the study is presented in Figure 1.

Training of Students with the New Educational Booklet: Students were randomly divided into two groups of control and intervention. Because of limited physical space in the laboratory, students in each group were further divided into three subgroups and educated in separate classes. The control group (30 students in three subgroups) was trained using the traditional booklet, followed by performing practical laboratory skills. The control group received the training one week before the intervention group to avoid their access to the AR-based booklet. Students in the intervention group (n = 35 in three subgroups) were trained using the new educational booklet and then continued the routine course in the laboratory. Finally, both groups of students went through the practical implementation of the experiments. At the end of the research, students in the control group were granted access to the novel AR-based booklet to observe justice and maintain equal learning opportunities.

Evaluation of Learning Efficacy: Pre-test and post-test assessments were conducted for all students (control and intervention) to check the students' basic knowledge and their learning achievements. The pre-test and post-test included three short-answer questions from the content of the respective lab booklet designed by the course-holding professor.

Evaluation of Practical Skills: During the implementation of experiments in the laboratory, students' practical skills were evaluated according to a student evaluation checklist designed and completed by the professor and the lab assistant instructor based on predetermined indicators (e.g., the number of test repetitions, number of obvious errors, number of troubleshooting questions, improper use of equipment, ability to perform the tests completely, missing a step, correctly detecting end-points, correct understanding of materials, performing the test within the time specified, and log book preparation). The score of each item ranged between 0 (the poorest performance) and 5 (the best performance). This checklist was evaluated by five expert professors of pharmacognosy, and the

CVI and CVR of the questions were calculated above 0.8.

Evaluation of Students' Satisfaction: The students' satisfaction with the novel educational method was assessed using the modified questionnaire for user interface satisfaction (QUIS) (5, 6). This questionnaire was originally designed for evaluating mobile-based applications, so it was slightly modified to be applicable for the evaluation of this AR-based booklet. The modified questionnaire consisted of 29 questions, two of which were related to identity information. The remaining 27 questions were related to usability and

satisfaction, including general queries about the usability, capabilities, information richness, terminology, educational power, and general efficacy of the new booklet. The score of each question ranged between 0 and 9. A score of 0-2 was designated as poor, 3-5 as fair, 6-8 as good, and nine as excellent levels of satisfaction and ability. The content validity index (CVI) and content validity ratio (CVR) were calculated based on the amendments received from ten experts. The CVI values were calculated between 0.75 and 0.99, and CVR ranged from 0.84 to 0.9. Cronbach's alpha coefficient of the whole instrument was calculated to be 0.919.

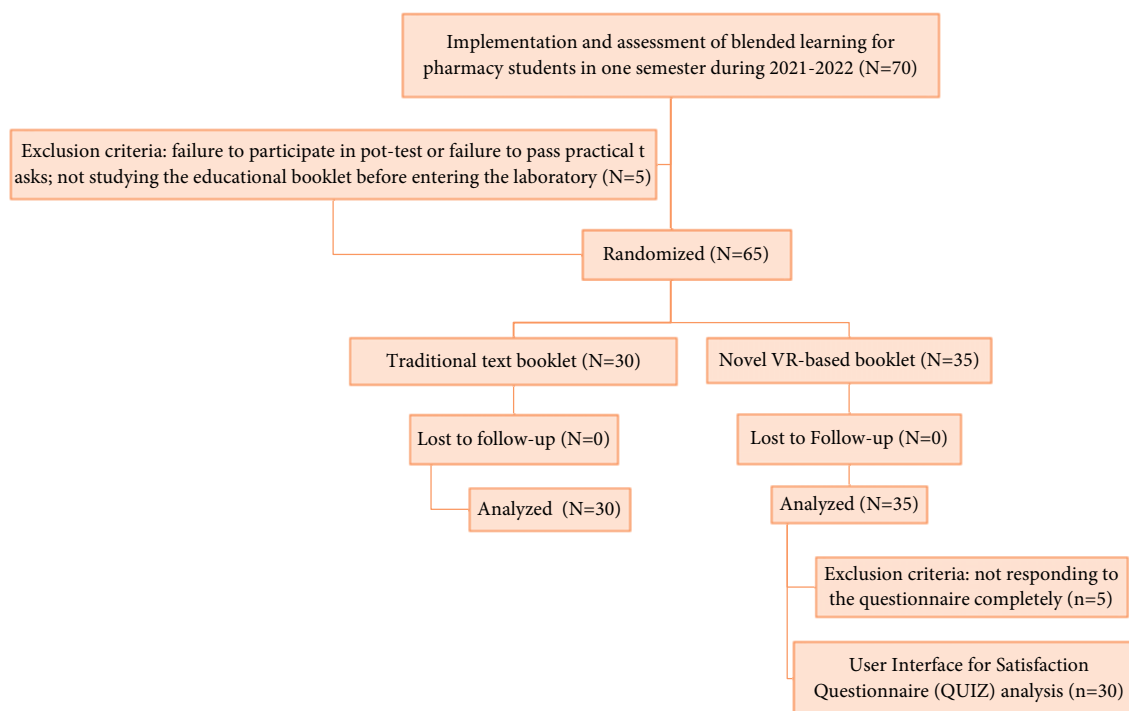


Figure 1: The CONSORT flow chart of the pre-test and post-test steps in this randomized controlled trial

Statistical Analysis: Data were analysed using SPSS software (IBM[®]21). Plots were drawn by GraphPad Prism 8.0. Descriptive statistics, including mean and standard deviation (SD), were calculated for each numerical scale variable. Normality was analysed by the Kolmogorov-Smirnov and Shapiro-Wilk tests using non-parametric analysis by SPSS. A Sig. value of > 0.05 in both tests indicated the normal distribution of the data. The paired t-test was employed to compare mean differences between the pre-test and post-test scores in each group, and ANCOVA was used to compare mean differences in post-test scores between the two groups after adjusting for pre-test scores. Finally, ANOVA was applied to compare the scores of practical skills between all six subgroups of the

students participating in the lab course. P values below 0.05 were considered statistically significant.

Results

The Effect of Using an AR-Based Combined Training Booklet on Pre-Test and Post-Test Scores: The mean scores of the pre-test and post-test are shown in Table 1. This study included six subgroups of students who attended the laboratory on six different days. The first three subgroups of the students (i.e., the control group) were educated by the traditional booklet, and the other three subgroups (i.e., the intervention group) were trained using the new AR-based booklet. The normality of data distribution was affirmed in both groups. The mean pre-test grade of students in the intervention

group was slightly higher than that of their counterparts in the control group, but this difference was not statistically significant. Regarding post-test grades, the results of Levene's test showed the equality of error variances, and ANCOVA showed no statistically

significant difference in the mean post-test grades between the two groups. Of note, a slight increase in the mean of the post-test grades was seen in the intervention group compared to the control group (1.999 for the intervention group vs. 1.788 for the control group).

Table 1. Mean \pm SD of Students' Pre-Test and Post-Test Grades in the Control and Intervention Groups

Type of education	Subgroup No.	Pre-test	Post-test	Between-group comparison (p-value)		
				Pre-test	Post-test	Pre- and post-test
Control (traditional booklet)	1	2.2 \pm 0.9	1.8 \pm 0.98	0.639	0.027	<0.001
	2	2.5 \pm 0.6	1.8 \pm 0.87			
	3	2.2 \pm 0.6	2.3 \pm 0.91			
Intervention (AR-based booklet)	4	2.2 \pm 0.8	1.8 \pm 0.58			
	5	2.7 \pm 0.4	1.7 \pm 1.1			<0.001
	6	2.8 \pm 0.3	1.7 \pm 0.89			

Within-Group Comparison of Pre-Test and Post-Test Scores: Considering the fact that pre-test and post-test scores in each group are dependent on each other, the paired sample student t-test was performed to check if attending the laboratory course boosted the post-test scores of the students. A decrease in the mean of post-test scores compared to pre-test scores was observed in both groups (Table 1), and the difference between the means of the pre-test and post-test scores was statistically significant in both groups (p-value<0.05).

The Effect of the AR-Based Booklet on Students' Practical Skills: The students' practical laboratory skills were evaluated and scored according to the criteria mentioned previously (Table 2). A two-step comparison at two levels was applied (i.e., first, all six subgroups (three control and three intervention subgroups) were individually compared to each other, and then skills were compared between the control and intervention groups). The two levels of analysis included comparing individual components separately and then as a whole index of practical skills. Comparing the mean of each component between the control and intervention groups showed a statistically significant difference in the number of obvious errors, the number of troubleshooting questions, the improper use of equipment, and the misidentification of materials. There was no significant difference between the three subgroups of either the control or the intervention group. An increase was seen in the mean scores of all components except for the duration of test conduction and logbook preparation. Finally, the mean score of laboratory skills obtained by the students in the intervention group was significantly higher than that of the students in the control group (p-value <0.05) (Figure 2).

Students' Satisfaction with the AR-Based Booklet: In this study, a modified form of the QUIS was used to

check the level of functionality and user satisfaction with the AR-based booklet developed.

The questionnaire was completed by the students in the intervention group. The general opinion regarding the new booklet, with a mean score of 7.34 ± 1.3 , was satisfactory (i.e., between 6-8). The lowest scores were related to the items of "the ability to work continuously with the booklet" (6.9 ± 2.1) and "the clarity of supplementary educational references" (6.5 ± 2.8) (Figure 3). The highest score was reported for "the ease of working with the booklet and its display capabilities", with a score of 0.944.

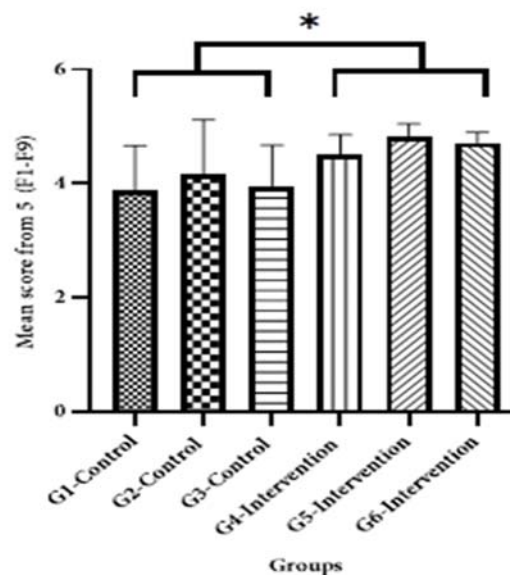
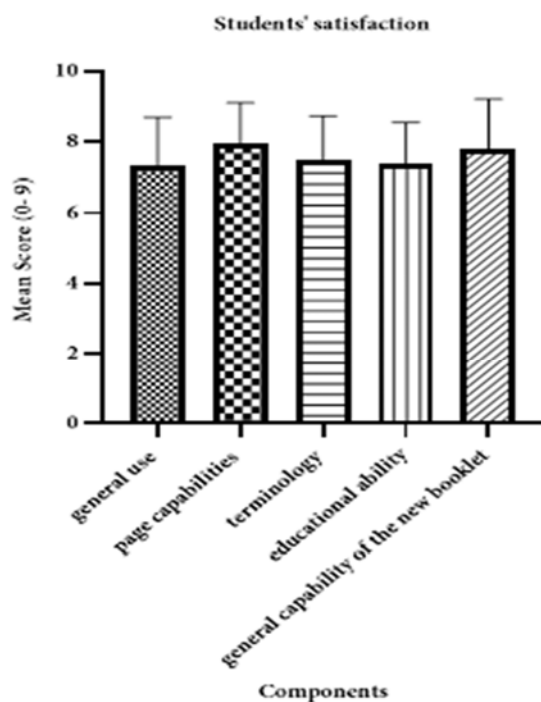


Figure 2: Comparison of practical skills of students between the intervention and control groups; each bar in each group is related to a subgroup. *indicates a p-value<0.01.

Table 2. Students' Scores Regarding the Components Used as Indexing Factors for Practical Skills

	Components	The mean of scores \pm SD						Comparison of mean between control and intervention groups
		Control group			Intervention group			
		1	2	3	1	2	3	P-value
F1	Number of test repetitions	4.3 \pm 0.6	5 \pm 0.0	4 \pm 0.0	4.7 \pm 0.6	4.3 \pm 0.6	5 \pm 0.0	0.651
F2	Number of obvious errors	3.3 \pm 0.6	4 \pm 0.0	3.7 \pm 0.6	4.7 \pm 0.6	4.7 \pm 0.6	4.7 \pm 0.6	0.007
F3	Missing a step during performing the test	4.3 \pm 0.6	4 \pm 0.0	4.3 \pm 0.6	4.7 \pm 0.6	4.3 \pm 0.6	5 \pm 0.0	0.116
F4	Number of troubleshooting questions	2 \pm 0.0	2 \pm 0.0	2.3 \pm 0.6	4.7 \pm 0.6	4.3 \pm 0.6	4.7 \pm 0.6	<0.001
F5	Improper use of equipment	4 \pm 0.0	3.7 \pm 0.6	4 \pm 0.0	5 \pm 0.0	5 \pm 0.0	5 \pm 0.0	0.001
F6	Ability to perform tests and detect correct results	4 \pm 0.0	5 \pm 0.0	4 \pm 0.0	5 \pm 0.0	5 \pm 0.0	5 \pm 0.0	0.116
F7	Misidentification of materials	4 \pm 0.0	4.3 \pm 0.6	4 \pm 0.0	4.7 \pm 0.6	5 \pm 0.0	4.7 \pm 0.6	0.007
F8	Duration of performing the test	4.7 \pm 0.6	5 \pm 0.0	4 \pm 0.0	4.7 \pm 0.6	4.3 \pm 0.6	5 \pm 0.0	0.374
F9	Logbook preparation	4.2 \pm 0.5	4.5 \pm 0.05	4.3 \pm 0.2	4.4 \pm 0.18	4 \pm 0.48	4.4 \pm 0.14	0.698
	Mean of subgroups	3.9 \pm 0.8	4.2 \pm 0.95	3.96 \pm 0.7	4.7 \pm 0.2	4.5 \pm 0.3	4.8 \pm 0.2	
	Mean of groups	4.0 \pm 0.087			4.68 \pm 0.088			0.005

SD: Standard deviation

**Figure 3:** Mean scores of different components of the QUIS questionnaire. The number of valid questionnaires evaluated was n= 30.

Discussion

In this study, a novel educational AR booklet was designed, combining the traditional text booklet and e-learning technology, to deliver lab-based pharmacognosy courses to pharmacy students. It is of utmost importance to improve traditional teaching methods, particularly by using information and distance learning technologies. The novel booklet designed here employed augmented reality to better convey practical

skills to pharmacy students, and it was implemented for one academic semester. However, the results showed that the new booklet could not significantly improve students' grades, evidenced by no profound change in their post-test scores. On the other hand, the students were satisfied with the AR-based booklet provided in the context of a blended learning method. Similarly, a previously published work showed that the use of blended learning technology in a microbiology laboratory did not significantly contribute to achieving learning objectives, noting that the students who attended the virtual laboratory course obtained similar grades to their peers who, completely or partially, were physically present in the laboratory. Nevertheless, the results showed that the knowledge gained was satisfactory, and the participants valued the experience (7).

It has been proven that learning in laboratories can be augmented by providing essential information virtually during lab work. Augmented reality seems particularly suitable for providing basic information during lab courses as it can integrate physical and virtual tasks. Virtual information can be displayed in close spatial proximity to the corresponding lab environment. In fact, VR can be a basic component for the effective delivery of multimedia education, thus reducing the cognitive load of learners, strengthening their productive processing, and, finally, enhancing the acquisition of conceptual knowledge. In a previous study, researchers successfully developed a tablet-based AR application to support learning practical physics skills among higher education students (8). However, in our study, learning output did not show a significant improvement among the students who used the novel AR-based educational booklet based on paper exams. This may be explained by the poor involvement of

students or their failure to study the novel booklet or watch the microlearning media embedded in the booklet adequately. Nevertheless, this novel educational booklet could improve the practical skills of students in the laboratory and deliver scores equivalent to the traditional in-person lab course, highlighting this booklet as a tool worthy of further development and evaluation.

In another study, students attending a general chemistry lab course, although deemed hands-on activities and exposition to new scientific instruments necessary for learning practical laboratory skills in chemistry labs, often considered these tools as black boxes, so they had no knowledge about how to use them or what capabilities they had. Becoming acquainted with laboratory instruments is an important part of laboratory training. In another study, an application known as Augmented Reality in the Educational Laboratory (ARiEL) was designed using AR technology to connect students to instruments' analytical information, and the results showed that ARiEL could reduce students' anxiety when using instruments and improve their intellectual attachment to the data retrieved by the instrument (9). The fact that we could not find a significant role for this novel educational booklet in boosting students' learning might be related to the simplicity and the lack of attractiveness of the technology used for students. Therefore, using more advanced and intriguing technologies, such as what is used in ARiEL, can be considered in future studies to achieve more promising results.

Although blended education can be attractive for students, it cannot replace face-to-face training methods. In a study in 2010, the attitudes of pharmacy students towards face-to-face or blended teaching of a pharmacokinetics course were evaluated, demonstrating that face-to-face interactions of students with each other and with the instructor were ranked higher than online interactions (10).

Our study had several limitations, which might have affected the results. This study was conducted only in one pharmacognosy lab-based course during a single semester and only in one faculty (Pharmacy School). Our primary goal was to preliminarily investigate the effectiveness and attractiveness of the novel AR-based educational booklet and its influence on students' skills. In future studies, it is recommended to include more courses and disciplines to assess the applicability of this novel booklet. Moreover, due to Internet limitations, the training videos prepared in this study had minimum coverage of essential educational concepts and the details of experiments. Better access to the Internet can allow for uploading more media and should be

considered in future studies. In general, AR-based methods have been promising, given that the essential tools and infrastructure are available, which allows for more advanced methods to be applied. Therefore, by employing novel technologies such as AR or VR, we recommend developing more comprehensive AR-based booklets to be employed in a more controlled manner to achieve the best educational outcomes in lab-based courses (11).

Conclusion

Facing the COVID-19 pandemic forced the educational system to seek different educational methods primarily based on virtual platforms. Since virtual education had not been generally applied in Iran before COVID-19, especially for lab-based courses, Iranian teachers and students, like many others around the globe, faced many challenges in adopting these teaching and learning courses. Blending learning has been introduced as an efficient method for lab-based courses in higher education (2, 12, 13). Here, we developed a novel educational package based on blended learning in which educational movies were adjoined to texts using QR codes. The implementation of this novel booklet for training a pharmacognosy lab-based course to pharmacy students could not improve the post-test scores of the students compared to the control group who received the traditional learning method. However, the students expressed their eagerness for and satisfaction with the novel booklet. Further studies are required to assess the effectiveness of novel advanced technologies, such as AR or VR, in promoting the learning and practical skills of pharmacy students participating in lab-based courses.

Acknowledgements: The authors greatly thank the research deputy of the Virtual School of Medical Education and Management, Shahid Beheshti University of Medical Sciences, Tehran, Iran; for financial support.

Conflict of interests: The authors declare that they have no financial or non-financial conflict of interest. This study did not receive any financial support.

Ethical approval: This study was approved by the Research Ethics Committee of Shahid Beheshti University of Medical Sciences, Tehran, Iran, with the approval code IR.SBMU.SME.REC.1401.025. The confidentiality of students' information and fair, equal access to educational opportunities for all students were considered during the study.

Funding/Support: This study was financially supported by Virtual School of Medical Education and Management, Shahid Beheshti University of Medical Sciences, Tehran, Iran (Grant# 43003544).

References

1. Alamri HA, Watson S, Watson W. Learning technology models that support personalization within blended learning environments in higher education. *Tech Trends*. 2021;65(1): 62-78. doi: 10.1007/s11528-020-00530-3.
2. Dakhi O, JAMA J, IRFAN D. Blended learning: a 21st century learning model at college. *International Journal of Multi Science*. 2020;1(08):50-65.
3. Kumar V, Sharma D. E-Learning theories, components, and cloud computing-based learning platforms. *International Journal of Web-Based Learning and Teaching Technologies (IJWLTT)*. 2021;16(3):1-16. doi: 10.4018/IJWLTT.20210501.oa1.
4. Ossiannilsson E. Blended Learning-State of the Nation. Setúbal - Portugal: CSEDU 2024; 2018.
5. Isa WMW, Rozaimie A, Satar SDM, Hamid NA, Rahim N, Hashim J, et al. Evaluation of user interface satisfaction for virtual Umrah among secondary school students. *Advanced Science Letters*. 2017;23(5):4149-52. doi: 10.1166/asl.2017.8299.
6. Wallace DF, Norman KL, Plaisant C. The american voice and robotics" guardian" system: a case study in user interface usability evaluation. Maryland, USA: University of Maryland; 1988.
7. Sancho P, Corral R, Rivas T, González MJ, Chordi A, Tejedor C. A blended learning experience for teaching microbiology. *Am J Pharm Educ*. 2006 Oct 15;70(5):120. doi: 10.5688/aj7005120. [PMID: 17149449] [PMCID: PMC1637024]
8. Altmeyer K, Kapp S, Thees M, Malone S, Kuhn J, Brünken R. The use of augmented reality to foster conceptual knowledge acquisition in STEM laboratory courses—Theoretical background and empirical results. *British Journal of Educational Technology*. 2020;51(3):611-28. doi: 10.1111/bjet.12900.
9. An J, Poly L-P, Holme TA. Usability Testing and the Development of an Augmented Reality Application for Laboratory Learning. *Journal of Chemical Education*. 2020;97(1):97-105. doi:10.1021/acs.jchemed.9b00453.
10. Edginton A, Holbrook J. A Blended Learning Approach to Teaching Basic Pharmacokinetics and the Significance of Face-to-Face Interaction. *Am J Pharm Educ*. 2010 Jun 15;74(5):88. doi: 10.5688/aj740588. [PMID: 20798797] [PMCID: PMC2907853]
11. Tang KS, Cheng DL, Mi E, Greenberg PB. Augmented reality in medical education: a systematic review. *Can Med Educ J*. 2020 Mar 16;11(1):e81-e96. doi: 10.36834/cmej.61705.
12. Güzer B, Caner H. The Past, Present and Future of Blended Learning: An in Depth Analysis of Literature. *Procedia - Social and Behavioral Sciences*. 2014;116:4596-603. [PMID: 32215146] [PMCID: PMC7082471]
13. Keshavarz M, Mirmoghtadaie Z, Nayyeri S. Design and validation of the virtual classroom management questionnaire. *International Review of Research in Open and Distributed Learning*. 2022 May;23(2):120-35. doi:10.19173/irrodl.v23i2.5774.

Exploring Lived Experiences of Students Studying at Master's Degree of Online Medical Education Regarding Hidden Curriculum

Shoaleh Bigdeli¹, Mahboubeh Rastgou Salami^{2*}, Afsaneh Dehnad^{1,3}, Atefeh Zabihi Zazoly⁴, Zohreh Sohrabi⁵, Zahra Nahardani⁶, John Sandars⁷

¹Professor, Center for Educational Research in Medical Sciences (CERMS), Department of Medical Education, School of Medicine, Iran University of Medical Sciences, Tehran, Iran

²MSc. of Medical Education, Center for Educational Research in Medical Sciences (CERMS), Department of Medical Education, School of Medicine, Iran University of Medical Sciences, Tehran, Iran

³Department of English Language, School of Health Management and Information Sciences, Iran University of Medical Sciences (IUMS), Tehran, Iran

⁴Assistant Professor, School of Allied Medical Sciences, Mazandaran University of Medical Sciences, Sari, Iran

⁵Associate Professor, Center for Educational Research in Medical Sciences (CERMS), Department of Medical Education, School of Medicine, Iran University of Medical Sciences, Tehran, Iran

⁶Assistant Professor, Center for Educational Research in Medical Sciences (CERMS), Department of Medical Education, School of Medicine, Iran University of Medical Sciences, Tehran, Iran.

⁷Professor, Director of Medical Education Innovation and Scholarship, Faculty of Health, Social Care and Medicine, Edge Hill University, Ormskirk, UK

Received: 2023 April 29

Revised: 2023 June 15

Accepted: 2023 July 23

Published online: 2023 July 23

***Corresponding author:**

Center for Educational Research in Medical Sciences (CERMS), Department of Medical Education, School of Medicine, Iran University of Medical Sciences, Tehran, Iran.

Email: mahboubeh.rastgou@gmail.com

Citation:

Bigdeli S, Rastgou Salami M, Dehnad A, Zabihi Zazoly A, Sohrabi Z, Nahardani Z, Sandars J. Exploring Lived Experiences of Students Studying at Master's Degree of Online Medical Education Regarding Hidden Curriculum. *Strides Dev Med Educ.* 2023 July; 20(1):110-117. doi:10.22062/sdme.2023.198577.1211

Abstract

Background: The hidden curriculum has a significant role in students' learning in general and in online learning in particular. However, there are few studies on hidden curriculum of online medical education programs.

Objectives: The present study explored master students' experience of hidden curriculum in an online medical education program.

Methods: A phenomenological study was conducted on 12 students of an online medical education master's degree program at Iran University of Medical Sciences. The results of the semi-structured interviews were analysed by using Colaizzi seven-stage data analysis method.

Results: We extracted 6 categories and 12 subcategories from data analysis, depicting the students' experiences of the hidden curriculum. The categories were interactions and communications factors; motivational factors; reflective and interactive feedback; effective teaching and assessing; educational standards, rules, and discipline; faculty member's roles.

Conclusion: The findings reflect the hidden messages and factors that constitute the hidden curriculum in the online environment. Constructive interaction and communication, encouragement and reward, and reflective and interactive feedback were the most important aspects defining the hidden curriculum in this learning environment. Therefore, each of the afore-mentioned categories can be considered by educational planners to develop strategies for promoting online learning.

Keywords: Hidden Curriculum; Online Learning; Medical; Education

Background

Curriculum is axial for any learning and teaching opportunities (1). The concept and function of curriculum may slightly differ for different researchers and educators. Therefore, there are several definitions of a curriculum, such as curriculum as a set of objectives, courses of study or content, plans, subject-specific document, and experiences. In the definition of

curriculum as experiences, set of plans and experiences are amalgamated. In this definition, plans are referred to planned curriculum and experiences attribute to unplanned happenings in educational process and classroom. This interpretation of the curriculum refers to formal, informal and hidden curriculum, which have also been emphasized in the health professional learning

environment as three interrelated spheres of curriculum (2-5).

The formal curriculum is the planned and organized program of objectives, content, learning experiences, resources and assessment that encompass a wide variety of educational and instructional practices. Informal curriculum is the unscripted form of teaching and learning not officially listed in the curriculum. It is sometimes concerned as co-curricular activities adopted from outside setting such as peers, media, community and parents (2).

The hidden curriculum has been defined in studies from different aspects. For example, Skelton describes hidden curriculum as a set of messages about the values, behavioral norms and attitudes that learners implicitly learn during educational processes (6). These messages are not explicitly stated in the official and written documents (7). Yazdani et al. defined the hidden curriculum in medical education as a framework that could include professional ethics, social, and spiritual dimensions (8). In general, hidden curriculum is the behaviors, procedures, unspoken or implicit values, and norms that exist in the educational environment and can shape future attitudes, behaviors, and beliefs (7, 9).

Hidden curriculum is important in medical education. It has an impact on the formation of learners' professional development, professional identity, socialization, professionalism and values (10, 11). Studying and knowing the hidden curriculum factors will be of great help to teachers and educational planners. For example, the teachers will be aware of positive and negative messages in the classroom and will use it to better manage the classes. Teachers will be able to use hidden curriculum as a teaching strategy to send specific message to learners, such as peer and cooperative learning (7).

According to studies and different definitions of hidden curriculum, it can be concluded that the learning environment and its characteristics play an important role in the formation of the hidden curriculum (12). Today, one of the most important learning settings is the online environment. In other words, information Technology, including electronic media and the internet, has become an integral part of educational programs and has made major changes in the process of teaching and learning (13). Online learning, although a broad concept, is based on the assumption that learning is experienced through the internet (14), and is characterized by the separation of the learners and teacher

in terms of time and space (12). Typically, and from the pedagogical perspective, online learning is flexible, with a learner-centered approach, engaging learners in different forms of interaction, communication and collaboration (15). Effective online learning depends on the complex combination of several key factors, including students' personal characteristics, effective teacher-student and student-student interactions, educational content and ease of access to technology (16).

According to Anderson, the distinctive physical and interactional context of distance learning environments may define a different conception and experience of the hidden curriculum than that experienced by participants in traditional campus-based education (17). This issue has been confirmed in some of studies. For example, Oztok, focusing on "Discourses of Whiteness", "Social Absence", and "Inequity" issues in graduate programs for online courses at a public research university at Canada, has discussed that the hidden curriculum of online learning, maintains a cultural hegemony and creates an inequitable or unfair learning experiences via cultural differences (18, 19). Meng has shown that online hidden curriculum affected the learning tendency in Covid19 epidemic. According to his study, four dimensions of hidden curriculum with different effects on learner's learning tendency include learning rules and values, learning about teachers, learning to restrain self and gaining confidence in dialogues. He suggested that various universities could achieve the purpose of enhancing students' learning tendency by consciously considering these aspects of hidden curriculum in online courses (20).

Despite the importance of the hidden curriculum, the literature shows that researchers seldom examine hidden curriculum with a format outside the traditional paradigm (17). So that according to the search of the researchers of the current study, there are a few studies on the hidden curriculum in online courses, if any, they are mostly related to areas outside of medical education. On the other hand, given the Covid19 pandemic, most of the universities and departments have adopted online learning to protect the safety of faculty members and students and control the pandemic as well. With this movement towards online learning, the importance of considering hidden curriculum through online learning becomes more pronounced.

In Iran, similar to other countries, a number of programs leading to a bachelor or master's degree are offered via online and face to face modes. One of these

programs is Master of Science in Medical Education. This online program is similar to a two-year face-to-face program. Participants applying for this program are mainly those faculty members who would like to improve the quality of their educational activities (of faculty development) and obtain a master's degree as well. The first three semesters are devoted to online teaching of pre-requisite, core and optional courses, and the final semester focuses on dissertation (almost every semester includes four and a half months). This program, similar to other online programs, has its hidden curriculum, which has not been addressed in any study according to the researchers' review. Moreover, hidden curriculum is a relatively new concept and has rarely been used in the research related to online learning programs. Therefore, there is a crucial need to study the lived experiences of learners in online learning, and online medical education programs, and share these experiences at the international and national levels.

Objectives

This study was an attempt to explore master students' lived experience of hidden curriculum in an online medical education program. The findings can contribute to curriculum planning with regard to both medical education and online learning.

It should be noted that in the current study, the program means the medical education online master's program, based on the approved curriculum by the Ministry of Health that includes core and optional courses.

Methods

Since students' experiences, as the main stakeholder of the educational system, of the hidden curriculum is an important criterion for studying the hidden curriculum (21), a qualitative phenomenological approach was employed to collect and analyse the lived experiences of participants of the phenomena and hidden meanings experienced by e-learners of medical education. Phenomenology is a form of qualitative research which focuses on the study of an individual's lived experiences in the world (22). A researcher who is conducting a phenomenological study explores various perceptions or reactions of participants to a particular phenomenon, and tries to describe them (23).

Participants: The study participants were students of master's degree in an online medical education program at Iran University of Medical Sciences, Tehran, Iran. A

purposive sampling with maximum variation in terms of educational semester and sex was used. The inclusion criteria were students experiencing at least one educational semester (from 2nd to 4th semester of the program), and being faculty members in other educational departments of the university pursuing master's degree of online medical education program. Participants' unwillingness was the exclusion criteria of study. Two of the researchers (Z. N and M. R) invited the participants to participate in the study through e-mail. A gift was considered for the participants in the study, but they refused to accept the gift and stated that their purpose was helping researchers and improve existing knowledge.

Data collection: The data collection method was semi-structured individual interviews which continued until data saturation was reached (n=12), when no new data emerged. All interviews were conducted by a researcher (M.R). She had experience and knowledge in the field of qualitative interview. Interviews were conducted face to face and scheduled at a convenient time and place for the interviewees. For the convenience of the participants, the interview locations were Medical Education Department, Center for Educational Research in Medical Sciences, Medical School, Teaching and Treatment Hospitals in Iran University of Medical Sciences. Each interview lasted between 30- 40 minutes and each participant was assigned a code to keep the anonymity. An information sheet was provided to participants by using e-mail and their informed consent forms were obtained. The interview questions were of the open type followed by probing questions. These questions were developed by the research team after a literature review and consulting with the experts of the field (Table 1). The participants' response guided the interviewer to ask the next interview questions. The interviews were fully recorded and verbatim transcription was applied for precise analysis.

Ethical considerations: This study was approved by the Ethics Committee (IR.IUMS.RES.1397.746) of Iran University of Medical Sciences. Details of the study were explained to the participants prior to signing the informed consent via an information sheet. The confidentiality of the participants' information was assured. For this purpose, a code was assigned to each participant. Permission was obtained from the participants to audio record the interviews or take notes from it. The interviews were analysed after the interviewee's confirmation.

Table 1. Interview and probing questions

The interview questions were as follows:
Could you please introduce yourself and talk about your experiences of studying in this master's degree program of online education?
Can you explain negative and positive experiences in this online program?
In your opinion, which part of your experiences was not foreseen in the program?
What hidden messages and lessons did this program have for you?
The following probing questions were asked:
Could you please explain more?
Please give an example.
Please support/ provide evidence for what you said.

Data analysis: Data were analysed according to the descriptive phenomenological approach of seven steps Content analysis of Colaizzi (24). The interviews were transcribed verbatim by one of the researchers (M.R). In order to understand participants' experiences and feelings, three researchers (S.B, A.D, A.Z) independently read and re-read the transcription carefully several times. Units of analysis, which were important words, phrases, and sentences drawn from the interviews, were coded and formulated meanings by the same three previous researchers (S.B, A.D, A.Z). Afterwards, the formulated meanings were classified into subcategories (based on commonalities and communication with each other) and finally by combining all the subcategories into a comprehensive description, the main categories emerged. The researchers (S.B, A.D, A.Z) sent two other researchers (J.S, Z.S) a copy of their results for confirmation and validation. Then they conducted several meetings among researchers to decide on disagreements and finalize the sub categories and categories. The researchers wrote an exhaustive description of the phenomenon (as clearly and unambiguously as possible) by combining the results. Therefore, researchers wrote an explicit and clear explanation of the basic structure of the studied phenomenon. The researchers returned this basic structure to all participants. They were then asked if this was an explanation for their experience. So that, if necessary, according to their feedback, the previous steps in the analysis can be modified. The results were confirmed by the participants and no new data were emerged.

Guba and Lincoln's criteria (1985) of Credibility, Transferability, Dependability and Confirmability were fulfilled to ensure validity and reliability of the findings (25). In this research, data credibility was ensured through a long-term interaction with the study participants, reviewing content of the interview and member checking. For transferability, researchers provided a comprehensive

description of the participants' characteristics. For dependability, all the study details and direct quotations from participants were described extensively to be easily audited by others. Finally, the Confirmability criteria were performed by reviewing the data collection, and analysis, and examining the codes and categories extracted by three faculty members (Peer-check).

Results

The participants were 12 students of an online medical education, masters' program: eight female and four male students. From among them, two were second semester students, six were third semester students and four were fourth semester students. Each semester lasted about four and a half months (Table 2).

Table 2. Demographic characteristics of the study's participants

Participant number	Gender	Semester	Experience in online learning
P1	Female	3	Two semesters
P2	Female	3	Two semesters
P3	Female	4	More than a year
P4	Male	3	Two semesters
P5	Female	3	Two semesters
P6	Female	2	One semester
P7	Female	4	More than a year
P8	Male	2	One semester
P9	Female	3	Two semesters
P10	Female	3	Two semesters
P11	Male	4	More than a year
P12	Male	4	More than a year

After removing duplicate codes and merging similar codes, a total of 46 open codes were extracted. On the basis of the findings of the study, we were able to identify some categories related to hidden curriculum of the online medical education program. In this regard, six categories and twelve sub-categories emerged (Table 3).

Examining the extracted categories in the present study demonstrated that these categories generally prevailed in the hidden curriculum from two aspects. First, some of the aforementioned categories reflect the factors that constitute the hidden curriculum in the

online environment, e.g., interactions and communications factors, motivational factors, reflective and interactive feedback. Second, all the categories and subcategories were hidden messages that the participants received in the course, most of which involved the factors associated with the improvement of teaching and learning and the role of various factors in the online system.

Some samples of the statements by the participants:

P6: *Most of my classmates are clinical and there are not many of them. Because we cannot be close to each other physically, we increased communication with each other to learn.*

P4: *We formed a virtual group. For example, in the lesson of learning theories, each of us would explain a chapter by voice in the group, then other classmates would ask questions, and this created interaction and cooperation between us.*

P8: *Even during the previous semester, the education officer contacted us and asked for our opinion on how we access the content, this is good for an education system.*

P11: *There's a positive point that in every moment we need to feel; my colleagues and I were able to contact our teachers who are respectable faculty members at the university.*

Table 3. Students' experiences of hidden curriculum in an online medical education program

Category	Sub-Category	Open code
Interactions and communications factors	Peer group impact on interactive learning	Forming groups in social networks to learn from one another
		Communication between learners via groups on social networks
		Informing via participation in an online group
		Establishing virtual communication with classmates
		The need to synchronous virtual classroom
	Face-to-face interactions as facilitator of teaching and learning	Establishing interaction and communication between learners in the online system
		Establishing face-to-face communication among learners when required
		Performing face-to-face follow-up when required
		Establishing Face-to-face communication with faculty members when required
		Feeling the need to establish face-to-face communication
		Formatting or establishing communication between students
		Establishing communication with faculty members by face-to-face contact
		Meeting with classmates at work to learn
Working relationships between peers	Establishing further contact with classmates of the same learning team	
Motivational factors	Providing reward as motivating a factor for learning	Rewarding points to students who are faculty members
		Master's degree as an incentive system for students who are faculty members
		Free of charge courses for faculty members
	Easy educational processes as incentives to continue education/choosing a field of study	Easy participation in an online education course
		No entrance exam or interview to join the course
		Easy (online) registration process
		Previous acquaintance with the course
Reflective and interactive feedback	Exchange of feedback between students and the education system	Possibility to provide student feedback
		Follow-up to receive feedback from the course supervisor
		Possibility to give feedback to the system
	Constructive feedback between faculty member and student	Providing timely constructive feedback to students by some faculty members
		Doing homework and exercises with receiving feedback in some cases
Effective teaching and assessing	Content consistency with the objectives of the course/lesson	Relevant content to student needs
		Relevant relation between course content and the tests
		Appropriate tests and questions
		Relevant assessment methods
		Teaching the key points
		Brevity of content
	The need to accommodate educational methods with assessment and examination	Practical educational content
		Necessity of using podcasts and audio content for virtual learning
	Dominance of traditional teaching methods	The need of content relationship with developing skills
		Memory-based content
		Theory-based educational content
		Considering homework as a necessary requirement for learning

Educational standards, rules, and discipline	Educational standards, rules, and discipline	Uploading the educational content
		Timely access to the course plan and educational content
Faculty member's roles	Instructor as an influential factor	Appropriate homework and exercise check to prevent cheating and copying
		Sufficiency of time allocated to teaching and learning
		Enhancing comprehension through online synchronous question and answer sections
		Dedicating enough opportunities to educate students
		The need to connect online at the same time as the faculty member
		The importance of the teacher's role in uploading content and assignments on time

P10: *The same thing, sometimes, when there is no feedback, it is a bit annoying. Feedback was important for my learning.*

Discussion

The current study aimed to investigate participants' experiences of an online degree-based medical education program regarding hidden curriculum. Data analysis indicated six categories to hidden curriculum of the online medical education program that included: interactions and communications factors; motivational factors; reflective and interactive feedback; effective teaching and assessing; educational standards, rules, and discipline; faculty member's role. Given that the study sample consisted of faculty members participating in an Online Medical Education Master's Program (for professional development), it is expected that the hidden messages and experiences they gained will influence their professional behaviours and teaching strategy for e-learners.

The following subcategories are placed under the "interactions and communications factors" category: "peer group impact on interactive learning", "face-to-face interactions as facilitator of teaching and learning", and "working relationships between peers". Literature review indicated that the importance of interactions and communications factors has been highlighted both in the formation of the hidden curriculum and as an educational experience. Some of these studies were related to face-to-face education and some were related to online education. For instance, the study by Høgdal et al. identified two types of interpersonal interactions as spots for a hidden curriculum: instructor-student interactions, student-student interactions (26). However, participants in the current study experienced different types of interaction (teacher-student, student-student in the form of peer learning, student and online system). The study by Karnieli-Miller et al. similarly revealed that communication and teamwork experiences had the most extensive association with the professionalism hidden curriculum (27). In their scoping review, Raso et

al. also identified the formation of hidden curricula through relationships between learners with peers, staff members, instructors, etc (2).

In the current study, the two subcategories of "providing reward as a motivating factor for learning" and "easy educational processes as an incentive to continue education/choosing a field of study" were placed under the "motivational factors" category, suggesting two issues: the impact of reward and encouragement on the formation of hidden curriculum and the transmission of hidden messages to learners about the importance of incentives and motivation in learning. Moreover, a literature review demonstrated significant relationships between the components of the hidden curriculum, e.g., encouragement, punishment, fostering creativity, and learning (28-30). According to published studies, motivation has a significant impact on the success of various types of e-learning for each individual (both teacher and student) and influences the content supplied by the teacher and its appeal to the learner, which is consistent with this apprehended hidden message (31).

The next category of the findings in the present study is "reflective and interactive feedback as the factor ensuring the success of online courses," which includes two subcategories: "exchange of feedback between students and the education system" and "constructive interaction between instructor and student". According to the experiences of participants in the current study, this category encouraged the formation of the hidden curriculum and was interpreted by the learners as a hidden message. The significance of feedback and reflective assessment in the development of hidden curriculum was underlined in some of studies (2, 32, 33). The study by Azadi et al. investigating the function of the hidden curriculum in patient education from the perspective of nursing and midwifery students can only absorb lessons deeply and sustainably if they receive adequate feedback (32).

According current study, three sub-categories of "content consistency with the objectives of the

course/lesson", "the need to accommodate educational methods with assessment and examination", and "dominance of traditional teaching methods" formed the hidden message (category) of "effective teaching and assessing". In Basyiruddin et al. study, teaching strategy is referred to as a powerful hidden curriculum that is used by the teacher (34). Bigdeli et al. identified effective teaching (clinical and theoretical) as one of the factors of the hidden curriculum in undergraduate medical students (21).

The category of "educational standards, rules, and discipline" indicates hidden messages related to time, duties and educational regulations. Some of studies emphasized the role of rules and regulations in the educational system hidden curriculum and their direct impact on the learning process (2). In their studies, Azimpour and Khalilzade also pointed out that the principles and rules of the faculty, such as methods of development, evaluation, disciplinary problems, incentive and punishment issues, etc., are influential in the formation of a hidden curriculum (35).

The "Faculty member's roles" category demonstrates the significance of the faculty member's position in the hidden curriculum formation. Karimi et al. study indicated that educator's behaviour was as important factors on learning through the hidden curriculum. Students pay attention to educator's behaviour and educational roles in educational setting (36). The current study showed that this paying attention and modeling (positive or negative) also exists in online settings.

Limitation: This study was conducted at one department, university and country. This limitation could be addressed as the future research guidance in this area. Therefore, it is suggested to compare several universities or countries that use different online environments.

Conclusion

According to the current study, the participants of this online medical education program had several positive and negative experiences of online hidden curriculum which was not taken into consideration in advance and not addressed in the official curriculum. In the current study, the learning environment which influenced the categories and subcategories of the hidden curriculum was online. Constructive interaction and communication, encouragement and reward, and reflective and interactive feedback were the most important aspects defining the hidden curriculum in this learning environment. Therefore, each of the afore-

mentioned categories can be considered by educational planners to develop strategies for promoting online learning.

Acknowledgements: This research is supported and granted by Iran university of Medical Sciences Research Deputy. The authors are grateful to participants of the study.

Conflict of interests: The authors report no conflicts of interest.

Ethical approval: This paper is part of a research conducted for the partial fulfilment of a master's degree in medical education. It is approved by Iran University of Medical Sciences (IUMS), Tehran, Iran (design code: 97-02-30-33149). All participants were above 24 years of age. After orally coordinating with the participants and sending the information sheet to them, written informed consent was provided by all participants. All methods were performed in accordance with the relevant guidelines in accordance with the Declaration of Helsinki.

Funding/Support: None.

References

1. Uleanya C. Hidden curriculum versus transition from onsite to online: A review following COVID-19 pandemic outbreak. *Cogent Education*. 2022;9(1):2090102. doi:10.1080/2331186X.2022.2090102.
2. Raso A, Marchetti A, D'Angelo D, Albanesi B, Garrino L, Dimonte V, et al. The hidden curriculum in nursing education: a scoping study. *Med Educ*. 2019 Oct;53(10):989-1002. doi: 10.1111/medu.13911. [PMID: 31144353]
3. Kridel C. *Encyclopedia of curriculum studies*. California, US: Sage Pub; 2010.
4. Coleman M, Graham-Jolly M, Middlewood D. *Managing curriculum in South African schools*. London: Commonwealth Secretariat; 2003:3-16.
5. Su SW. The Various Concepts of Curriculum and the Factors Involved in Curricula-making. *Journal of language teaching & research*. 2012;3(1): 153-8. doi:10.4304/jltr.3.1.153-158.
6. Fathi Vajargah K, Vahed S. Identification of citizenship education damages in hidden curriculum: secondary education system from the perspective of women teachers in Tehran & provide ways to improve its situation. *J Educ Innov*. 2006;5(17):93-132. [In Persian]
7. Alsubaie MA. Hidden curriculum as one of current issue of curriculum. *Journal of Education and Practice*. 2015;6(33):125-8.
8. Yazdani S, Andarvazh MR, Afshar L. What is hidden in hidden curriculum? a qualitative study in medicine. *J Med Ethics Hist Med*. 2020 May 10;13:4. doi: 10.18502/jmehm.v13i4.2843. [PMID: 33088431] [PMCID: PMC7569532]
9. Themane MJ. Understanding curriculum: A challenge to curriculum development in teacher education programmes. *South African Journal of Higher Education*. 2011;25(8):1639-51.
10. Mackin R, Baptiste S, Niec A, Kam AJ. The hidden curriculum: a good thing? *Cureus*. 2019 Dec 6;11(12):e6305. doi: 10.7759/cureus.6305. [PMID: 31938597] [PMCID: PMC6944161]
11. Safari Y, Khatony A, Khodamoradi E, Rezaei M. The role of hidden curriculum in the formation of professional ethics in Iranian medical students: A qualitative study. *J Educ Health Promot*. 2020 Jul

- 28;9:180. doi: 10.4103/jehp.jehp_172_20. [PMID: 32953908] [PMCID: PMC7482700]
12. Nahardani SZ, Salami MR, Mirmoghtadaie Z, Keshavarzi MH. The Hidden Curriculum in Online Education Is Based on Systematized Review. *Shiraz E-Med J*. 2022 April; 23(4):e105445 . doi:10.5812/semj.105445.
13. Geladze D. Using the Internet and Computer Technologies in Learning/Teaching Process. *Journal of Education and Practice*. 2015;6(2):67-9.
14. Singh V, Thurman A. How many ways can we define online learning? A systematic literature review of definitions of online learning (1988-2018). *American Journal of Distance Education*. 2019;33(4):289-306 .doi:10.1080/08923647.2019.1663082.
15. Ellaway R, Masters K. AMEE Guide 32: e-Learning in medical education Part 1: Learning, teaching and assessment. *Med Teach*. 2008 Jun;30(5):455-73. doi: 10.1080/01421590802108331. [PMID: 18576185]
16. Benigno V, Trentin G. The evaluation of online courses. *Journal of Computer Assisted Learning*. 2000;16(3):259-70.
17. Anderson T. The hidden curriculum in distance education an updated view. *Change: the magazine of higher learning*. 2001;33(6):28-35 .doi:10.1080/00091380109601824.
18. Oztok M. The hidden curriculum of online learning: discourses of whiteness, social absence, and inequity. Toronto: University of Toronto; 2013.
19. Öztok M. The hidden curriculum of online learning: Understanding social justice through critical pedagogy. London: Routledge; 2019.
20. Meng Z. Research of Online Hidden Curriculum Based on Bigdate. Proceedings of the 17th International Conference on Bioinformatics and Intelligent Computing; 2021 Aug 12-15; Shenzhen, China. 2021.
21. Bigdeli S, Koohestani HR, Arabshahi SKS. Lived experiences of undergraduate medical students about hidden curriculum: A phenomenological study. *Acta Med Iran*. 2019;57(5):308-15. doi:10.18502/acta.v57i5.1867.
22. Neubauer BE, Witkop CT, Varpio L. How phenomenology can help us learn from the experiences of others. *Perspect Med Educ*. 2019 Apr;8(2):90-97. doi: 10.1007/s40037-019-0509-2. [PMID: 30953335] [PMCID: PMC6468135]
23. Fraenkel JR, Wallen NE, Hyun HH. How to design and evaluate research in education. 8nd ed. New York, Us: McGraw-Hill; 2012.
24. Morrow R, Rodriguez A, King N. Colaizzi's descriptive phenomenological method. *The Psychologist*. 2015;28(8):643-4.
25. Lincoln Y, Guba E. *Naturalistic inquiry* (Vol. 75). Beverly Hills, California: Sage; 1985.
26. Høgdal C, Rasche A, Schoeneborn D, Scotti L. Exploring student perceptions of the hidden curriculum in responsible management education. *Journal of Business Ethics*. 2021;168(1):173-93.
27. Karnieli-Miller O, Vu TR, Frankel RM, Holtman MC, Clyman SG, Hui SL, et al. Which experiences in the hidden curriculum teach students about professionalism? *Acad Med*. 2011 Mar;86(3): 369-77. doi: 10.1097/ACM.0b013e3182087d15. [PMID: 21248599]
28. Dere Z. Investigating the Creativity of Children in Early Childhood Education Institutions. *Universal Journal of Educational Research*. 2019;7(3):652-8. doi:10.13189/ujer.2019.070302.
29. Sorrentino C. Creativity Assessment in School: Reflection from a Middle School Italian Study on Giftedness. *Universal Journal of Educational Research*. 2019;7(2): 556-62. doi:10.13189/ujer.2019.070228.
30. Kian M, Ehsangar H, Izanloo B. The Effect of Hidden Curriculum on Creativity and Social Skills: The Perspective of Elementary Schools. *Journal of Social Behavior and Community Health*. 2020; 4(1): 487-96. doi:10.18502/sbrh.v4i1.2828.
31. Kusumaningrum DE, Budiarti EM, Triwiyanto T, Utari R. The effect of distance learning in an online learning framework on student learning independence during the Covid-19 pandemic. Proceedings of the 6th International Conference on Education and Technology (ICET); 2020 Oct 17; Malang, Indonesia. 2020.
32. Azadi Z, Ravanipour M, Yazdankhahfard M, Motamed N, Pouladi S. Perspectives of nursing and midwifery students regarding the role of the hidden curriculum in patient education: A qualitative study. *J Educ Health Promot*. 2017 Dec 4;6:108. doi: 10.4103/jehp.jehp_37_17. [PMID: 29296609] [PMCID: PMC5747219]
33. Van Deven T, Hibbert K, Faden L, Chhem RK. The hidden curriculum in radiology residency programs: A path to isolation or integration? *Eur J Radiol*. 2013 May;82(5):883-7. doi: 10.1016/j.ejrad.2012.12.001. [PMID: 23305755]
34. Basyiruddin M. Teaching strategies as a powerful hidden curriculum: A review study. Proceedings of the 3rd International Conference on Learning Innovation and Quality Education (ICLIQE); 2019 Sep 7; Surakarta, Indonesia. 2019.
35. Azimpour E, Khalilzade A. Hidden curriculum. *World Essays Journal*. 2015;3(1):18-21.
36. Karimi Z, Ashktorab T, Mohammadi E, Abedi H. Influential factors on learning through the hidden curriculum in the perspective of undergraduate baccalaureate nursing students. *J Adv Med Educ Prof*. 2014 Apr;2(2):53-7. doi:10.4103/2277-9531.162368. [PMID: 25512920] [PMCID: PMC4235555]

Requirements, Criteria, Challenges, and Solutions for the Internationalization of Medical Education in Iran: A Qualitative Study

Salman Bashzar¹, Vahid Yazdi Feyzabadi², Atefeh Ahmadi³, Fatemeh Karami Robati⁴, Masoomeh Shahsavari⁴, AliAkbar Haghdoost⁵, Bagher Amirheidari⁶

¹PhD, Student Research Committee, Faculty of Management and Medical Information Sciences, Kerman University of Medical Sciences, Kerman, Iran

²Associate Professor, Health Services Management Research Center, Institute for Futures Studies in Health, Department of Health Management, Policy and Economics, Faculty of Management and Medical Information Sciences, Kerman University of Medical Sciences, Kerman, Iran

³Reproductive Health, Family and Population Research Center, Department of Counselling in Midwifery, Razi Faculty of Nursing and Midwifery, Kerman University of Medical Sciences, Kerman, Iran

⁴MSc, Clinical Research Development Unit, Afzalipour Hospital, Kerman University of Medical Sciences, Kerman, Iran

⁵Professor, Health Modeling Research Center, Institute for Futures Studies in Health, Kerman University of Medical Sciences, Kerman, Iran

⁶Associate Professor, Department of Pharmaceutical Biotechnology, Pharmaceutics Research Center, Institute of Neuropharmacology, Faculty of Pharmacy, Kerman University of Medical Sciences, Kerman, Iran

Received: 2023 February 20

Revised: 2023 June 06

Accepted: 2023 August 21

Published online: 2023 August 24

***Corresponding author:**

Department of Pharmaceutical Biotechnology, Faculty of Pharmacy, Kerman University of Medical Sciences, Kerman, Iran.
Email: baheidari@gmail.com

Citation:

Bashzar S, Yazdi Feyzabadi V, Ahmadi A, Karami Robati F, Shahsavari M, Haghdoost AA, Amirheidari B. Requirements, Criteria, Challenges, and Solutions for the Internationalization of Medical Education in Iran: A Qualitative Study. *Strides Dev Med Educ.* 2023 August; 20(1):118-125.
doi:10.22062/sdme.2023.198164.1177

Abstract

Background: Despite some obstacles, internationalization of medical education can promote the educational, research and clinical level of universities.

Objectives: The purpose of this study was to explore the opportunities, challenges, and solutions of the internationalization of higher medical education in Iran.

Methods: The present qualitative study was conducted with Brown and Clark's thematic content analysis approach. Purposeful sampling was performed using the snowball strategy, and the data were collected using semi-structured interviews. The statistical population included Iranian students and professors residing in universities abroad, experts and key officials working in the Deputy of International Relations in Iran's Ministry of Health and Medical Education, the Vice-Chancellors of the International Relation Units of the country's universities of medical sciences, and foreign students studying in Iran's universities of medical sciences. The data were gathered by conducting 17 interviews with eligible individuals following the principle of data saturation. Finally, the data were subjected to thematic analysis by MAXQDA-10 software.

Results: The data extracted from the interviews were categorized into 268 codes, 29 subcategories, and six categories. The themes identified were "specifications of an international higher education center", "advantages of internationalization", and "necessary items and requirements" in the field of requirements and criteria, "weaknesses and challenges of internationalization" in the field of challenges, "operational solutions for addressing challenges" and "successful domestic and foreign experiences of the internationalization of higher medical education centers" in the field of solutions. The subthemes of "weaknesses and challenges at the level of the university" and "hardware specifications" attained the highest frequency among open codes.

Conclusion: A need to be responsive to many present and future needs of our country necessities that the higher medical education system moves in parallel with the globalization process and multicultural societies. In this regard, officials should pay attention to the requirements, criteria, challenges, and solutions of the internationalization of higher medical education in Iran based on the evidence disclosed in this study.

Keywords: Internationalization; Medical Education; Challenges; Requirements; Criteria; Iran

Background

Universities' fundamental functions are among the most important factors shaping the future world (1), and

the need to adjust these functions is becoming more evident every day in response to cultural exchanges and globalization (2, 3). The internationalization of

universities is considered a way to establish intercultural and global relationships in the higher education system (2) and a planned response to the globalization process (4). There are a number of strategies for societies and institutions to move toward internationalization, originating from the demands arising from efforts for globalization (4, 5). This phenomenon also consists of consensus-based cooperation between universities in the fields of education, research, and service provision (6), which changes the world of higher education (7). Two indispensable parts of internationalization are international students and cooperation (8).

It is expected that universities across the world will host about 8 million international students by 2025 (9). Higher education institutions in many regions of the world give priority to internationalization, and countries pursue different goals for attracting international students in the future (10-13). This event requires establishing effective communication between higher education systems as a necessary revolution (14, 15). Across the world, the international affairs of educational systems are expanding in the context of becoming global citizens and being obliged to develop and empower these citizens (16). Since science recognizes no boundaries, universities should inevitably be considered international institutions (17).

Among the benefits of internationalization for universities are the promotion of national identity, improvement of the quality of education through reforms (18), scientific development, facing countless economic opportunities, and transformation into a financial source (2, 19). From a cultural point of view, the most important function of the internationalization of higher education includes the expansion and spread of national values and cultural principles at the international level (2, 20).

In most European countries, the internationalization of higher education is one of the goals of standardization and is seen as a process that offers universities an economic opportunity by attracting investment. Strategies such as dynamic international students and promoting the qualifications of personnel have helped this process for years; however, even big plans such as Erasmus are sometimes unwelcomed by some states or professors (21-23). Creating appropriate curricula and futurism are among the challenges of the internationalization of universities in many Asian countries (22), which can be obviated by quality promotion and the regionalization and unifying of internationalization policies (23). For example, China has already started harmonizing its national policies

regarding the internationalization of higher education (24). An important challenge faced by many countries in this regard includes close-minded brains and the departure of elites (25). Anyway, many countries, including African and Latin American countries, have embarked on this journey and are trying to solve obstacles and enforce their strengths in this field (26, 27).

It is necessary for Iran's higher education system to move toward internationalization, and reasons for this notion include the necessity of knowing other nations and cultures, identifying and addressing the needs of the global community, and becoming the top scientific power in the region in line with the objectives of the country's 20-year vision document (16). In this regard and in pursuit of the benefits of internationalization, Iran, and particularly the Ministry of Health and Medical Education, has set a clear path for the country's medical universities by offering medical education transformation and innovation plans in the form of transformation packages in the fourth step of the health system transformation plan. In line with this policy and considering the lack of adequate studies on the structure of medical sciences universities, this study aimed to assess the requirements, criteria, challenges, and solutions of the internationalization of Iran's higher medical education system.

Objectives

The purpose of this study was to explore the opportunities, challenges, and solutions of the internationalization of higher medical education in Iran.

Methods

Since Iran has focused on admitting the maximum number of foreign students in its universities, and the fact that no qualitative study has yet been conducted to thoroughly explore the requirements, criteria, challenges, and solutions of the internationalization of higher medical education in Iran, we decided to conduct this study with a qualitative approach. The present qualitative study was conducted on 17 people, recruited by purposeful sampling and the snowball strategy, using thematic content analysis method (28, 29). Data collection was performed using semi-structured interviews.

Participants in this study were recruited using purposeful sampling and the snowball strategy. For this purpose, initially, a list containing the names of people involved in the internationalization of Iran's medical sciences universities and those having rich information on this topic (for example, because of studying or

teaching in universities abroad) was prepared. Then according to eligibility criteria (being informed of the process of the internationalization of universities, being studying or teaching at universities abroad, managers and officials in charge of the internationalization of the higher medical education system, or foreign students studying in Iran’s medical sciences universities), people were chosen as participants in the study. In order to ensure to include of all possibly eligible people, participants during interviews were requested to introduce experts in the field who possibly could fulfill inclusion criteria.

After selecting the research participants and contacting them via a phone call or e-mail, the interview guide was sent to them via e-mail. After making the necessary arrangements, the interview’s time and place were determined considering the preferences of the interviewees, and informed consent was obtained from them. During the interview, the participants were fully explaining the objectives and protocols of the study, and their consent was obtained regarding the voice recording of the interview. Data collection was conducted using semi-structured interviews.

Considering the main questions of the research, the interview was started with open-ended questions such as: "In your opinion, what are the characteristics of a higher medical education center?", "Could you please note the criteria and requirements of the internationalization of higher medical education?" or "Would you please state the challenges, weaknesses, solutions, and strengths of the internationalization of

higher medical education in Iran?". The subsequent probing questions were then asked to enrich the data. The validity and reliability of the interview questions were assessed by the criteria proposed by Lincoln and Guba (30). The texts of the interviews were transcribed precisely and verbatim after the end of each interview. The interviews were conducted considering the principle of data saturation, meaning that data collection through interviews continued until reaching the understanding that the interviews provided no new information.

In this study, 17 people fulfilled our inclusion criteria, whose gender distribution and educational characteristics at the time of the interviews have been provided. Overall, 88.23% of the interviewees were males with doctorate degrees working in a university. The duration of the interviews varied between 40 and 80 minutes. Interviews with people outside Iran were conducted virtually and with people inside Iran either in-person or virtually. The instructions and duration of the interview were initially informed to the participants at the beginning of the session so that they could manage the time dedicated to responding to the questions. Considering that the study was conducted during the Covid-19 pandemic, only four (23.52%) of the participants preferred in-person interviews, seven (41.17%) of them were interviewed by phone, and six (35.29%) individuals were interviewed via virtual communication applications (Skype and WhatsApp) (Table 1).

Table 1. The Characteristics of the Interviewees Participating in this Research

Variable	Domains	Number
Executive position	Deputy Minister of Education of the Ministry of Health, Treatment, and Medical Education	1
	The director of the international affairs of the university or faculty	5
	Foreign students studying in Iran’s universities	2
	Employees at research centers affiliated with medical universities	4
	Employees at educational departments affiliated with medical universities (professors and staff)	5
Educational level	Foreign student	11.77%
	Holding a doctorate or Ph.D. degree	88.23%
Gender	Female	11.77%
	Male	88.23%
Interview method (%) and duration	In-person (373 minutes)	23.52%
	Telephone (434 minutes)	41.17%
	Virtual communication applications (160 minutes)	35.29%

The reliability of the data was ensured according to the four criteria proposed by Lincoln and Guba, including validity, transferability, reliability, and verifiability. For validity and verifiability, experts in the internationalization, medical education, and qualitative study methodology fields were invited to participate in

the research as a strategy to achieve triangulation and, more deeply, divulge the topic. In addition, for the triangulation of data resources, the interviewees were selected purposefully from diverse groups, such as foreign students studying in Iran, Iranian students studying abroad, as well as professors, researchers, and

activists engaged with management and policymaking in the internationalization of higher medical education. In addition, data coding was conducted by two members of the research team, and when there were disagreements and ambiguities in the codes extracted, group discussions with the participation of other team members were held to resolve the issue. Using the continuous comparative analytic strategy and repeatedly surfing through code extraction steps, the accuracy, consistency, meaningfulness, and analyzability of the model and research findings were employed to ensure the validity of the data (31).

Moreover, the details of the research protocol, including the composition of the interviewees and data collection and analysis methods, were clearly described. When reporting the findings, relevant and suitable quotes from the interviewees were provided to explain field experiences and compare them with other studies if necessary. For reliability, after reaching data saturation (i.e., the emergence of no further information with regard to the main question), two additional interviews were conducted to ensure data sufficiency. After data transcription on paper

by typing, the data were entered into MAXQDA software (version 10) for analysis. After reading the data several times to acquire a good grasp of the interviews' concepts, primary codes were identified, and this process was repeated until recognizing the main theme and sub-themes. For each interview, data analysis was started by repeatedly reading the data to achieve data immersion and a feeling of sinking into a whole (as reading a novel). Then the interview texts were read verbatim, and the primary codes were extracted by highlighting unique words that could possibly harbor key ideas or concepts. Note-taking from the primary perceptions was used to close the primary impressions and thoughts to the text. This process continued until the extraction of the primary codes from the text, which were then categorized into sub-themes based on their links and connections. These newly merged categories were utilized to organize and classify the codes into meaningful themes. Subsequently, the researcher specified a unique and comprehensive title based on the shared meanings existing between the codes of a given category. Finally, the themes, sub-themes, and codes identified in the study were described (Table 2).

Table 2. The Main Themes and Subthemes and Respective Number of Open Codes

Main themes	Subthemes	Number of codes
Specifications of an international higher education center	Hardware features	17
	Intellectual features	11
	Software features	10
Necessary criteria and requirements for the internationalization of medical universities	Political criteria and requirements	10
	Legal criteria and requirements	5
	Economic criteria and requirements	4
	Cultural criteria and requirements	9
	Academic criteria and requirements	13
	Communication criteria and requirements	11
	Managerial criteria and requirements	9
Weaknesses and challenges of internationalization	Political weakness and challenges	12
	Socio-cultural weakness and challenges	9
	Environmental and physical weaknesses and challenges	7
	Academic weaknesses and challenges	20
	Structural and administrative weaknesses and challenges	14
	Economic weakness and challenges	3
	Technological weaknesses and challenges	4
Operational solutions to resolve available challenges	Political, cultural, and social suggestions and solutions	14
	Technological and communication suggestions and solutions	14
	Economic suggestions and solutions	3
	Educational and research suggestions and solutions	10
	Structural and administrative suggestions and solutions	10
Advantages of internationalization of Iran's higher education system	Political strengths	5
	Socio-cultural strengths	6
	Scientific strengths	11
	Geographical strengths	4
	Structural and administrative strengths	7
Successful domestic and foreign experiences of internationalization of higher medical education centers	Successful experiences inside the country	12
	Successful experiences abroad	4

Results

The analysis of 17 interviews conducted with the participants revealed 268 codes, 29 sub-themes, and six themes (Table 1). Based on thematic content analysis and the main themes identified in this research, the interviewees denoted factors that can be very helpful for the internationalization of higher medical education. The themes emerged were as follows: "specifications of an international higher education center", "advantages of internationalization", and "necessary items and requirements" in the field of requirements and criteria, "weaknesses and challenges of internationalization" in the field of challenges, "operational solutions for addressing challenges" and "successful domestic and foreign experiences of the internationalization of higher medical education centers" in the field of solutions.

The subthemes of "weaknesses and challenges at the level of the university" and "hardware specifications" attained the highest frequency among open codes.

Specifications of an International Higher Medical Education Center

Regarding the features of a higher medical education center, three items, including hardware, software, and intellectual features, were prominent. So, it can be noted that being equipped with suitable tools, having adequate physical spaces, the existence of active and enthusiastic human resources, seeing internationalization as a necessary requirement, and taking into consideration an internationalization continuum when making decisions are among the main characteristics of an international higher education center.

Participant No. 5 stated: "...managers' believing in internationalization and their trying to be present in this field, as well as considering an internationalization continuum before making any decision, are among the main specifications of an international educational center".

Necessary Items and Requirements for the Internationalization of Medical Sciences Universities

In response to the question of what are the necessary criteria and requirements for the internationalization of higher medical education, the interviewees raised a number of issues, which were classified into several categories, including political, legal, economic, cultural, university-related, communication, and managerial. Examples of these items included having political and diplomatic relations with numerous countries, political support from high-ranked policymakers, coordination of internationalization policies with the country's political visions, legal facilitating the issuance of visas for

foreign students and professors, valuing the rules and regulations governing international communications, paying attention to internationalization when hiring professors and establishing necessary standards, engaging universities' boards of directors and trustees, discarding complicated rules and regulations, increasing the internationalization budget of universities, nurturing a multicultural environment and flexibility in facing other cultures in universities, paving the ground for international research opportunities, active participation in international relations, exchanging information about internationalization requirements with other domestic and foreign universities, changing the attitude and understanding of managers towards internationalization, changing the organizational structure of medical universities in favor of internationalization, etc. These were among the sub-themes noted in this research as the necessary criteria and requirements of internationalization.

One of the interviewees (No. 7) stated: "... beyond all, an organization's authorities should truly believe in internationalization because not only there is a need to create structural changes, but also visions, strategies, and attitudes ... so, the selection of people should be tailored accordingly".

Discussion

Universities can solve social problems substantially and help the community achieve scientific advancements only when they deliver high-quality performance in terms of education and research (32). One of the strategies that developing countries can employ to improve the quality of research and education in their universities is to establish international communication (33). This agrees with the results of the present study, as the participants reiterated the importance of establishing international communication at all levels and policy areas.

The criteria and requirements of internationalization in the field of medical education encompass multiple areas and three generations of international universities, and each of these generations has its own challenges and advantages (34). In terms of political requirements, the most important items include establishing political and diplomatic relations with other countries, the need for high-rank policymaking and political support for the internationalization of universities, the coordination of higher education internationalization policies with national political values, facilitating the rules of issuing

visas for foreign students and professors, valuing the rules and regulations related to international communication, paying attention to internationalization when hiring professors, and creating necessary standards (35). The most important role of the government regarding the internationalization of higher education is to support strategic thinking in this area. In fact, state policies have a decisive role in countries where universities are affiliated with the government. Overall, 41% of international students around the world are studying in countries that have a national strategic plan for the internationalization of higher education and have chosen English as their second language (36).

The solutions raised in this study have also been emphasized in other articles (37). Likewise, the weaknesses and challenges of internationalization mentioned are in line with similar studies (38). Political and security issues and realities, especially the fear of terrorism, education costs, and the process of obtaining visas, have always been among the parameters with negative impacts on the internationalization of universities (39). The poor spirit for researching, poor English language skills, and poor literature search skills among students and professors were among the most important challenges of higher education (40). Therefore, educational institutions should consider revising their traditional teaching methods and employing new alternative techniques if they want to sustain in the present and future (1), a notion mentioned by most of our participants in this study. The specific and operational suggestions and solutions raised by the interviewees to overcome the existing challenges were confirmed by similar studies (41, 42). The strengths of the internationalization of the higher education system in Iran have also been reiterated in similar studies (43).

The benefits of internationalization for medical universities encompass political, cultural, social, and economic venues. Studies have noted the positive outcomes of the internationalization of education, such as the expansion of intercultural communication skills (44), technology transfer, strengthening of political relations (45), attracting foreign elites, increasing international cooperation, increasing scientific research and products, economic productivity, and financial venues (42), supporting the results of the present study.

Consistent with similar studies, a number of disadvantages were noted for the internationalization of higher education, such as the departure of elites, conflicts between the roles of the university as a political

or national organization (39), reduced diversity of curricula, excessive use of English as the second language, and the commercialization of education (42). It is worth mentioning that the issue of the departure of elites was noted only by one of our participants.

Evaluating the internationalization of the higher education system in the United States, Canada, and Australia showed that the most important strategy employed by these countries was the internationalization of the curriculum via learning and integrating international content into the existing curricula. However, translocating professors and students in the context of exchange programs is less popular, while priority is given to local and national curricula in each country (46).

Limitations: This study coincided with the Covid-19 pandemic, which limited our capability to conduct face-to-face interviewees with some of the participants, somehow interfering with data collection. This is the first qualitative study deeply exploring the viewpoints of students, professors, and managers regarding internationalization in the context of medical education to disclose the requirements, criteria, and challenges of the internationalization of higher medical education in Iran. However, considering the cross-sectional nature of the study, we cannot rule out changes in the opinions of the participants due to alterations in the respective criteria and challenges of internationalization over time due to social, political, economic, and cultural transitions.

Conclusion

The findings of the study indicate that responding to the numerous needs of the country requires that higher medical education moves towards globalization and creating multicultural societies. Regarding the specification of internationalization, it is required not only to benefit from appropriate equipment, physical spaces, and active and enthusiastic human resources but also to see internationalization as a necessity for the university. There is a need to prepare and adhere to an internationalization continuum before making any decision in the university. The Ministry of Health and medical universities in Iran, as the representative of the government in the field of medical education, should pay attention to the following:

- Creating a suitable structure for the university tailored to the culture of the indigenous people living around the university

-Developing an internationalization continuum at the national and provincial levels and adhering to it before making any decision related to the field of medical sciences

-Creation of local standards comparable to international norms

-Reorganizing and developing infrastructure compatible with international standards

-Reviewing the organizational structure of medical universities to comply with internationalization

-Creating an international language in universities

-Establishing scientific and research communication with reputable universities around the world

-Establishing diplomatic relations with countries hosting reputable universities (macro policymaking)

-Supporting students and professors participating in international activities

-Efforts to remove internal and external sanctions (macro and social policymaking)

Considering the high potential of Iran's medical universities for internationalization in the field of medical education, it is advisable to prioritize removing barriers and fulfilling requirements in this area to promote the internationalization of these universities.

Supplementary material(s): is available here [To read supplementary materials, please refer to the journal website and open [PDF/HTML](#)].

Acknowledgements: We thank the Deputy of Research and Technology of Kerman University of Medical Sciences, the National Center for Strategic Research in Medical Education of Iran, and all those who helped us conduct this study.

Conflict of interests: Authors declared no conflict of interest.

Ethical approval: This study was approved by the Ethics Committee of Kerman University of Medical Sciences under the code IR.KMU.REC.1397.517.

Funding/Support: This research project was approved by the Deputy of Research and Technology of Kerman University of Medical Sciences under the number 97000462 and by the National Center for Strategic Research in Medical Education of Iran under code 961964.

References

1. Hejrati MS. A brief look at the country's higher education system and some of its challenges. Proceedings of the National Higher

Education Congress of Iran; 2016 Apr 14; Tehran, Iran. 2016. [In Persian]

2. Shamsi Gooshki E, Pourabbasi A, Akbari H, Rezaei N, Arab Kheradmand A, Kheiry Z, et al. Internationalization of medical education in Iran: A way towards implementation of the plans of development and innovation in medical education. *J Adv Med Educ Prof.* 2018 Jan; 6(1): 43-8. doi:10.30476/jamp.2018.43341. [PMCID: PMC5757156] [PMID: 29344529]

3. Sarkarani MR. Internationalization of Higher Education. *Journal of Political and Economical Information.* 2002;306:183-4.

4. Mosavi T, Nave Ebrahim A, Araste HR, Abdollahi B. Analysis of the inside and outside of universities outcomes of internationalization for the Iranian Selected State Universities. *Journal of Innovation and Value Creation.* 2020;17(9):85-104. [In Persian]

5. Wilkins S, Huisman J. International student destination choice: The influence of home campus experience on the decision to consider branch campuses. *Journal of Marketing for Higher Education.* 2011;21(1):61-83. doi: 10.1080/08841241.2011.573592.

6. Rezaei H, Yousefi AR, Larijani B, Dehnavieh R, Rezaei N, Adibi P. Internationalization or globalization of higher education. *J Educ Health Promot.* 2018 Jan 10;7:8. doi: 10.4103/jehp.jehp_25_17. [PMID: 29417068] [PMCID: PMC5791431]

7. Knight J. Crossborder education: An analytical framework for program and provider mobility. Higher education: Handbook of theory and research. Dordrecht, Netherlands: Springer; 2006: 345-95. doi:10.1007/1-4020-4512-3_7.

8. Rezaei H, Yousefi A, Larijani B, Rezaei N, Adibi P. Road map of Iran's internationalization of medical sciences education: Experience of Isfahan University of Medical Sciences. *Iran J Med Educ.* 2017;17:125-33. [In Persian]

9. Siegmund J, Rawdon B, Ren C. Top Markets Report Education: A Market Assessment Tool for US Exporters. [cited 2016 May 8]. Available from: https://legacy.trade.gov/topmarkets/pdf/Education_Top_Markets_Report.pdf.

10. Alfaro L, Ketels C. Microeconomics of competitiveness: Singapore's higher education aspiration. [cited 2016 May 06]. Available from: <https://www.isc.hbs.edu/Documents/resources/courses/moc-course-at-harvard/pdf/student-projects/Singapore%20Higher%20Education%202016.pdf>.

11. Hearn R, editor Global trends & disruptors in international student referrals. Melbourne: ANZA; 2016.

12. O'Connor A. A conceptual framework for entrepreneurship education policy: Meeting government and economic purposes. *Journal of Business Venturing.* 2013;28(4):546-63. doi:10.1016/j.jbusvent.2012.07.003.

13. Blackwell B. Industrial strategy: Government and industry in partnership—Building Information Modelling. London: HM Government; 2012.

14. DeBoer GE. The globalization of science education. *Journal of Research in Science Teaching.* 2011;48(6):567-91. doi:10.1002/tea.20421.

15. Marashi S, Mehralizadeh Y, Toosi T. Globalization and its Effects on Curriculum Goals in Educational System of Iran. *Journal of Educational Sciences.* 2013;20(1):51-74. [In Persian]

16. Khoshnoodifar M, Fathi Vajargah K. Internationalization distance education curricula in Iran higher education. *Technology of Education Journal.* 2012;6(1):1-18. doi:20.1001.1.20080441.1390.6.1.1.9. [In Persian]

17. Bostrom CA. Diffusion of internationalization in Turkish higher education. *Journal of Studies in International Education*. 2010;14(2):143-60. doi:10.1177/1028315309332028.
18. De Vita G, Case P. Rethinking the internationalisation agenda in UK higher education. *Journal of Further and Higher Education*. 2003;27(4):383-98. doi:10.1080/0309877032000128082.
19. Fazeli N. Globalization and Higher Education: Global Trends in the Institution of Higher Education and The Status of Higher Education in Iran. *Social Sciences*. 2004;11(25):1-41. [In Persian]
20. De Wit H. Internationalization of higher education in the United States of America and Europe: A Historical, Comparative, and Conceptual Analysis. London: Greenwood Press; 2002.
21. Yilmaz G. Emulating Erasmus? Turkey's Mevlana exchange program in higher education. *Asia Europe Journal*. 2019;17(2):145-59. doi:10.1007/s10308-017-0497-y.
22. Ng SW. Rethinking the mission of internationalization of higher education in the Asia-Pacific region. *Compare: A Journal of Comparative and International Education*. 2012;42(3):439-59. doi:10.1080/03057925.2011.652815.
23. Tanhuenco-Nepomuceno L. Internationalization among selected HEIs in the ASEAN region: Basis for a proposed framework for an internationalized campus. *International Journal of Educational Development*. 2019;65:152-71. doi: 10.1016/j.ijedudev.2018.07.003.
24. Pan SY. China's approach to the international market for higher education students: strategies and implications. *Journal of Higher Education Policy and Management*. 2013;35(3):249-63. doi:10.1080/1360080X.2013.786860.
25. Tight M. Internationalisation of higher education beyond the West: challenges and opportunities—the research evidence. *Educational Research and Evaluation*. 2022;27(3-4):239-59. doi:10.1080/13803611.2022.2041853.
26. Guilherme A, Morosini M, Kohls dos Santos P. The process of internationalisation of higher education in Brazil: the impact of colonisation on south-south relations. *Globalisation, Societies and Education*. 2018;16(4):409-21. doi: 10.1080/14767724.2018.1440351.
27. Thondhlana J, Abdulrahman H, Chiyevu Garwe E, McGrath S. Exploring the internationalization of Zimbabwe's higher education institutions through a decolonial lens: postcolonial continuities and disruptions. *Journal of Studies in international Education*. 2021;25(3):228-46. doi:10.1177/1028315320932319.
28. Graneheim UH, Lundman B. Qualitative content analysis in nursing research: concepts, procedures and measures to achieve trustworthiness. *Nurse Educ Today*. 2004 Feb;24(2):105-12. doi: 10.1016/j.nedt.2003.10.001. [PMID: 14769454]
29. Hsieh HF, Shannon SE. Three Approaches to Qualitative Content Analysis. *Qual Health Res*. 2005 Nov;15(9):1277-88. doi: 10.1177/1049732305276687. [PMID: 16204405]
30. Lincoln YS, Guba EG. *Naturalistic inquiry*. California, US: Sage; 1985. doi:10.1016/0147-1767(85)90062-8.
31. Braun V, Clarke V. Using thematic analysis in psychology. *Qualitative Research in Psychology*. 2006;3(2):77-101. doi:10.1191/1478088706qp063oa.
32. Sotodeh Asl N, Ghorbani R, Rashidy-Pour A. Restrictive factors in medical research in the viewpoint of students of Medical Sciences University of Semnan. *Koomesh*. 2015; 17(1):267-76. [In Persian]
33. Arasteh HR. International Higher Education Contributions in Iran and How to Improve Them. *Quarterly Journal of Research and Planning in Higher Education*. 2006;12(1):99-115. [In Persian]
34. Knight J. International universities: Misunderstandings and emerging models? *Journal of Studies in International Education*. 2015;19(2):107-21. doi:10.1177/1028315315572899.
35. Valimoghaddam S, Kamali N, Mojtazadeh M. Role of government in internationalization of higher education in Universities of Medical Sciences of the Country: A Qualitative Research. *J Journal of Medical Education Development*. 2019;12(33):43-55. doi:10.29252/edcj.12.33.66.
36. Curaj A, Deca L, Pricopie R. European higher education area: The impact of past and future policies. Cham, Switzerland: Springer Nature; 2018. [PMCID:PMC6045661]
37. Moosavi MM, Azizi M, Badizadeh A, Rezghi H. Identifying the Components of Internationalization of Higher Education (Case Study: Medical Services Education Industry). *Journal of Healthcare Management*. 2019;9(4):7-18.
38. Nikbin M, Zakersalehi G, Mahozi R. The Model of Internationalization of Higher Education from Cultural Policy Perspective. *Journal of Science and Technology Policy*. 2017;10(3):33-43. doi: 20.1001.1.20080840.1396.10.3.5.8. [In Persian]
39. Altbach PG, Teichler U. Internationalization and exchanges in a globalized university. *Journal of Studies in international Education*. 2001;5(1):5-25. doi:10.1177/102831530151002.
40. Rahmanpour M, Leyagatdar MJ, Afshar E. A comparative study of the development of information technology in higher education worldwide with an emphasis on Iranian higher education system. *Educational Researches*. 2009;5(18):1-39. [In Persian]
41. Ardakani FB, Yarmohammadian MH, Abari AAF, Fathi K. Internationalization of higher education systems. *Procedia Soc Behav Sci*. 2011;15:1690-5. doi:10.1016/j.sbspro.2011.03.353.
42. Knight J. 2005 IAU Global Survey Report: Internationalization of Higher Education: New Directions, New Challenges. Paris, France: International Association of Universities (IAU); 2006.
43. Galavandi H, Hasani M, Moradi Z. Analysis and evaluation of the country's universities status in the indicators of internationalization of higher education from the perspective of students. *Public Organizations Management*. 2018;6(3):157-73.
44. Grünzweig W, Rinehart N. *Rockin'in Red Square: Critical approaches to international education in the age of cyberculture*. New Brunswick, New Jersey: LIT Verlag Münster; 2002.
45. Tremblay K. Academic mobility and immigration. *Journal of Studies in International Education*. 2005;9(3):196-228. doi:10.1177/1028315305277618.
46. Behjati Ardakani F, Yarmohammadian MH. Comparative studying internationalizing high education in different countries of the world and presenting proper model in Iran. *Journal of New Approach in Educational Administration*. 2018;9(3):1-18. [In Persian]

Socialization Training Courses for Medical Sciences Students: Bridging the Gap Between Theoretical and Clinical Education

Mohammad Hossain Mehrolohasani¹, Rohaneh Rahimisadegh^{2*}

¹PhD in Health Care Management, Professor of the Department of Health Management, Policy and Economics, Faculty of Management and Medical Information Sciences, Kerman University of Medical Sciences, Kerman, Iran.

²PhD in Health Care Management, Health Services Management Research Center, Institute for Futures Studies in Health, Kerman University of Medical Sciences, Kerman, Iran.

Received: 2023 August 20; **Revised:** 2023 September 11; **Accepted:** 2023 September 25; **Published online:** 2023 September 26

***Corresponding author:** Health Services Management Research Center, Institute for Futures Studies in Health, Kerman University of Medical Sciences, Kerman, Iran. Email: rhn.rahimi@gmail.com

Citation: Mehrolohasani MH, Rahimisadegh R. Socialization Training Courses for Medical Sciences Students: Bridging the Gap Between Theoretical and Clinical Education. Strides Dev Med Educ. 2023 September; 20(1):126-128. doi: 10.22062/sdme.2023.198888.1265.

Keywords: Socialization Training, Medical Science Students, Curriculum Design

Dear Editor,

The primary mission of medical sciences universities is to provide opportunities for students to acquire and enhance their knowledge, attitudes, and skills. The goal is to develop the necessary competence in students, aligning them with societal expectations of becoming specialized professionals who, upon entering society, can perform specialized tasks while adhering to professional principles. Their aim is to contribute to the improvement of public health (1). Achieving this mission necessitates close collaboration between faculties and medical training centers. Recognizing the significance of this collaboration, a substantial structural change took place in the country's healthcare system in 1364 when all educational institutions responsible for medical sciences education transitioned from the Ministry of Higher Education to become part of the Ministry of Health, subsequently known as the Ministry of Health, Treatment, and Medical Education (2,3).

Students across various medical sciences fields, being the future specialized workforce of the healthcare system, bring with them unique perspectives, attitudes, ethics, and behaviors shaped by their life experiences. These values and expectations significantly influence their initial perceptions as they enter the hospital environment (4). Many medical students encounter challenges when they are exposed to new conditions in

medical settings without adequate preparation. This can lead to frustration and reduced motivation in performing assigned tasks, ultimately impacting the quality of education and, subsequently, the quality of healthcare services (5). Research results indicate that some medical students lack the necessary skills and competencies upon entering society and healthcare service environments. Contributing factors include insufficient coordination between theoretical and clinical courses, unclear clinical education objectives, and high-stress environments like hospitals (6). Solutions to address these issues involve a need to review clinical education programs and methods, as well as a focus on the quality of pre-clinical education to better prepare students for their hospital experiences (7).

Orientation training courses, often referred to as socialization courses, play a vital role in helping students from various disciplines navigate the challenges they encounter when entering the hospital environment. These courses should encompass a comprehensive range of essential and relevant subjects, tailored to meet the specific needs of the students (4). Research findings underscore the significance of educational courses designed to address the unique requirements of new students as they enter the hospital setting (8). Effective implementation of orientation training courses enhances students' self-confidence in performing

clinical skills and making decisions, ultimately contributing to their professional satisfaction (5).

While the significance of developing educational programs cannot be overstated, any oversight during the program development stages can yield undesirable outcomes in the field of education. This article delves into the experience of the Afzalipur Medical Education Center in Kerman, specifically focusing on the planning of socialization training courses for medical science students, a venture undertaken in 2019.

Problem design and general needs assessment

Until 2019, with the commencement of each new academic year and the arrival of diverse medical science students at Afzalipur Medical Education Center, a brief and generic orientation course lasting 2 to 3 hours was conducted under the purview of the center's Vice President of Education. However, prompted by patient and staff grievances stemming from medical and paramedical students' lack of knowledge in certain areas, there arose a need for the development of more comprehensive and suitable content in the form of socialization training courses within the hospital.

Needs assessment of the target group

To assess the requirements and determine suitable educational topics tailored to students from various fields as target demographics, a series of three focused independent group discussions were conducted. These sessions included 15 members of the center's management and leadership team, academic staff physicians from the center, representatives from the university's Office of Education, and student representatives, each representing different disciplines. Additionally, the experiences of other universities of medical sciences across the country were leveraged during this phase. Following the compilation of results, a questionnaire was developed and subjected to two rounds of Delphi consensus, involving the center's management and leadership team and physicians. Ultimately, the training course subjects were categorized into seven general modules based on the needs assessment summary. These modules encompass: 1. Familiarization with the Center, 2. Medical and Professional Ethics and Conduct, 3. Holistic Medicine with an Emphasis on Health Promotion, 4. Principles of Health and Safety, 5. Risk, Disaster, and Crisis Management, 6. Development of Individual and Group Skills, 7. Enhancement of Specialized and Professional Competencies.

Determining educational goals and strategies

Following the identification of the educational needs for each group of students and the specification of the subjects and courses corresponding to each student's field of study, the third stage involved establishing overarching and specific goals for each course and educational topic. These objectives encompassed cognitive, emotional, and psychomotor domains. In the fourth stage, which pertains to educational strategies, the content of the educational program and the instructional methods were delineated. This was done with the aim of enhancing the likelihood of achieving the educational objectives, and it was accomplished through focused group discussion sessions.

Implementation and evaluation of training courses

In the fifth phase of implementing the educational program, educational experts from the center's vice-chancellor of education collaborated with professors and student representatives to formulate the course schedule. Additionally, meetings involving the center's management team, including the Chairman, Director, Vice President of Education, and Vice President of Center Treatment, were conducted to ensure optimal course arrangements and delivery. For the evaluation phase, Kirkpatrick's model was employed to assess the effectiveness of the educational program at two levels: reaction and learning.

This study involved the development of a curriculum for orientation courses aimed at medical students embarking on their hospital internships and clinical rotations. The curriculum was created in a comprehensive manner, with active involvement from the relevant stakeholders. The implementation of such socialization courses, featuring relevant and contemporary content, serves as an effective bridge connecting theoretical and clinical education within the realm of medical science education. This approach ensures that theoretical knowledge acquired within the confines of academic institutions is seamlessly integrated into the clinical environment. The findings of this study can offer valuable insights for other educational and medical centers across the country.

Supplementary material(s): is available here [To read supplementary materials, please refer to the journal website and open [PDF/HTML](#)].

Conflict of interests: Authors mention that there is no conflict of interests in this study.

Ethical approval: Not applicable.

Funding/Support: Not applicable.

References

1. Brennan MD, Monson V. Professionalism: good for patients and health care organizations. *Mayo Clin Proc.* 2014 May;89(5): 644-52. doi: [10.1016/j.mayocp.2014.01.011](https://doi.org/10.1016/j.mayocp.2014.01.011). [PMID: [24797645](https://pubmed.ncbi.nlm.nih.gov/24797645/)]
2. Marandi SA. The Integration of Medical Education and Health Care Services in the IR of Iran and its Health Impacts. *Iranian J Publ Health.* 2009;38(1):4-12.
3. Noori Hekmat S, Haghdoost A, Dehnavieh R. The consequences of integration of the medical education and the health services system of Iran: A systematic review and meta-synthesis of literature. *Iranian Journal of Epidemiology.* 2019;14:12-26. [In Persian]
4. Francis A, Kotturan AD, Kuttichira PL. Orientation program to MBBS course at a missionary run medical college in Kerala: analysis of students' feedback. *Int J Res Med Sci.* 2018;6(8): 2758-62. doi:[10.18203/2320-6012.ijrms20183265](https://doi.org/10.18203/2320-6012.ijrms20183265).
5. Janula Raju DMMM, Chithra R. The Effectiveness of Orientation Programme among Nurse Interns: An Initial Step towards Quality Nursing Care. *Int J Health Sci Res.* 2017;7:218-23.
6. Siavash Vahabi Y, Ebadi A, Rahmani R, Tavallaei A, Khatouni A R, Tadrissi SD, et al. Comparison of the status of clinical education in the views of nursing educators and students. *Educ Strategy Med Sci.* 2011; 3(4): 179-182. [In Persian]
7. Mannix J, Faga P, Beale B, Jackson D. Towards sustainable models for clinical education in nursing: An on-going conversation. *Nurse Educ Pract.* 2006 Jan;6(1):3-11. doi: [10.1016/j.nepr.2005.05.004](https://doi.org/10.1016/j.nepr.2005.05.004). [PMID: [19040850](https://pubmed.ncbi.nlm.nih.gov/19040850/)]
8. Ivey J. (dissertation). Transition from student to nurse: The orientation process. North Carolina: Gardner-Webb University; 2012.

Design, Implementation and Evaluation of a Systematic Review Course for Medical Students

Mehrnoosh Khoshnoodifar¹, Moein Zangiabadian^{*2}, Mehran Ilaghi³

¹Ph.D. of E-Learning, Assistant Professor, Department of E-Learning, Virtual School of Medical Education and Management, Shahid Beheshti University of Medical Sciences (SBMU), Tehran, Iran

²MD-MPH-MSc, Virtual School of Medical Education and Management, Shahid Beheshti University of Medical Sciences (SBMU), Tehran, Iran

³MD-MSc, Department of Medical Education, Education Development Center, Kerman University of Medical Sciences, Kerman, Iran

Received: 2023 August 07

Revised: 2023 September 14

Accepted: 2023 September 23

Published online: 2023 September 24

***Corresponding author:**

Virtual School of Medical Education and Management, Shahid Beheshti University of Medical Sciences (SBMU), Tehran, Iran.

Email: zangiabadian1998@gmail.com

Citation:

Khoshnoodifar M, Zangiabadian M, Ilaghi M. Design, Implementation and Evaluation of a Systematic Review Course for Medical Students. *Strides Dev Med Educ.* 2023 August; 20(1):129-134.

doi:10.22062/sdme.2023.198835.1254

Abstract

Background: Teaching research skills to medical students is an essential component of modern medical education curricula. Despite the students' need and enthusiasm for practical research courses, there is a lack of basic training, particularly on secondary research types.

Objectives: In this study, we aimed to design, implement and evaluate a systematic review training course for medical students.

Methods: This was a pretest-posttest study conducted among medical students of Shahid Beheshti University of Medical Sciences (SBMU) in Iran. A total of 78 medical students were screened for eligibility based on their lack of previous systematic review publication experience and 30 individuals were ultimately enrolled to participate in the training course. A pre-test consisting of 20 multiple-choice questions was administered to the students. Following the ADDIE instructional design model, the training course was conducted in 12 sessions using a blended approach (in-person, synchronous online, and asynchronous sessions). At the end of the course, the evaluation of student satisfaction, knowledge, and skills was performed based on the Kirkpatrick model.

Results: Out of the 30 participating students, 27 successfully completed the course and took part in the post-test. Among them, 23 individuals expressed 100% satisfaction with the course implementation. Comparison of pre-test and post-test scores indicated a significant improvement in participants' theoretical knowledge (p -value<0.001). The most pronounced increase in the knowledge level was observed in clerkship students and interns. Asynchronous online teaching was significantly more effective than in-person and synchronous online methods. At the end of the course, eight participants tested their practical skills by successfully registering a systematic review study protocol on the International Prospective Register of Systematic Reviews (PROSPERO) website.

Conclusion: Overall, this study underscores the value of organizing research workshops focused on systematic review methodology as an effective means to enhance the knowledge of medical students in the realm of high-quality evidence-based research methods.

Keywords: Instructional Design; ADDIE Model; Kirkpatrick Model; Systematic Review; Medical Students

Background

The field of medicine is built upon a foundation of scientific inquiry and rigorous evidence-based practice. To uphold the highest standards of patient care, it is imperative for medical students to cultivate a deep understanding of research methodology and evidence evaluation. While educational interventions targeting

primary research types have received extensive attention (1), the development of effective training courses focused on secondary research, such as review studies, has been relatively neglected thus far.

Systematic reviews and meta-analyses play a pivotal role in evidence-based medicine (EBM), serving as the highest level of evidence in the EBM pyramid (2).

Medical education guidelines suggest undertaking a practical approach toward systematic reviews, emphasizing the need for implementing this research approach in medical education (3).

Research-related interventions are fundamental components of modern medical curricula (4). The majority of students are eager to learn research skills, and the reason why some students are not inclined toward research is their perception of a lack of connection between research and clinical activities (5). However, university medical curricula often fail to adequately prioritize the training and enhancement of research skills. The absence of basic research training creates a sense of disinterest among students and prevents them from participating in research fields. Consequently, many medical students encounter difficulties in research projects when they reach the final stages of their education. These challenges may include inadequate familiarity with research methodology, difficulty in data analysis, lack of scientific writing experience, and weaknesses in evaluating research effectiveness (6). Familiarity with systematic reviews and meta-analyses enables medical students to accurately analyze medical evidence and comprehensively evaluate different study findings. These skills empower them to make better decisions based on scientific information and benefit from the best existing evidence (7). Therefore, conducting comprehensive training workshops on systematic review methodology appears essential to address these gaps.

Objectives

This study aimed to design, implement, and evaluate a training course specifically focused on systematic reviews for medical students. The objective was to establish a solid foundation that underscores the importance of educational interventions in this area, to further promote such instructional designs at the national and international scale.

Methods

Study design: This study was conducted at Shahid Beheshti University of Medical Sciences (SBMU) in 2023 using a pretest-posttest design. The instructional design followed the five steps of the ADDIE instructional design model (analysis, design, development, implementation, evaluation) (8), and the first three steps of the Kirkpatrick's evaluation model (reaction, learning, behavior). Kirkpatrick's model evaluates the effectiveness of an educational program

based on four different levels: reaction, learning, behavior, and results. This framework helps teachers and instructional designers to comprehensively evaluate the value of training and its impact (9).

Study population and participant sampling: Initially, a poster of the training course along with a questionnaire was shared with medical students of all academic levels at SBMU through online messengers. The student recruitment questionnaire included initial demographic information (name, age, gender, academic level, and email), familiarity with fundamentals of basic research, research experience, preferred research area, and a needs assessment for a systematic review training course which was assessed based on a 10-point Likert scale. The questionnaire was designed to assess the participants' characteristics and their learning needs according to the first step of the ADDIE model (analysis). The minimum required sample size for the normal distribution of data was calculated to be 30. A total of 78 students from various academic levels completed the initial recruitment questionnaire. These individuals were assessed for eligibility to register in the workshop and the final 30 participants were enrolled using convenience sampling. Accordingly, the criterion for students' enrollment was their lack of previous familiarity with systematic reviews, which was assessed based on the absence of published systematic review and meta-analysis articles. The course plan, along with the final registration link, was emailed to the selected individuals for their final registration, in accordance with the course content and regulations. Eventually, 30 medical students from various academic levels (basic sciences, physiopathology, clerkships and internships) who were interested in learning systematic reviews and had not published any articles in this field, were selected as the final sample.

Instructional design and implementation of the course: Instructional contents were produced before starting the course. Multimedia contents, including instructional videos and narrated PowerPoint files alongside text and Excel files, were provided. Participants were also introduced to relevant books and online resources. Prior to the start of the course, a pretest consisting of 20 multiple-choice questions based on the course content was administered to the participants. The questionnaire was assessed in terms of face validity and content validity (using content validity index (CVI) and content validity ratio (CVR)) according to the opinions of five medical education specialists, ensuring that the questions cover all aspects of the course content. The students were divided into five groups, each

comprising six members, and a representative was appointed for each group. In line with the design, development and implementation steps of the ADDIE model, the training was delivered through a combination of in-person, synchronous online and asynchronous online methods over 12 sessions. The

course plan is presented in Table 1. The last step of the ADDIE model was carried out according to Kirkpatrick’s model. Upon completion of the course, students' satisfaction (reaction) was evaluated using a 5-point Likert scale.

Table 1. An overview of the systematic review course plan

Content Type	Duration (hour)	Teaching Method	Educational Topic
Instructional video	1	Asynchronous online	Methodology of Primary Studies and the Importance of Systematic Reviews and Meta-Analysis
Instructional video, book introduction	1	Asynchronous online	Overview of the Steps in Conducting Systematic Reviews
PowerPoint presentation	1	Synchronous online	Topic Selection and Preliminary Search
Text file, instructional video available on the internet	1	Asynchronous online	Protocol Registration and PRISMA Checklist
Instructional video	1.5	Asynchronous online	Systematic Search
Instructional video	1	Asynchronous online	Working with EndNote Software and Initial Screening
Text file	1	Asynchronous online	Finding Articles for Secondary Screening and Creating PRISMA Flowchart
Excel data file	1	Synchronous online	Data Extraction File Preparation
PowerPoint presentation	1.5	In-person	Basic Statistical Concepts
PowerPoint presentation	1.5	In-person	Concepts Related to Meta-analysis
Narrated PowerPoint file	1	Asynchronous online	Qualitative Assessment of Studies and Types of Bias
Instructional video, text file	1.5	Asynchronous online	Scientific Writing Training in the Format of a Comprehensive Review of a Systematic Study and Meta-analysis

To assess students' knowledge (learning), the same pre-test questions were used as a post-test, and the average scores before and after the course implementation were compared. Additionally, the impact of different teaching methods alongside the participants' demographic characteristics (gender and academic level) were assessed on the final course outcomes. Lastly, to measure the skill of interested students (behavior), the protocol registration of a systematic review study was submitted to the International Prospective Register of Systematic Reviews (PROSPERO) website as an evaluation basis.

Statistical analysis: All analyses were performed using SPSS software, Version 24. To compare the results of the pre-test and post-test for assessing the changes in participants' theoretical knowledge, the data distribution was first determined using Shapiro-Wilk and Kolmogorov-Smirnov tests. If the distribution was normal, a paired t-test was used; otherwise, the non-parametric Wilcoxon test was employed. A p-value < 0.05 was considered significant.

Ethical considerations: This study was approved by the ethical committee of SBMU (ethics code: IR.SBMU.SME.REC.1402.039). The course was completely free of charge, and no fees were required from the students to participate in the course.

Results

General characteristics of the study participants: The sample age range varied from individuals born in 1994 to 2001 (mean age: 25.2, SD: 1.9). Among the participants, 17 (56.6%) were male and 13 (43.4%) were female. Interns had the highest participation rate, with 14 (46.6%) individuals, followed by clerkship students, with 12 (40%) participants. Additionally, there were two participants each from the basic science (6.6%) and physiopathology (6.6%) disciplines (Figure 1).

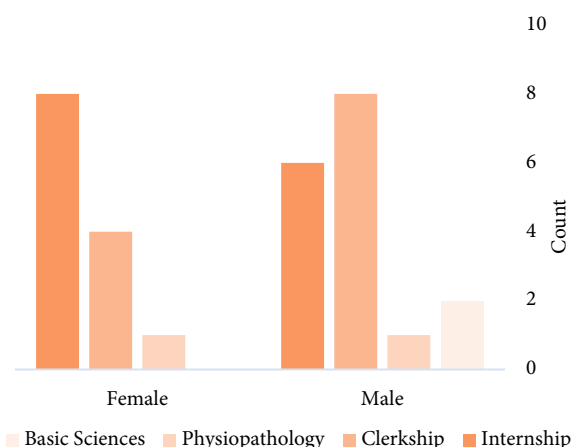


Figure 1. Demographic characteristics of participants

Out of the initial 30 participants, 3 individuals (one female from the clerkship level and two males from the internship level) dropped out during the course. The remaining 27 individuals remained enrolled in the course until its completion.

Half of the participants expressed a 100% need for the implementation of this course (Figure 2).

Participants' satisfaction: The satisfaction survey, administered at the end of the course using a 5-point Likert scale, indicated that 85.2% of the students expressed complete satisfaction with the course, while the remaining participants indicated an 80% satisfaction rate.

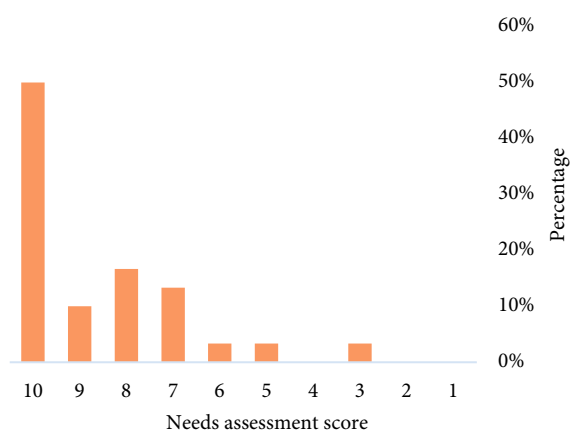


Figure 2. Needs assessment for the implementation of the systematic review training course

Learning outcomes: The results of the pre-test and post-test are presented in Table 2. Based on the results of the Kolmogorov-Smirnov and Shapiro-Wilk tests, the data obtained from the pre-test and post-test were not normally distributed (p -value < 0.05). Therefore, the Wilcoxon test was used to compare the means. The results of this test indicated that the training course significantly improved the participants' theoretical knowledge (p -value < 0.001). The training had a significant impact on learning in both male (p -value = 0.001) and female (p -value = 0.013) participants. Due to the small number of participants in the basic science (2 participants) and physiopathology (2 participants) levels, a comparison was made between the three groups: basic science/physiopathology, clerkship students and interns. The training resulted in a significant increase in theoretical knowledge for clerkship students (p -value = 0.004) and interns (p -value = 0.006), but no significant

difference was found in the basic science/physiopathology group (p -value = 0.414).

The greatest improvement in test scores was observed among subjects that were instructed using the asynchronous online teaching method (p -value=0.001), presumably due to students' access to content and reviewing materials compared to the other two methods (synchronous online: p -value = 0.180/ in-person: p -value = 0.660). However, it should be noted that the statistical concepts that were taught through in-person methods, require more practice and repetition to achieve mastery due to their inherent complexity. Therefore, the absence of improvement in students' learning outcomes for these topics cannot be solely attributed to the teaching method.

Skill outcomes: In order to assess the practical skills of the students at the behavioral level, considering the time constraints of medical students, a survey was conducted to allow individuals with both interest and sufficient available time to participate in this stage. Based on the survey, eight individuals expressed their readiness to participate. They were divided into two groups of four, and two systematic review study protocols were submitted to the PROSPERO website and subsequently approved after peer review.

Discussion

Considering the existing gap in teaching systematic review methodology to medical students, this study focused on the design, implementation, and evaluation of a systematic review training course. To the best of our knowledge, this is the first study aiming to conduct and evaluate a systematic review training course in Iran. Overall, our findings demonstrate that the structured implementation of a training course for systematic review studies has a significant impact on enhancing the satisfaction, theoretical knowledge and skills of medical students.

In a study conducted by Patabendige et al. in 2023, which was similar to our study in terms of designing and implementing a systematic review training course, 29% of the students expressed their motivation for participating in these courses as a desire to acquire research principles, while another 29% mentioned their motivation to pursue systematic review research in the future. Additionally, 24% expressed the need to carry out these types of research as a college project (10).

Table 2. Pre-test and post-test results

Variable	No.	Mean		Standard Deviation		Median		Interquartile Range		Wilcoxon test (P-value)
		Pre-test	Post-test	Pre-test	Post-test	Pre-test	Post-test	Pre-test	Post-test	
All participants	27	8.04	12.70	2.45	3.90	8	11	4	7	0.000
Gender										
Male	15	7.67	13.67	2.69	3.92	8	15	3	7	0.001
Female	12	8.50	11.50	2.15	3.68	8	10	3	7	0.013
Academic Level										
Basic science/physiopathology	4	9.25	9.75	3.20	3.77	8	8.5	5	7	0.414
Clerkship	11	7.73	12.73	2.00	3.92	8	11	1	8	0.004
Internship	12	7.92	13.67	2.67	3.72	7.5	15.5	5	7	0.006

These findings are consistent with the results of our study, indicating high students' interest in learning the methodology of secondary studies.

The evaluation of the program at the reaction level among our study participants showed that 85.2% of the students were completely satisfied with the course, and others expressed an 80% satisfaction rate. Previous studies on designing interventions for research principles have also demonstrated that the structured design of such courses can be accompanied by positive participant reactions. For example, Mbuagbaw et al. designed a preliminary workshop on systematic review studies and demonstrated that the participants had a high level of satisfaction with the content of the course (11).

Previous studies have also shown that the appropriate design of educational interventions aiming at teaching research methodology can promote theoretical knowledge about research activities. For example, Shrivastava et al. conducted a four-day research methodology training course, including lectures, interactive sessions, and group work. Evaluating the participants' knowledge indicated a significant improvement in post-test scores compared to pre-test scores (12). In another study by Kumar et al., a two-day educational intervention in research methodology resulted in a significant increase in the average post-test knowledge score compared to the pre-test score (13).

Investigation of the factors influencing participants' learning revealed that the increase in theoretical knowledge was not dependent on the participants' gender, as this improvement was observed in both male and female students. However, our findings indicated a more noticeable improvement in the level of theoretical knowledge among clerkship students and interns. This finding suggests that these students, due to their clinical exposure and acknowledgment of the significance of evidence-based research in medicine, prioritize research and recognize its importance in their medical practice.

Our preliminary findings demonstrated that students showed the greatest improvement in their level of theoretical knowledge in the topics taught using the asynchronous online approach. The asynchronous approach is a type of virtual learning in which learners engage in independent learning without the need for synchronous online presence. In this approach, educational materials are provided through a learning management system (14). Considering that the majority of our course participants were interns and clerkship students, who are often involved in clinical shifts, the use of an asynchronous online approach, due to the availability of educational content and the flexibility in study schedules, could effectively enhance individual learning outcomes. Nevertheless, this method has limitations due to restricted interaction with instructors and other learners (15). Therefore, in the present study, we adopted a blended learning approach to achieve maximum efficiency while considering the constraints of the students. In this approach, the use of traditional in-person teaching methods was combined with asynchronous and synchronous online approaches. This approach not only facilitated face-to-face interaction between instructors and learners but also mitigated the limitations of each method when used independently. In other words, the shortcomings of each individual approach were reduced, and their strengths were integrated (16).

This study has different limitations that should be considered in interpreting the results. The present study was conducted on a limited number of medical students of SBMU, and only one mentor was responsible for the implementation of the course. In order to generalize the results on a larger scale, other similar studies with increased sample sizes and expert mentors should be carried out in other institutions. On the other hand, the participation of basic science and physiopathology students in this training course was low, and distinct

analysis for each group was not possible. This may have led to bias in analysis among these student subgroups.

Conclusion

Considering the results of this study, medical students felt a significant need to familiarize themselves with systematic reviews. The increase in knowledge after training course was more pronounced among students at higher academic levels, including interns and clerkship students, who have tangible exposure to the clinical field. By adopting instructional design models like the ADDIE model and employing diverse teaching methods, including the production of instructional videos within an asynchronous virtual learning environment, we could successfully design and implement a systematic review research training course tailored to the needs of medical students.

Acknowledgments: None.

Conflict of interest: Authors declared no conflict of interest.



Ethical approval: All study protocols have been conducted under the approval of the Ethics Committee of Shahid Beheshti University of Medical Sciences and were carried out in accordance with relevant guidelines and regulations.

Funding/Support: The authors received no financial support for the current study.

References

- Mostafa SR, Khashab SK, Fouaad AS, Abdel Baky MA, Waly AM. Engaging undergraduate medical students in health research: students' perceptions and attitudes, and evaluation of a training workshop on research methodology. *J Egypt Public Health Assoc.* 2006;81(1-2):99-118. [PMID: 17382086]
- Ahn EJ, Kang H. Introduction to systematic review and meta-analysis. *Korean J Anesthesiol.* 2018 Apr;71(2):103-112. doi: 10.4097/kjae.2018.71.2.103. [PMID: 29619782] [PMCID: PMC5903119]
- Sharma R, Gordon M, Dharamsi S, Gibbs T. Systematic reviews in medical education: a practical approach: AMEE guide 94. *Med Teach.* 2015 Feb;37(2):108-24. doi: 10.3109/0142159X.2014.970996. [PMID: 25314376]
- Illing J. Thinking about research: frameworks, ethics and scholarship. In: Swanwick T, Understanding medical education: evidence, theory and practice. 1st ed. New Jersey: Wiley; 2010: 283-300. doi:https://doi.org/10.1002/9781444320282.ch20.
- Burgoyne LN, O'Flynn S, Boylan GB. Undergraduate medical research: the student perspective. *Med Educ Online.* 2010 Sep 10;15. doi: 10.3402/meo.v15i0.5212. [PMID: 20844608] [PMCID: PMC2939395]
- Carberry C, McCombe G, Tobin H, Stokes D, Last J, Bury G, et al. Curriculum initiatives to enhance research skills acquisition by medical students: a scoping review. *BMC Med Educ.* 2021 Jun 2;21(1):312. doi: 10.1186/s12909-021-02754-0. [PMID: 34078364] [PMCID: PMC8173745]
- Moosapour H, Saeidifard F, Aalaa M, Soltani A, Larijani B. The rationale behind systematic reviews in clinical medicine: a conceptual framework. *J Diabetes Metab Disord.* 2021 Apr 8;20(1):919-929. doi: 10.1007/s40200-021-00773-8. [PMID: 34178868] [PMCID: PMC8212290]
- Allen WC. Overview and evolution of the ADDIE training system. *Advances in Developing Human Resources.* 2006; 8(4): 430-441. doi: 10.1177/1523422306292942.
- Kirkpatrick J. An Introduction to The New World Kirkpatrick Model. [cited 2021 Sep 11]. Available from:URL: <https://www.kirkpatrickpartners.com/wp-content/uploads/2021/11/Introduction-to-the-Kirkpatrick-New-World-Model.pdf>.
- Patabendige NS, Scott KM, Barnes EH, Caldwell PY. Learning outcomes from a systematic review workshop series for junior doctors. *Intern Med J.* 2023 Jun 24. doi: 10.1111/imj.16168. [PMID: 37354432]
- Mbuagbaw L, Shey Wiysonge C, Shey Nsagha D, Ongolo-Zogo P, Pantoja T. An introduction to systematic reviews and meta-analysis: a workshop report on promoting evidence based medical practice through capacity building in research synthesis. *Pan Afr Med J.* 2011;8:15. doi: 10.4314/pamj.v8i1.71066. [PMID: 22121424] [PMCID: PMC3221401]
- Shrivastava M, Shah N, Navaid S. Assessment of change in knowledge about research methods among delegates attending research methodology workshop. *Perspect Clin Res.* 2018 Apr-Jun;9(2):83-90. doi: 10.4103/picr.PICR_41_17. [PMID: 29862201] [PMCID: PMC5950615]
- Kumar D, Singh US, Solanki R. Assessment of a group activity based educational method to teach research methodology to undergraduate medical students of a rural medical college in Gujarat, India. *J Clin Diagn Res.* 2015 Jul;9(7):LC01-3. doi: 10.7860/JCDR/2015/12854.6154. [PMID: 26393146] [PMCID: PMC4572977]
- Mahoney J, Hall CA. Exploring online learning through synchronous and asynchronous instructional methods. In: Sistek-Chandler CM. Exploring online learning through synchronous and asynchronous instructional methods. 1st ed. Pennsylvania: IGI Global; 2019: 52-76. doi: 10.4018/978-1-7998-1622-5.ch003.
- Ameri F, Dastani M, Gholami A, Heidary M. Challenges Faced by University Teachers in Virtual Education During Coronavirus Disease 2019 (COVID-19) Pandemic: A Systematic Review. *Strides Dev Med Educ.* 2023; 20(1): 20-28. doi: 10.22062/sdme.2023.197931.1123.
- Cahyani NM, Suwastini NK, Dantes GR, Jayantini IG, Susanthi5 Blended online learning: Combining the strengths of Synchronous and Asynchronous Online learning in EFL context. *Jurnal Pendidikan Teknologi Dan Kejuruan.* 2021; 18(2): 174-184. doi: 10.23887/jptk-undiksha.v18i2.34659.

Artificial Intelligence, A Great Revolution in Student Support Services in E-Learning

Ehsan Toofaninejad¹ , Soleiman Ahmady², Zohreh Khoshgoftar³, Somaye Sohrabi^{4*} 

¹Ph.D. of Educational Technology, Assistant Professor, Department of E-Learning in Medical Sciences, School of Medical Education and Learning Technologies, Shahid Beheshti University of Medical Sciences, Tehran, Iran

²MD/Ph.D. of Medical Education, Professor, Department of Medical Education, School of Medical Education and Learning Technologies, Shahid Beheshti University of Medical Sciences, Tehran, Iran

³Ph.D. of Medical Education, Assistant Professor, Department of Medical Education, School of Medical Education and Learning Technologies, Shahid Beheshti University of Medical Sciences, Tehran, Iran

⁴Ph.D. Candidate of Medical Education, Department of Medical Education, School of Medical Education and Learning Technologies, Shahid Beheshti University of Medical Sciences, Tehran, Iran

Received: 2023 July 26; **Revised:** 2023 August 20; **Accepted:** 2023 October 04; **Published online:** 2023 October 06

***Corresponding author:** Department of Medical Education, School of Medical Education and Learning Technologies, Shahid Beheshti University of Medical Sciences, Tehran, Iran. Email: sohrabisomaye1@gmail.com

Citation: Toofaninejad E, Ahmady S, Khoshgoftar Z, Sohrabi S. Artificial Intelligence, A Great Revolution in Student Support Services in E-Learning. Strides Dev Med Educ. 2023 October; 20(1):135-136. doi:10.22062/sdme.2023.198865.1261.

Keywords: Artificial Intelligence, Student Support Service, E-learning

Dear Editor,

Student support services (SSS) are crucial to every successful online learning program. They include all the activities that let students set and accomplish their learning objectives. They consist of academic and nonacademic services like administration, counseling, tutoring, and teaching (1).

For online learners, SSS offers a variety of advantages, including decreased isolation, improved self-direction, increased motivation, improved satisfaction, and promoted retention and recruitment. However, due to the diversity, adaptability, and scalability of online learners and programs, providing SSS in e-learning might be difficult (2).

A subfield of computer science known as artificial intelligence (AI) tries to build robots capable of reasoning, learning, and problem-solving—tasks that require human intelligence. Facial recognition, natural language processing, and robotics are just a few of the numerous fields where AI has found use (3).

By offering personalized, adaptable, and intelligent assistance for online learners based on their data and needs, AI can also be utilized to improve SSS in e-

learning (4). Applications of AI for SSS in e-learning include some of the following:

- Academic performance prediction: to forecast students' academic results, including grades, dropout, retention, and achievement, AI can examine student data and behavior. This can assist pupils in keeping track of their development and pinpointing their weak points. Additionally, it can assist educators and counselors in stepping in and providing prompt feedback and support to needy pupils (5).
- Course planning support: based on their interests, objectives, and available time, AI can assist students in planning their courses and schedules. Based on a student's interests, experience, and ability, it can also suggest courses and learning materials that are appropriate for them. Students may benefit from optimizing their learning processes and results (6).
- Intelligent tutoring: according to the learning preferences, skills, and demands of each student, AI may offer individualized and adaptive teaching. Based on their reactions and input, it can also produce dynamic and interactive learning materials

and activities for pupils. This can assist students to improve their knowledge and abilities in various areas (7).

- Automatic feedback: Based on students' performance and progress, AI can offer immediate and customized feedback. Additionally, it can give students pointers and recommendations for enhancing their learning processes and results. This can assist students in self-regulating their learning and motivation (8).
- Chatbots: Using AI, conversational agents that can speak to pupils in their native language can be created. For students who regularly have concerns regarding several facets of e-learning, such as fees, tests, grades, policies, etc., chatbots can offer real-time SSS 24/7. Chatbots can help students manage their mental health and stress during exams or other stressful events. Chatbots can collect students' input through voice, text, or facial expression, translate, evaluate, and process the information, and then respond to the student with a gesture, speech, or text (9).

By offering tailored, adaptable, and intelligent support for online learners based on their data and requirements, AI can redefine SSS in e-learning. By automating parts of the chores or enhancing human staff and faculty's capacities, AI can help lessen the workload and expenses of those who provide SSS in e-learning. However, AI also presents certain dangers and obstacles for SSS in e-learning, including moral dilemmas, privacy issues, problems with quality control, and social repercussions (5).

To generate best practices and implementation guidelines, academics, practitioners, and policymakers must thoroughly examine the advantages and disadvantages of utilizing AI for SSS in online learning. Researchers can understand how it can improve tailored learning experiences, student engagement, and timely feedback by examining the advantages of using AI for SSS online learning. It is equally crucial to be aware of any potential negative effects, such as worries about data privacy and the potential for prejudice to persist in algorithmic decision-making. Practitioners and

policymakers can create thorough rules that enable the appropriate and successful adoption of AI in online learning settings by examining the pros and cons.

Conflict of interest: The authors mention that there is no conflict of interest in this study.

Ethical approval: Not applicable.

Funding/Support: Not applicable.

References

1. Sohrabi S, Ahmady S, Khoshgoftar Z, Toofaninejad E, Kalantarion M, Simpson O. Identifying dimensions and components of student support system in virtual learning: A scoping review. *J Edu Health Promot* 2023;12:332. doi: [10.4103/jehp.jehp_146_23](https://doi.org/10.4103/jehp.jehp_146_23).
2. Sanchez-Elvira Paniagua A, Simpson O. Developing student support for open and distance learning: The EMPOWER project. *Journal of Interactive Media in Education*. 2018;2018(1): 1-10. doi: [10.5334/jime.470](https://doi.org/10.5334/jime.470).
3. Berente N, Gu B, Recker J, Santhanam R. Managing artificial intelligence. *MIS Quarterly*. 2021; 45(3):1-5.
4. Chen Y, Jensen S, Albert LJ, Gupta S, Lee T. Artificial intelligence (AI) student assistants in the classroom: Designing chatbots to support student success. *Information Systems Frontiers*. 2023;25(1):161-82. doi:[10.1007/s10796-022-10291-4](https://doi.org/10.1007/s10796-022-10291-4).
5. Zawacki-Richter O, Marín VI, Bond M, Gouverneur F. Systematic review of research on artificial intelligence applications in higher education—where are the educators? *International Journal of Educational Technology in Higher Education*. 2019;16(1):1-27. doi:[10.1186/s41239-019-0171-0](https://doi.org/10.1186/s41239-019-0171-0).
6. Kim J, Lee H, Cho YH. Learning design to support student-AI collaboration: Perspectives of leading teachers for AI in education. *Education and Information Technologies*. 2022;27(5):6069-104. doi:[10.1007/s10639-021-10831-6](https://doi.org/10.1007/s10639-021-10831-6).
7. Cunningham-Nelson S, Boles W, Trouton L, Margerison E. A review of chatbots in education: practical steps forward. *Proceedings of the 30th annual conference for the australasian association for engineering education (AAEE): educators becoming agents of change: innovate, integrate, motivate; 2019 Jan 18-20; Brisbane, Queensland, Australia*. 2019: 299-306.
8. Cavalcanti AP, Barbosa A, Carvalho R, Freitas F, Tsai YS, Gašević D, et al. Automatic feedback in online learning environments: A systematic literature review. *Computers and Education: Artificial Intelligence*. 2021;2:100027. doi: [10.1016/j.caeai.2021.100027](https://doi.org/10.1016/j.caeai.2021.100027).
9. Nurshatayeva A, Page LC, White CC, Gehlbach H. Proactive student support using artificially intelligent conversational chatbots: The importance of targeting the technology. *EdWorking paper, Annenberg University*. [cited 2020 Feb 19]. Available from: <https://www.edworkingpapers.com/sites/default/files/ai20-208.pdf>.

Role of the Educational Atmosphere on Self-Efficacy Among Dental Students

Fatemeh Farshad¹, Masoomeh Kheirkhah², Jorma I. Virtanen³, Hossein Hessari^{4*}

¹Doctor of Dental Surgery, Community Oral Health Department, School of Dentistry, Tehran University of Medical Sciences, Tehran, Iran

²PhD of Medical Education, Associated Professor Nursing Care Research Center (NCRC), Department of Midwifery and Reproductive Health, School of Nursing and Midwifery, Iran University of Medical Sciences, Tehran, Iran

³PhD of Oral Public Health, Department of Clinical Dentistry, Faculty of Medicine, University of Bergen, Norway; Institute of Dentistry, University of Turku, Finland

⁴PhD of Oral Public Health, Research Center for Caries Prevention, Dentistry Research Institute, Tehran University of Medical Sciences, Tehran, Iran

Received: 2023 April 07

Revised: 2023 September 11

Accepted: 2023 September 27

Published online: 2023 September 29

***Corresponding author:**

Research Center for Caries Prevention,
Dentistry Research Institute, Tehran
University of Medical Sciences,
Tehran, Iran.

Email: h-hessari@tums.ac.ir

Citation:

Farshad F, Kheirkhah M, Virtanen JI,
Hessari H. Role of the educational
atmosphere on self-efficacy among
dental students. *Strides Dev Med Educ.*
2023 September; 20(1):137-144.
doi:10.22062/sdme.2023.198514.1206

Abstract

Background: Learning is due to behavioral changes in knowledge, skills, and attitude.

Objectives: The current research assesses the state of the atmosphere, educational environment, and self-efficacy domains. It also assesses how the educational environment affects dental students' sense of self-efficacy.

Methods: All clinical undergraduate dental students (N=190) at Tehran University of Medical Science's School of Dentistry were the focus of a descriptive-analytical research conducted in 2018. The Dundee Ready Education Environment Measure (DREEM), the demographic surveys, and the validated Persian version of the Sherer Self-Efficacy Scale were all employed by the researchers. The DREEM assessed students' perceptions of learning (PoL), teaching (PoT), academic self-perception (ASP), atmosphere (PoA), and social self-perception (SSP) in addition to other key categories. Demographic factors and educational data (academic level, admittance quota, overall average grade, final semester grade, employment experience outside of dentistry school, and self-perceived effectiveness) were included in the demographic questionnaire. The factors from the demographic questionnaire were compared to the educational climate and self-efficacy using linear regression analysis. Additionally, the association between the educational environment and self-efficacy was assessed using Pearson's correlation (ρ) coefficient.

Results: The majority of clinical dentistry students (87.3%) were single, female (52.6%), and lived in dorms. All DREEM domains and the overall educational environment, with the exception of the PoT domain (p -value=0.302), significantly correlated positively with students' self-efficacy (p -value < 0.05). Self-efficacy and the overall educational environment are highly associated ($p=0.001$, $\rho=0.311$).

Conclusion: A good educational atmosphere may enhance dental students' self-efficacy.

Keywords: Dental Student, Education, Atmosphere, Self-Efficacy, Learning

Background

Self-efficacy is described as a psychological construct in the social learning theory (1). This idea was described by Albert Bandura as one's confidence in carrying out the behaviors necessary to get consistent results. Four sources of self-efficacy were proposed by Bandura's theory: verbal persuasion, mastery experiences, vicarious experiences, and physical sensations (2). To put it another way, self-efficacy is the certainty a person has about doing something exceptional and the courage to take action (3), both of which are necessary for

practicing dentistry professionally. The contact between instructors and students leads to learning. It has to do with how learners' knowledge, abilities, and attitudes evolve through time in terms of behavior. The educational environment and other factors make learning more efficient (4). The intended curriculum is reflected in the learning environment (5). It could make a difference in how motivated children are and how well they do in school (6). The learning environment, instructors' attitudes toward teaching, the institutional behavioral culture, students' perceptions of the learning

environment, the social context, and curriculum implementation are all part of the educational environment (7, 8). Successful academic and educational organizations in pre-clinical and clinical medical/dental courses are aided by the assessment of the curriculum and the learning experiences of the students. According to studies, academic discontent lowers student motivation and raises their anxieties (9-11). Self-efficacy has a modest impact on (non-university) student accomplishment, according to a meta-analysis (12). On the other hand, in a stressful atmosphere, academic competence and personal skills may be diminished (13). Education at dentistry schools is influenced by a number of variables, including student background and socioeconomic position, treatment results assessed by patients, educational exams conducted by instructors according to a set timetable, academic aptitude, and individual abilities. Studies on the association between academic degrees, interest in the topic of study, contentment with learning, grade, gender, family education, economic position, and self-efficacy have been conducted in nursing and medical schools with varying degrees of success (2, 14). Few studies have examined dental students' self-efficacy or learning environment (10, 13, 15, 16), but to the best of our knowledge, no research has examined the connection between these two factors in dental schools.

Objectives

This study examines the status of self-efficacy and educational ambience among clinical dental students at Tehran University of Medical Sciences (TUMS) in 2018, as well as the relationship between self-efficacy and educational atmosphere.

Methods

The current cross-sectional descriptive-analytical research was carried out in 2018 at Tehran University of Medical Sciences' School of Dentistry. All third through sixth year clinical dentistry students were included in the study's participants. It was optional to take part in the research. The study protocol (IR.TUMS.DENTISTRY.REC.1397.114) was approved by the School of Dentistry Ethics Committee.

Sampling And Data Collection: With an alpha of 0.05, a beta of 0.20, an R² of 0.1, and 16 variables without any controlled variables, 187 individuals were needed. A total of 190 clinical dentistry students (or 87% of the 216 who wanted to participate in the research) agreed to take part and complete the questionnaire. Participants'

informed written permission was collected after a brief description of the research design. The Sherer Self-efficacy Scale (17) and the Dundee Ready Education Environment Measure (DREEM) (18) were then used to gauge the students' sentiments regarding their self-efficacy and the learning environment, followed by a brief questionnaire providing basic information that was completed anonymously.

Data Collection Tool: The data collection instrument had three components. The first section consisted of a general information questionnaire that included background characteristics (gender, marital status (single or married)), place of residence (with family, dorm, personal house), parents' education (classified as university education or not), and self-reported socioeconomic status (good, moderate, poor). Besides, the questionnaire included educational variables (academic year of study, acceptance rate, grade point average, grade point for the previous semester, post-dental school employment experience, and self-perceived efficacy (good, moderate, or poor)). On the national university entrance exam, a quota system is used to select students from privileged areas (province capitals and large cities: quota 1), underprivileged areas (small cities: quota 2), remote areas (quota 3), children of faculty members (quota 4) and disabled and volunteer veterans (quota 5) allowing for preferential treatment. All nominal variables with many states were transformed to those with just two. For instance, the five categories of quotas-1 to 5-were changed into 1 to 3 and 4 to 5. The explanation was that although 1-3 quotas were all accepted to the university through examination without any special benefit, 4-5 quotas were admitted via additional incentive. Therefore, there was no need for dummy variables. The second section included 17 items on a five-point Likert scale from the validated Persian version of the Sherer Self-Efficacy Scale. A sample question for measuring self-efficacy is, "When I make plans, I am confident I can make them work." To get the overall score for self-efficacy, 8 questions were rated in reverse. The overall self-efficacy score goes from 17 (the lowest level) to 85 (the highest level). The Sherer Self-Efficacy Scale has already been verified (Cronbach's alpha coefficient=0.86) and its reliability has been acknowledged (19). Professors of dentistry and medical education verified the questionnaires' content validity for the current research.

The DREEM questionnaire, which consists of 50 items on a five-point Likert scale and has been verified and deemed trustworthy in Persian (Cronbach's alpha

coefficient = 0.91) (20) as the third component, was used to assess the study's educational environment. This survey examines five crucial areas: students' perceptions of learning (PoL), perceptions of teaching (PoT), academic self-perception (ASP), perception of the environment (PoA), and social self-perception (SSP). A PoL question might be, "I am encouraged to participate during teaching sessions." The PoT question "The course teachers are knowledgeable." is an example. The extra file contains the whole questionnaire. To get the overall educational environment score, 8 questions were rated in reverse. The overall score for the educational environment goes from 50 (worst educational environment) to 250 (best educational environment). The overall rating of the educational environment was divided into five categories: non-desirable (0-50), semi-desirable (51-100), desirable (101-150), very desirable (151-200), and highly desirable (201-250). The PoL domain has twelve questions with a maximum score of 60. With a maximum score of 55, 11 questions are used to assess the PoT domain. The ASP domain is evaluated with eight questions, with a possible score of 40. The PoA domain is evaluated using 12 questions with a maximum score of 60, while the SSP domain is evaluated using 7 questions with a maximum score of 35.

Statistical Analyses: For statistical analysis, IBM SPSS version 20 (Armonk, NY: IBM Cop.) was utilized.

Kolmogorov-Smirnov was employed to verify the normality of the data distribution.

ANOVA was used to evaluate the statistical difference between three or more independent groups, and the T-test was used to compare the means of two groups.

Multiple regression analysis was utilized because dependent variables had a normal distribution depending on the values of the independent variables. Univariate linear regression analysis was used to predict the values of the dependent variables (scores of overall educational environment and its dimensions in addition to overall self-efficacy) based on the independent factors. The linear connection between the quantitative variables was assessed using Pearson correlation.

P-values < 0.1 were regarded as statistically significant.

Regarding the exploratory nature of the present article and the number of participants, the p-value was set as 0.1 at the discretion of the statistical analysis expert.

Results

About half of the clinical dental students who participated in this study were female (52.6%), single (87.4%), resided in a residence (50%) and had a decent self-reported economic status (50%). The fathers of 80.5% of the pupils were college graduates. 51.1% of the students had a grade point average in the range of 16 to 16.9 out of 20.

85.5% of the students admitted to quota 2 had no prior job experience, while the acceptance rate for those students was 38.9%. Self-perceived efficacy was rated as excellent by 42.1% of students and moderate by 53.2% of students. Self-efficacy had a mean score of 57.9 (SD = 6.3), while the overall educational climate had a mean score of 158.1 (SD = 15.4).

According to demographic and educational data, [Table 1](#) displays the mean self-efficacy and educational environment ratings. Dental students in lower years ($p=0.04$), those with a higher-grade point average ($p=0.015$), and those with greater self-perceived effectiveness ($p=0.001$) had higher self-efficacy scores on average. The mean score for the overall educational environment was also higher for dental students in lower years ($p=0.039$) and for those with a better grade point average ($p=0.036$).

Only grade point average and admission quota among all demographic and educational characteristics, according to a linear regression analysis, predicted self-efficacy ([Table 2](#)). For each point raised in the grade point average and each admission quota, the mean self-efficacy score dropped by 0.839 points and 0.641 points, respectively.

Among all demographic and educational variables, linear regression analysis revealed that only gender (Beta = -3.97, $p=0.076$) and academic year (Beta = -0.1887, $p=0.061$) predicted the total educational ambiance score ([Table 2](#)).

Bivariate analysis revealed no significant differences in the mean scores of most educational milieu domains based on background and educational variables, with the exception of PoL, where male ($p=0.02$) and married ($p=0.023$) subjects had a higher mean score ([Table 3](#)). Regarding PoA, pupils with a moderate socioeconomic status achieved a higher mean score (p -value = 0.033). In addition, the subjects with higher self-perceived efficacy had higher self-efficacy ($p = 0.0001$), ASP ($p = 0.006$), PoA ($p = 0.013$), and SSP ($p = 0.017$) scores.

Table 1. Mean Score and Standard Deviation of Self-Efficacy* and Educational Atmosphere** According to Demographic/Educational Information Among Clinical Dental Students (N=190), 2018

Demographic variables		n	Self-efficacy		Total educational atmosphere	
			Mean (SD)	P-value****	Mean (SD)	P-value****
Gender	Male	90	58.3 (6.2)	0.385	160.3 (15.2)	0.063
	Female	100	57.5 (6.3)		156.1 (15.5)	
Marital status	Single	166	57.9 (6.4)	0.639	158.4 (15.5)	0.445
	Married	24	57.3 (4.1)		155.8 (15.4)	
Place of residence	Family home	74	58.5 (6.8)	0.308	159.1 (16.5)	0.410
	Dormitory	95	57.8 (5.9)		158.2 (15.9)	
	Single home	21	56.1 (5.0)		154.0 (7.9)	
Father's education	Non-university educated	37	57.5 (6.2)	0.659	159.9 (14.1)	0.428
	University educated	153	57.9 (6.3)		157.7 (15.8)	
Mother's education	Non-university educated	73	57.3 (5.9)	0.349	159.6 (13.7)	0.306
	University educated	117	58.2 (6.4)		157.2 (16.5)	
Self-reported economic status	Good	95	57.8 (6.1)	0.884	157.9 (14.8)	0.262
	Moderate	94	57.8 (6.3)		158.5 (16.1)	
	Poor	1	61.0 (0.0)		133.0 (0.0)	
Educational variables						
Academic year	6 th	49	56.8 (5.3)	0.0407	155.2 (19.7)	0.039
	5 th	51	57.6 (6.2)		155.3 (12.6)	
	4 th	45	58.4 (7.1)		163.2 (11.5)	
	3 rd	45	58.8 (6.2)		159.1 (15.8)	
The last semester's grade	17-20	32	58.8 (6.4)	0.380	158.2 (16.7)	0.972
	16.99 >	158	57.7 (6.2)		158.1 (15.3)	
Total average grade	17-20	28	60.5 (6.4)	0.015	163.75 (14.9)	0.036
	16.99 >	162	57.4 (6.1)		157.12 (15.5)	
Acceptance quotas***	Quota 1	51	59.3 (5.9)	0.141	158.3 (18.1)	0.879
	Quota 2	74	57.8 (5.9)		158.2 (16.5)	
	Quota 3	27	57.7 (7.4)		160.1 (14.7)	
	Quota 4	6	54.0 (6.1)		155.1 (10.7)	
	Quota 5	32	56.5 (6.2)		156.1 (8.5)	
Working experience out of dental school	Yes	27	58.1 (1.0)	0.821	155.5 (3.3)	0.359
	No	163	57.8 (0.4)		158.5 (1.1)	
Self-perceived efficacy	Good	80	59.9 (6.4)	0.001	160.3 (15.0)	0.059
	Moderate	101	56.6 (5.7)		157.1 (15.0)	
	Poor	9	54.1 (5.2)		148.3 (20.9)	

*: According to the Sherer questionnaire (20); **: According to the DREEM questionnaire (22); ***: Quota 1= lived in a big city at the time of entrance to the university, Quota 2 lived in a small city at the time of entrance to the university, Quota 3=live in a very small city or remote area at the time of entrance to the university, Quota 4= child of a faculty member, Quota 5= veterans; ****: According to results of t-test for comparing two groups and ANOVA for three or more groups.

After adjusting for the impacts of all other independent factors, female dentistry students had a total educational environment score that was 4 points lower, and switching to a higher academic year caused that score to drop by around two points.

All other categories and the overall educational environment positively linked with the student's self-

efficacy, with the exception of PoT (p=0.302). Students' perception of the environment had the strongest positive correlation (highest Pearson coefficient, rho=0.351), followed by their perception of their academic performance (rho=0.291) (Table 4).

Table 2. Results of Linear Regression Analysis for Self-Efficacy* and Total Educational Atmosphere** According to Demographic/Educational Information Among Clinical Dental Students (N=190), 2018

Demographic variables	Total Self Efficacy			Total Educational Atmosphere		
	Unstandardized coefficient B***	SE	P-value ³	Unstandardized coefficient B***	SE	P-value****
Gender	-1.18 ^o	0.972	0.195	-3.97	2.445	0.076
Marital status	1.161	1.522	0.863	0.811	3.830	0.928
Place of residence	-.894	0.742	0.374	-2.448	1.868	0.141
Father's education	0.477	0.860	0.765	-0.449	2.164	0.556
Mother's education	-0.125	0.547	0.980	-1.256	1.376	0.337
Self-reported economic status	0.496	0.991	0.738	-1.140	2.493	0.768
Educational variables						
Academic year	-1.518	0.820	0.161	-1.887	2.064	0.061
The last semester's grade	0.693	0.784	0.340	0.161	1.974	0.483
Total average grade	-0.839	0.800	0.084	-0.952	2.012	0.358
Acceptance quotas*****	-0.641	0.369	0.055	-0.374	0.929	0.564
Working experience out of dental school	-1.314	1.416	0.616	1.274	3.563	0.532

*: According to the Sherer questionnaire (20); **: According to the DREEM questionnaire (22); ***: B was the unstandardized coefficient; ****: P-values less than 0.1 were significant; *****: all groups of acceptance quotas were divided into two main groups (1 to 3 named 1 and 4 to 5 named 2).

Table 3. Results of Linear Regression Analysis for five domains of educational Atmosphere* according to demographic/educational information among clinical dental students (N=190), 2018

Demographic variables	PoL			PoT			ASP			PoA			SSP		
	B**	SE	P***	B**	SE	P***	B**	SE	P***	B**	SE	P***	B**	SE	P***
Gender	-1.526	0.738	0.026	-0.713	0.681	0.447	-0.645	0.630	0.470	-1.269	0.812	0.185	-0.437	0.467	0.231
Marital status	-0.988	1.156	0.309	1.838	1.068	0.126	0.095	0.987	0.911	-0.278	1.273	0.596	0.811	0.731	0.846
Place of residence	-0.552	0.564	0.157	-0.375	0.521	0.709	-0.315	0.481	0.645	-0.806	0.621	0.120	-2.448	0.357	0.479
Father's education	-0.879	0.653	0.609	-0.281	0.603	0.346	-0.077	0.558	0.437	0.754	0.719	0.228	-0.449	0.413	0.744
Mother's education	0.211	0.415	0.615	-0.116	0.384	0.362	-0.273	0.335	0.39	-0.595	0.457	0.079	-1.256	0.263	0.468
Self-reported economic status	-0.959	0.752	0.155	0.125	0.695	0.738	-0.417	0.643	0.825	-0.136	0.828	0.996	-1.140	0.476	0.387
Educational variables															
Academic year	-0.993	0.623	0.001	1.034	0.575	0.064	-0.493	0.532	0.666	-0.726	0.686	0.031	-1.219	0.394	0.532
The last semester's grade	0.041	0.596	0.814	0.171	0.550	0.672	-0.291	0.509	0.268	0.195	0.656	0.922	0.161	0.337	0.702
Total average grade	0.049	0.607	0.692	-0.380	0.561	0.563	-0.062	0.519	0.418	-0.480	0.669	0.679	-0.952	0.384	0.756
Acceptance quotas	-0.149	0.280	0.313	-0.102	0.259	0.831	-0.83	0.240	0.575	-0.160	0.309	0.331	-0.374	0.177	0.474
Working experience out of dental school	1.599	1.075	0.164	-0.390	0.993	0.732	-0.118	0.918	0.892	0.193	1.184	0.764	1.274	0.680	0.922

*: According to the DREEM Questionnaire (22), **: B was the Unstandardized Coefficient; ***: P-values less than 0.1 Were Significant. PoL: Students' Perception of Learning; PoT: Students' Perception of Teaching; ASP: Students' Academic Self-Perception; PoA: Students' Perception of Atmosphere; SSP: Students' Social Self-Perception.

Table 4. Mean Score (and Standard Deviation) of Educational Atmosphere and its Domains, and Results of Correlation Analysis (Pearson Correlation) of Educational Atmosphere and its Domains with Self-Efficacy Among Clinical Dental Students (N=190), 2018

Demographic variables		Educational atmosphere					
		PoL	PoT	ASP	PoA	SSP	Total
Self-efficacy	Mean (SD)	35 (4.8)	35.5 (4.3)	26.1 (3.9)	38.7 (5.1)	22.8 (2.9)	158.1 (15.5)
	Max. attainable score (question number)	60 (12)	55 (11)	40 (8)	60 (12)	35 (7)	250 (50)
	RHO*	0.146	0.075	0.291	0.351	0.206	0.311
	P-value	0.044	0.302	0.001	0.001	0.004	0.001

*: Pearson correlation coefficient

PoL: students' Perception of Learning; PoT: students' Perception of Teaching; ASP: students' Academic Self-Perception; PoA: students' Perception of Atmosphere; SSP: students' Social Self-Perception.

Discussion

This research discovered that dentistry students had a highly desired (151-200) degree of self-efficacy and educational environment. According to the research, dental students' self-efficacy was significantly influenced by the teaching environment. According to our knowledge, this is the first research to examine how the educational environment affects dentistry students' self-efficacy using two widely used instruments, the DREEM and Sherer self-efficacy measures. The two tools have been utilized in various contexts in the past, such as with medical students (11). According to our main analysis, the mean self-efficacy score was greater for junior dental students and those with better grade point averages.

Self-efficacy was shown to be inversely connected with acceptance rate and grade point average in advanced analysis, which may be related to these students' initial individual skills and stronger self-efficacy at the time of university entrance.

With the exception of students' Perception of Teaching (PoT), advanced analyses in a well-fitted sample size demonstrated a substantial strong association between self-efficacy and the overall score of the educational environment and most of its dimensions. The Perception of Atmosphere (PoA) average score for the students was greater than in previous research (18, 21, 22), although it was comparable to a local report (23). Additionally, it was greater than the PoA score stated as the average for medical students at a recently founded local institution (24). This distinction between dentistry school clinics and hospitals may be the result of their different physical environments. The premise that the educational environment has a significant impact on self-efficacy is supported by the substantial correlation between the PoA and self-efficacy. Our results demonstrated a relationship between self-efficacy and the educational

environment. On the other hand, students who felt more confident in their own abilities were more likely to achieve better grade point averages. Self-efficacy beliefs have an impact on students' mental health, and perceived self-efficacy has a direct impact on academic accomplishment (25). The students' motivation for accomplishment is significantly influenced by cognitive self-efficacy (26). International rankings in academic and research accomplishments are a point of competition for educational institutions all around the globe. Evaluation of the variables influencing self-efficacy in educational contexts may help with lesson design.

Boys outperformed girls in terms of overall educational climate and perception of learning (PoL), which is likely related to the differences in personality traits between male and female pupils. As a general rule, girls are exacting and stern, while guys tend to have more expansive viewpoints. The findings of a research by Sunkad et al. (2015) on 914 medical, dentistry, nursing, physiotherapy, and health students of KLE University of India were identical to the males' more favorable impression. In line with the findings of the current investigation, this study revealed that male students had a more favorable PoA than female students (21). Boys have a learning style that is independent of the educational environment, but girls have a learning style that is tied to it (27). Similar to the findings of studies on dental students in Saudi Arabia (18, 28) and Australia (26), senior students in the present study had reduced self-efficacy and educational ambiance scores. In advanced linear regression analysis, however, the relationship between self-efficacy and performance was no longer significant. As students advance to higher academic years, their experience increases, and they become involved with more real-world cases and administrative, social, and communication conditions, which may result in a

decrease in the senior students' rating of the total educational atmosphere. Self-efficacy is related to both self-oriented and other-oriented perfectionism, as previously reported. Higher levels of socially prescribed perfectionism correlate with high self-efficacy (29). In this study, students with a lower grade point average had higher self-efficacy, indicating self-directed perfectionism. This study presents an innovative method for analyzing the effect of the educational environment on the self-efficacy of clinical dental students.

In addition, the Persian versions of the utilized instruments were validated before their English counterparts. This study was limited by the large number of educational assignments given to students in clinical departments. In order to guarantee the veracity of the responses, the questionnaires were collected within two days. Thus, the pupils were able to respond to the queries calmly and without anxiety. Together with meticulous planning, identifying the strengths and limitations of clinical dental education can enhance the education and training of competent dentists.

Limitation: Despite applying the p-value of 0.1, this research has valuable implications, given that this was among the first studies in an Iranian population with its certain characteristics and the educational curriculum used in it.

Conclusion

This study revealed a correlation between dental student self-efficacy, educational ambiance, and its domains. TUMS dental students reported a moderate to high level of self-efficacy and a very desirable (151-200) level of educational ambiance. The study confirmed the considerable positive effect of the educational environment on the self-efficacy of dental students. The results can assist faculty members in designing optimal educational programs to enhance the quality of education and produce students who are empowered and responsive to the requirements of the community.

Acknowledgements: The authors are grateful to the School of Dentistry, TUMS students for their cooperation in data gathering.

Conflict of interests: The authors have no proprietary, financial, or other personal interest in any product, service, or company presented in this article.

Ethical approval: This study was conducted by all the provisions of the local human subject's oversight

committee guidelines, and policies. The approval code for this study is IR.TUMS.DENTISTRY.REC.1397.114.

Funding/Support: This study was supported by the Research Center for Caries Prevention, Dentistry Research Institute, Tehran University of Medical Sciences.

References

- Cheng Y. Academic self-efficacy and assessment. *Educational Psychology*. 2020; 40(4): 389-91. doi: [10.1080/01443410.2020.1755501](https://doi.org/10.1080/01443410.2020.1755501).
- Qian H, Yuan C. Factors Associated With Self-care Self-efficacy Among Gastric and Colorectal Cancer Patients. *Cancer Nurs*. 2012 May-Jun; 35(3): E22-31. doi: [10.1097/NCC.0b013e31822d7537](https://doi.org/10.1097/NCC.0b013e31822d7537). [PMID: 22067688]
- Pouresmail Z, Heshmati Nabavi F, Sadeghi T, Shafiee Jafarabadi M N, Behnam Voshani H R. Correlation between adjustment and self-efficacy in patients with intestinal ostomy. *Journal of Hayat* 2017; 22(4): 300-11. [In Persian]
- Riquelme A, Oporto M, Oporto J, Mendez J, Viviani P, Salech F, et al. Measuring students' perceptions of the educational climate of the new curriculum at the pontificia universidad catolica de chile: Performance of the spanish translation of the Dundee Ready Education Environment Measure (DREEM). *Educ Health (Abingdon)*. 2009 May;22(1):112. [PMID: 19953435]
- Soemantri D, Herrera C, Riquelme A. Measuring the educational environment in health professions studies: A systematic review. *Med Teach*. 2010; 32(12): 947-52. doi: [10.3109/01421591003686229](https://doi.org/10.3109/01421591003686229). [PMID: 21090946]
- Genn JM. AMEE Medical Education Guide No. 23 (Part 1): Curriculum, environment, climate, quality and change in medical education-a unifying perspective. *Med Teach*. 2001 Jul;23(4):337-344. doi: [10.1080/01421590120063330](https://doi.org/10.1080/01421590120063330). [PMID: 12098379]
- Varma R, Tiyagi E, Gupta JK. Determining the quality of educational climate across multiple undergraduate teaching sites using the DREEM inventory. *BMC Med Educ*. 2005 Feb 21;5(1):8. doi: [10.1186/1472-6920-5-8](https://doi.org/10.1186/1472-6920-5-8). [PMID: 15723699] [PMCID: PMC553968]
- Mohd Yani AA, Ahmad MS, Ngah NA, Md Sabri BA. The relationship of educational environment and preparedness to practice-perceptions of Malaysian dental graduates. *Eur J Dent Educ*. 2023 Aug;27(3):449-456. doi: [10.1111/eje.12826](https://doi.org/10.1111/eje.12826). [PMID: 35579452]
- Curtis DA, Lind SL, Brear S, Finzen FC. The correlation of student performance in preclinical and clinical prosthodontic assessments. *J Dent Educ*. 2007 Mar;71(3):365-72. doi: [10.1002/j.0022-0337.2007.71.3.tb04286.x](https://doi.org/10.1002/j.0022-0337.2007.71.3.tb04286.x). [PMID: 17389571]
- Kalkwarf KL, Haden NK, Valachovic RW. ADEA commission on change and innovation in dental education. *J Dent Educ*. 2005 Oct;69(10):1085-7. doi: [10.1002/j.0022-0337.2005.69.10.tb04008.x](https://doi.org/10.1002/j.0022-0337.2005.69.10.tb04008.x). [PMID: 16204673]
- Miles S, Leinster SJ. Medical students' perceptions of their educational environment: expected versus actual perceptions. *Med Educ*. 2007 Mar;41(3):265-72. doi: [10.1111/j.1365-2929.2007.02686.x](https://doi.org/10.1111/j.1365-2929.2007.02686.x). [PMID: 17316211]
- Çikrıkci Ö. The Effect of Self-efficacy on Student Achievement. In: Karadag E, editor. *The Factors Effecting Student Achievement: Meta-Analysis of Empirical Studies*. Cham: Springer International Publishing; 2017: 95-116. doi: [10.1007/978-3-319-56083-0_6](https://doi.org/10.1007/978-3-319-56083-0_6).
- Myint K, See-Ziau H, Husain R, Ismail R. Dental Students' Educational Environment and Perceived Stress: The University of

- Malaya Experience. *Malays J Med Sci.* 2016 May;23(3):49-56. [PMID: 27418869] [PMCID: PMC4934718]
14. Rahimi F, Seyed mirnasab Hs, Alamdar E, Kamali K, Khoushemehr G. Relationship Between Self-efficacy and Academic Achievements in the Students of Tehran University of Medical Sciences. *Iranian Journal of Nursing Research.* 2018;13(2):59-66.
 15. Sherer M, Maddux JE, Mercandante B, Prentice-Dunn S, Jacobs B, Rogers RW. The Self-efficacy Scale: Construction and validation. *Psychological reports.* 1982;51(2):663-71. doi:10.2466/pr0.1982.51.2.663.
 16. Yeturu SK, Kumar VS, Pentapati KC, Krishnan NA, Roy S, Babu RS. Students' perceptions of their educational environment in a south Indian dental school—A cross-sectional study. *Journal of International Oral Health.* 2022;14(5):518.
 17. Roff S, McAleer S, Harden RM, Al-Qahtani M, Ahmed AU, Deza H, et al. Development and validation of the Dundee Ready Education Environment Measure (DREEM). *Medical Teacher.* 1997;19(4):295-9. doi:10.3109/01421599709034208.
 18. Al-Saleh S, Al-Madi EM, AlMufleh B, Al-Degheishem AH. Educational environment as perceived by dental students at King Saud University. *Saudi Dent J.* 2018 Jul;30(3):240-249. doi: 10.1016/j.sdentj.2018.02.003. [PMID: 29942109] [PMCID: PMC6011212]
 19. Rahimi Pordanjani S, Ghobari Bonab B. The effect of multiple intelligences training on general self efficacy of high school deaf students. *Research in Cognitive and Behavioral Sciences.* 2011;1(1):73-86.
 20. Fallah kheiri Langroudi SA, Badsar AR, Hosseini Z, Rouhi M. Validation of the Persian version of the Dundee Ready Educational Environment Measure (DREEM). *Research in Medical Education.* 2012;4(2):24-33.
 21. Sunkad MA, Javali S, Shivapur Y, Wantamutte A. Health sciences students' perception of the educational environment of KLE University, India as measured with the Dundee Ready Educational Environment Measure (DREEM). *J Educ Eval Health Prof.* 2015 Jun 27;12:37. doi: 10.3352/jeehp.2015.12.37. [PMID: 26268829] [PMCID: PMC4536364]
 22. Tomás I, Aneiros A, Casares-de-Cal M, Quintas V, Prada-López I, Balsa-Castro C, et al. Comparing student and staff perceptions of the “educational Climate” in Spanish Dental Schools using the Dundee Ready Education Environment Measure. *Eur J Dent Educ.* 2018 Feb;22(1):e131-e141. doi: 10.1111/eje.12270. [PMID: 28504872]
 23. Jalili Z, Sabahi-Rooy F. Evaluation of the educational environment based on the model DREEM From the perspective of students of clinical psychology of university Islamic Azad University Medical Sciences of Tehran. *Strides in Development of Medical Education.* 2015;11(4):464-70. [In Persian]
 24. Zolfaghari SH, Bijari B. Medical students' perspective of Clinical Educational Environment of Hospitals Affiliated with Birjand University of Medical Sciences, Based on DREEM Mode. *Journal of Birjand University of Medical Sciences.* 2015;22(4):368-75. [In Persian]
 25. Makhdoom NM. Assessment of the quality of educational climate during undergraduate clinical teaching years in the college of medicine, Taibah University. *Journal of Taibah University Medical Sciences.* 2009; 4(1): 42-52. doi:10.1016/S1658-3612(09)70080-0.
 26. Stormon N, Ford PJ, Eley DS. DREEM-ing of dentistry: Students' perception of the academic learning environment in Australia. *Eur J Dent Educ.* 2019 Feb;23(1):35-41. doi: 10.1111/eje.12384. [PMID: 30022585]
 27. Farajollahi M, Najafi H, Nosrati Hashi K, Najafiyan S. Relationship between learning styles and academic achievement of university students. *Educ Strategy Med Sci.* 2013; 6(2): 83-8. [In Persian]
 28. Al-Ansari A, El Tantawi M. Predicting academic performance of dental students using perception of educational environment. *J Dent Educ.* 2015 Mar;79(3):337-44. doi: 10.1002/j.0022-0337.2015.79.3.tb05889.x. [PMID: 25729028]
 29. Dunkley DM, Zuroff DC, Blankstein KR. Self-critical perfectionism and daily affect: Dispositional and situational influences on stress and coping. *J Pers Soc Psychol.* 2003 Jan; 84(1):234-52. doi:10.1037/0022-3514.84.1.234. [PMID: 12518982]

Acceptance of Online Education by Undergraduate Students During the Covid-19 Pandemic: A Case Study from Kerman, Iran

Milad Ahmadi Gohari¹, Abedin Iranpour², Salahodin Rakhshani Rad³, Moghaddameh Mirzaee^{4*}, Ali Akbar Haghdoost⁵

¹M.Sc. Researcher at Modeling in Health Research Center, Modeling in Health Research Center, Institute for Futures Studies in Health, Kerman University of Medical Sciences, Kerman, Iran

²Ph.D. Associate Professor of Health Education and Promotion, HIV/STI Surveillance Research Center, and WHO Collaborating Center for H.I.V. Surveillance, Institute for Futures Studies in Health, Kerman University of Medical Sciences, Kerman, Iran

³M.Sc. Student at Kerman University of Medical Sciences, Modeling in Health Research Center, Institute for Futures Studies in Health, Kerman University of Medical Sciences, Kerman, Iran

⁴Ph.D. Associate Professor of Biostatistics, Modeling in Health Research Center, Institute for Futures Studies in Health, Kerman University of Medical Sciences, Kerman, Iran

⁵Ph.D. Professor of Epidemiology, Modeling in Health Research Center, Institute for Futures Studies in Health, Kerman University of Medical Sciences, Kerman, Iran

Received: 2023 June 13

Revised: 2023 September 07

Accepted: 2023 October 01

Published online: 2023 October 02

***Corresponding author:**

Modeling in Health Research Center,
Institute for Futures Studies in Health,
Kerman University of Medical
Sciences, Kerman, Iran.

Email:

moghaddameh_mirzai@yahoo.com

Citation:

Ahmadi Gohari M, Iranpour A, Rakhshani Rad S, Mirzaee M, Haghdoost AA. Acceptance of Online Education by Undergraduate Students During the Covid-19 Pandemic: A Case Study from Kerman, Iran. *Strides Dev Med Educ.* 2023 October; 20(1): 145-154.

doi:10.22062/sdme.2023.198722.1236

Abstract

Background: Online education has become more vastly recognized as a powerful educational tool after the Covid-19 pandemic. It provides educational opportunities that were not previously possible because of time or place restrictions.

Objectives: This study investigated the factors influencing students' acceptance of online learning systems during the Covid-19 pandemic.

Methods: The study sample comprised 435 students from Kerman University of Medical Sciences. We used the external technology acceptance model (TAM) to determine the acceptance of online education systems by undergraduate students during the Covid-19 pandemic. Partial least square structural equation modeling (PLS-SEM) was used to check the model hypotheses. P-values less than 0.05 were considered statistically significant.

Results: In this study, 65% of the participants were men. The mean score for the items in the questionnaire was 53.1±19.3. The constructs of perceived ease of use and perceived usefulness had a significant effect on students' attitudes, and students' attitudes and perceived usefulness strongly influenced their behavior in using the online education system.

Conclusion: The results of this study show that the perceived ease of use and perceived usefulness of the online education system indirectly affect students' behavior in using online education. Thus, educational policymakers at universities can emphasize the ease of learning and especially the easy use of mobile phones when choosing an online education system. In addition, the creation and expansion of the necessary infrastructure can facilitate student use of online education.

Keywords: Technology Acceptance Model (TAM), Covid-19, Online Education, Iran

Background

The Covid-19 pandemic provoked massive changes in the lives of people around the world. Medical restrictions at the peak of the pandemic and economic problems caused by the imposed restrictions, and direct and indirect deaths due to Covid-19 compelled people of the world to experience critical conditions (1, 2). Governments and organizations had to accept the new conditions and change their policies in line with them.

These changes also affected the quality of education at universities and schools (1).

The suspension of public education and university courses had a tremendous impact on students, teachers, and educational institutions in different parts of the world (3). Like other countries, Iran adopted online education as one of the first policies to combat and control the Covid-19 outbreak and break the chain of Covid-19 transmission (3). Students were deprived

access to facilities such as libraries and sports halls and were unable to accompany their friends or receive help from them in classrooms and laboratories (3). The change in students' behavior towards online learning during the pandemic was sudden and unplanned. These issues caused many learning problems related to the use of technology for curriculum design and internet skills (1, 4). In addition, online education exposed professors and teachers to many difficulties in conveying course knowledge to students. Students also struggled to learn course material effectively (5, 6). These problems were especially evident at universities in developing countries with little experience in conducting online courses (7).

Students' unpreparedness to accept online learning and learning in unfavorable environmental conditions with inadequate communication equipment and facilities can affect their enthusiasm for learning (8). Moreover, the immediate adoption of an online learning system, especially in universities with less experience in using online education systems, may negatively affect students' learning process.

Before the pandemic, online education was not well-established in most Iranian universities. Some undergraduate students lacked experience in using online education systems. Thus, examining the factors affecting students' acceptance and use of online education systems can contribute to the effective use of these systems. Exploring these factors will also help policymakers manage and possibly remove obstacles that impact the successful acceptance of online educational systems and help teachers and educational institutions take advantage of these systems.

The Technology Acceptance Model (TAM) developed by Davis in 1986 is one of the most widely used and best technological acceptance models. It has been employed in various studies and is the most well-known model addressing technology acceptance (1, 4, 8). Compared to other theoretical methods, TAM is a highly effective model (9).

Experts have developed no clear criteria for the adoption of online educational systems, especially during the Covid-19 pandemic (10). Different countries have used different extended models of TAM based on the level of technological advancement and previous experience in using online education (1, 4, 8). Iran has one of the largest numbers of students among the universities of the MENA region (11).

Evaluation of the determinants influencing the adoption of online education by students in Iran and the adoption of effective educational policies can affect the

education of a large number of students. However, despite the importance of online education, few studies have addressed the factors affecting its acceptance by students, especially students of medical sciences in Iran during the COVID-19 pandemic. A study was conducted to analyze the determinants that affect the behavioral intentions of university students majoring in agriculture using the developed Technology Acceptance Model (TAM) model during and after the COVID-19 pandemic (12). The findings showed that attitudes and perceived self-efficacy have a direct relationship with behavioral intention to use online education. Providing education for students of medical universities in charge of training an effective workforce for healthcare systems is of special importance. Some of the courses in medical programs are practical. Before the Covid-19 pandemic, universities had no experience in conducting practical courses online, nor was it possible for Iran to use conventional global platforms for medical sciences universities. Each university, especially at the beginning of the pandemic, used customized online educational systems to offer their courses. Furthermore, some students were initially less familiar with how to use online education and had limited access to it. Thus, an innovative aspect of the current study is its focus on CSE and PA dimensions in the use of online education systems by students at medical universities. Examining the factors that influence the adoption of online learning, the acceptance of online education by medical students, and reflecting on their experiences can help professors more effectively conduct online education courses and assist educational policymakers in removing possible obstacles to contributing to continuing online education programs after the Covid-19 crisis.

To this end, the current study purposed to analyze factors affecting the acceptance of online learning systems during the Covid-19 crisis in Iran using the TAM model and to determine online education policies after Covid-19.

Research Framework and Hypotheses: TAM provides a short but useful theoretical framework for examining how perceived usefulness and ease of use of a new technology or service affect its adoption by users (1). According to this theory, people's attitudes toward using technology are influenced by external factors. A number of studies have considered various variables as external factors, depending on whether they were conducted in developed or developing countries (1, 7). The current study considered the two variables of computer self-

efficacy (CSE) and perceived accessibility (PA) as external factors affecting the acceptance of online education. Attitude is a vital factor accounting for technology use behavior. According to TAM, perceived usefulness and ease of use lead to positive attitudes toward technology acceptance. Many features of technology affect its acceptance and use by users (13). Thus, technology acceptance behavior was taken as a dependent variable in this study. Based on a review of previous TAM-related studies, various hypotheses according to internal and external factors were developed (Figure 1).

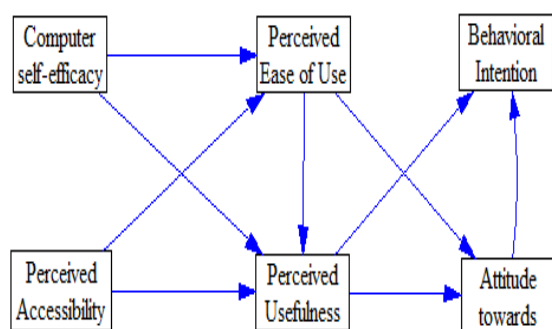


Figure 1. Research Model

TAM: Technology Acceptance Model

Computer Self-Efficacy (CSE): Computer self-efficacy (CSE) is one of the external factors most commonly used in TAM. Self-efficacy is defined as “an individual's belief in his or her capacity to execute behaviors necessary to face future situations” (14). In this study, self-efficacy is operationalized as users' confidence in their ability to use an online education system. Various research studies have indicated that computer self-efficacy plays a crucial role in determining the perceived usefulness and perceived ease of use of online education systems (7, 15).

Perceived Accessibility (PA): Perceived accessibility (PA) of a system refers to how easily users can access and utilize information from the online educational platform (16). Different studies have indicated that perceived accessibility significantly affects the users' perceived ease of use and the perceived usefulness of the online education system (17, 18). The more access to the online education system increases, the higher its perceived ease and usefulness will be (18). Perceived accessibility (PA) was taken as another external factor in TAM.

Perceived Ease of Use (PEU): received ease of use (PEU) of a system refers to the degree to which a person perceives that the use of a particular technology (e.g.,

learning through an online education system) is not complicated and does not require much effort (7, 13). Studies have shown that perceived ease significantly affects perceived usefulness and strongly predicts the attitude toward the use of online learning (19, 20).

Perceived Usefulness (PU): Perceived usefulness (PU) refers to the degree to which individuals believe that the use of new technology (e.g., learning through an online education system) can improve their job performance (achieving educational and learning goals) (13, 21). Many studies have suggested that PU significantly affects the behavioral intention to accept online learning and students' attitudes toward its use (22, 23).

Attitude Towards (AT): An individual's attitude towards using online education systems refers to the “degree to which a person has a positive or negative feeling towards electronic education systems” (24). Studies have indicated that attitude directly and significantly affects students' behavioral intention to use online education. In other words, students' intention to use online education is strongly influenced by their attitudes (13, 25).

Behavioral Intention (BI): The behavioral intention to use online learning refers to students' desire to use online learning (13, 26). Studies have shown that BI is strongly correlated with system acceptance and, as a result, its use. Therefore, it is one of the most important variables affecting the success of a system (13). In the present study BI was considered the main construct in the research model and also the response variable.

Study Context: The focus group of this research was undergraduate students studying at Kerman University of Medical Sciences. This university is one of the largest of its kind in Iran with over 6000 students in more than 150 fields of study and more than 50 years of educational experience. The students used two platforms, Adobe Connect and a national platform called Sky room, to take online courses.

Objectives

This study investigated the factors influencing students' acceptance of online learning systems during the Covid-19 pandemic.

Methods

Instruments: This cross-sectional, descriptive-analytical study was conducted using a quantitative approach. The data in this study were collected using a research-made questionnaire which consisted of two sections. The first section assessed the students' demographic characteristics (gender, grade of

education, major), and the second section contained 24 items to measure the research variables on a 5-point Likert scale ranging from strongly agree (score 5) to strongly disagree (score 1). The total score on the scale varied between 24 and 120. Questionnaire constructs included computer self-efficacy (CSE), perceived accessibility (PA), perceived ease of use (PEU), perceived usefulness (PU), attitude towards (AT), and behavioral intention (BI).

The items in the questionnaire were developed using sources based on a review of the literature. The items were translated and back-translated from English to Farsi by an English translator. After the initial item bank was collected, ten subject-matter experts, who were active in this field and had deep insights into the online education system, checked the items to assess the face and content validity of the questionnaire. The content validity index (CVI) was greater than 0.8, confirming the content validity of the questionnaire. After making the necessary revisions, the questionnaire was piloted on a sample of 30 students to assess its reliability. The reliability of the whole questionnaire was confirmed with Cronbach's alpha coefficient of 0.93. The final version of the questionnaire contained 24 items and 6 components.

Sample Size and Sampling: We recruited 450 students randomly from both genders and different study fields. As our theoretical model had 24 items, we chose at least ten subjects per item according to the "rule of 10 times," which is the most widely used method of estimating sample size in PLS-SEM (6). The data were collected in the fall semester. Fifteen students who provided incomplete responses to the items were excluded from the study. Thus, the final sample consisted of 435 students.

Measurement Model Evaluation and Statistical Analysis: The questionnaire was evaluated using convergent validity, internal consistency, and discriminant validity. Convergent validity was assessed using averaged variance extracted (AVE), and the internal consistency was checked using Cronbach's alpha (CA) and composite reliability (CR) (27).

The Fornell-Larcker (FL) criterion and the heterotrait-monotrait ratio of correlations (HTMT) were used to assess discriminant validity in this study. According to the Fornell-Larcker (FL) criterion, the square root of AVE by a construct should be greater than the correlation between that construct and any other (28). The HTMT ratio is an index developed based on the Monte Carlo simulation and used to check divergent

validity. Studies have recommended the value of this coefficient be less than 0.9 to establish divergent validity (26).

The results are presented as mean \pm standard deviation (SD) for the quantitative variables and frequency and percentage for the qualitative variables.

Normality of data was checked by the Kolmogorov-Smirnov (K-S) test. The Mann-Whitney U test was run to compare the mean scores for the questionnaire constructs with the demographic variables. To address the lateral collinearity issue, the variance inflation factor (VIF) was measured. Studies have shown that VIF values less than 10 indicate the absence of worrisome collinearity (29).

The model hypotheses were checked using partial least square structural equation modeling (PLS-SEM). Standardized root means square residual (SRMR), incremental fit index (IFI), R^2 index, and Cohen's f^2 effect size were used to check the fit of the structural equation model (30, 31). All analyses were performed in Smart PLS 3.0 software.

The standardized root means square residual (SRMR) and the incremental fit index (IFI) were measured for the model's goodness of fit. Previous studies have indicated that the SRMR index is acceptable when it is less than 0.10, and the model has a good fit index when it is less than 0.05 (32, 33). Moreover, IFI values greater than 0.9 indicate a good fit for the model (34).

Results

Demographic Characteristics: Of the 435 students who completed the questionnaire, 55.6% were female, 54.0% reported using mobile internet, and 46.0% used modems to participate in online courses. The most commonly used devices used to take online courses were computers or laptops (55.8%) followed by mobile phones or tablets (44.2%).

Most of the participants (58.4%) were medicine, dentistry, or pharmacy majors (MDP), and 41.6% of the participants were other undergraduate students (B.S.). Table 1 shows the questionnaire items and the mean, standard deviation, and percentage of the responses to each item (Table 1).

The result of the Kolmogorov-Smirnov test was significant for all instruments of the questionnaire. Thus, the results of the Mann-Whitney U test showed no significant difference between the mean scores of male and female participants in any of the studied constructs.

Table 1. Constructs and indicator

Construct	Statements/Items	Strongly Disagree	Disagree	Moderate	Agree	Strongly Agree	Mean (SD)
		n (%)					
AT ¹	I feel positive regarding the utilization of online education.	30 (6.9)	54 (12.4)	110 (25.3)	111 (25.6)	129 (29.7)	2.41 (1.23)
AT	In general, I admire the utilization of online education.	41 (9.4)	74 (17.1)	99 (22.8)	98 (22.6)	122 (28.1)	2.57 (1.31)
AT	Overall, I like using the online education.	34 (7.9)	60 (13.9)	103 (23.8)	106 (24.5)	129 (29.9)	2.45 (1.26)
AT	Online education, provides an attractive learning environment.	75 (17.4)	84 (19.4)	113 (26.2)	58 (13.4)	102 (23.6)	2.93 (1.40)
PU ²	The use of online education is beneficial for my learning activities during the Covid 19 pandemic.	8 (1.8)	16 (3.7)	64 (14.7)	161 (37.1)	185 (42.6)	1.85 (0.93)
PU	The use of online education during university closure due to the Covid-19 pandemic helps me to access learning resources.	11 (2.5)	48 (11.1)	112 (25.9)	154 (35.6)	108 (24.9)	2.31 (1.04)
PU	Using online education will improve learning performance in distance learning during the Covid-19 pandemic.	6 (1.4)	21 (4.8)	63 (14.5)	175 (40.4)	168 (38.8)	1.90 (0.92)
PU	The use of online education will increase my productivity in distance learning during the Covid-19 pandemic.	5 (1.2)	13 (3.0)	50 (11.5)	177 (40.9)	188 (43.4)	1.78 (0.85)
PEU ³	It is easy for me to use the university online learning system.	36 (8.3)	66 (15.2)	119 (27.4)	95 (21.9)	118 (27.2)	2.55 (1.26)
PEU	Overall, the university online learning system is easy to use.	23 (5.3)	47 (10.8)	98 (22.5)	135 (31.0)	132 (30.3)	2.30 (1.16)
PEU	It is easy to learn how to use the university online learning system.	38 (8.8)	78 (18.0)	117 (27.0)	83 (19.1)	118 (27.2)	2.62 (1.29)
PEU	It is easy to remember how to use the university online learning system.	60 (13.9)	94 (21.8)	102 (23.7)	78 (18.1)	97 (22.5)	2.86 (1.36)
BI ⁴	I will recommend using an online learning system in the future.	52 (12.0)	64 (14.7)	80 (18.4)	96 (22.1)	143 (32.9)	2.51 (1.39)
BI	I want all courses to be offered via an online learning system during Covid-19 and beyond.	53 (12.2)	68 (15.7)	104 (24.0)	101 (23.3)	107 (24.7)	2.67 (1.33)
BI	I will use online learning system if it is available in the post-Covid-19 pandemic.	38 (8.8)	55 (12.7)	89 (20.6)	122 (28.2)	129 (29.8)	2.42 (1.27)
PA ⁵	I access and use the online learning system in the university without any problems.	16 (3.7)	27 (6.2)	96 (22.2)	147 (33.9)	147 (33.9)	2.12 (1.06)
PA	The online learning system can be accessed appropriately by using the chain of communication.	14 (3.2)	23 (5.3)	115 (26.6)	146 (33.7)	135 (31.2)	2.16 (1.03)
PA	The online learning system is accessible according to my own possibilities.	8 (1.8)	15 (3.4)	88 (20.2)	169 (38.9)	155 (35.6)	1.97 (0.93)
PA	The chain of communication is suitable to get access to the online learning tool.	12 (2.8)	18 (4.2)	98 (22.6)	165 (38.1)	140 (32.3)	2.07 (0.98)
CSE ⁶	I feel confident in the utilization of online learning system even when no one is there for assistance.	6 (1.4)	13 (3.0)	43 (9.9)	144 (33.2)	228 (52.5)	1.67 (0.87)
CSE	I have sufficient skills to use the online learning system.	4 (0.9)	7 (1.6)	51 (11.8)	149 (34.3)	223 (51.4)	1.66 (0.82)
CSE	I feel confident when using the online learning system features.	5 (1.2)	7 (1.6)	54 (12.50)	173 (40.0)	194 (44.8)	1.74 (0.82)
CSE	I feel confident when using the online learning system even if I have only the online instructions.	12 (2.8)	22 (5.1)	75 (17.3)	152 (35.0)	173 (39.9)	1.96 (1.01)
CSE	I feel confident when using the online learning content in the online learning system.	8 (1.80)	11 (2.50)	65 (15.0)	158 (36.4)	192 (44.2)	1.81 (0.91)

Reference constructs: 1. AT: (Salloum et al., 2019); 2. PU: (Mailizar et al., 2021); 3. PEU: (Alshurafat et al., 2021); 4. BI: (Mailizar et al., 2021); 5. PA: (Salloum et al., 2019); 6. CSE: (Salloum et al., 2019).

SD: Standard deviation

Likewise, there was no significant difference between the mean scores of the investigated constructs and type of internet use (mobile or modem) except CSE. In all studied constructs other than AT, CSE, and PU, students who used mobile phones or tablets for online education courses obtained significantly higher mean scores for the questionnaire constructs. In addition, the mean scores of MDP students in all questionnaire constructs were significantly lower than those of undergraduate students (Table 2).

Model Evaluation: The highest AEU, Cronbach's alpha, and CR values for the investigated constructs were related to the AT area, and the lowest values were related to the PU construct. The AVE values were greater than 0.75 for all constructs. Moreover, Cronbach's alpha for all indices was greater than 0.87, and the CR index was greater than 0.75. The analysis of the measurement model suggested a positive indication of the robustness of the constructs' measures. The lowest FL value for the constructs in question was calculated as 0.85. In addition, all HTMT values were less than 0.86, demonstrating that every construct had adequate discriminant validity. As a result, the constructs had sufficient convergent and discriminant validity (Table 3).

Structural Model: For factor analysis, the six constructs of CSE, PEU, PU, PA, BI, and AT were identified. The structural model and its path coefficients are depicted in Figure 2. R² was determined to examine the predictive accuracy of the model. In Figure 2, the numbers inside the circles indicate the coefficient of determination (R²). R² for BI was 0.644. This indicates that the two exogenous constructs (AT and PU) explain

64.4% of the variance in BI. The numbers on the arrow between the circles show the path coefficients, and the numbers on the arrow between the circles and the rectangles are factor loadings. All indicators had factor loading values above 0.5, indicating the validity of the used indicators (27).

The results of the structural model and hypotheses tested are shown in Table 4. VIF values for all variables were less than 5, confirming the absence of worrisome collinearity in this study.

The hypotheses were tested using partial least square structural equation modeling (PLS-SEM). The results indicated that all tested hypotheses were significant except for the effects of computer self-efficacy on PEU, which means CSE did not significantly affect it. CSE, however, had a positive and significant effect on PU; therefore, hypothesis 2 was supported.

PA had a positive and significant effect on PEU and PU, so hypotheses 3 and 4 were supported. PEU had a positive and significant effect on PU and attitude towards using online education systems, indicating that hypothesis 5 and 6 were accepted. PU had a positive and significant effect on the BI of students and their attitude toward using online education systems. Therefore, hypotheses 7 and 8 were supported. Finally, attitude toward using online education systems directly and significantly affected students' BI to use online education; thus, hypothesis 8 was supported. SRMR and IFI were calculated as 0.05 and 0.89, respectively, confirming the good fit for the model. The values of path coefficients for PEU and AT as well as AT and BI variables were higher, indicating the strength of the relationship between these variables.

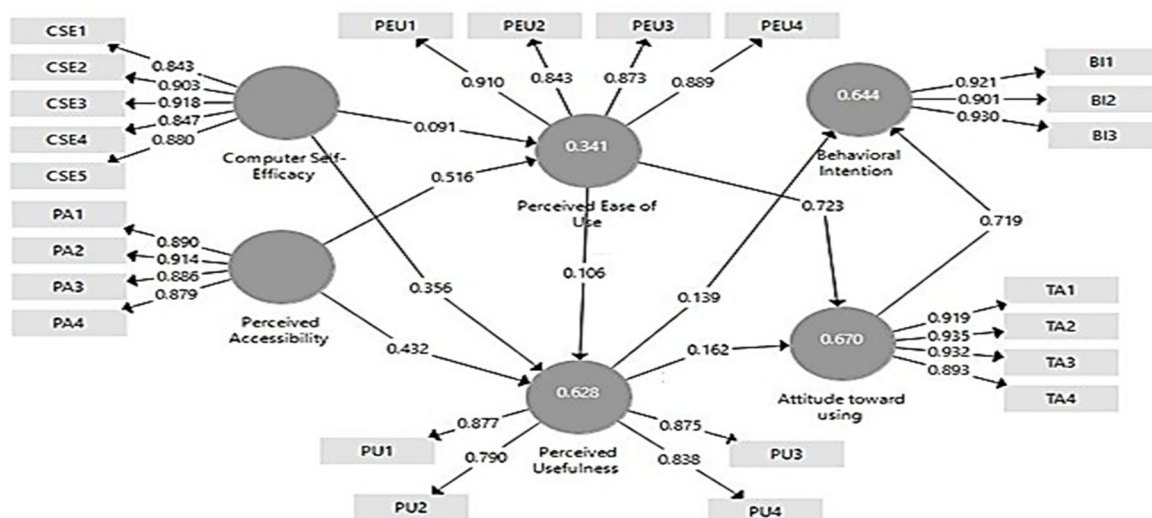


Figure 2. Model layout, factor loadings, coefficients of determination (R²), and model path coefficients

Table 2. Comparison of mean scores of questionnaires between study variables

Variables	Attitude Toward Using		Behavioral Intention		Computer Self-Efficacy		Perceived Accessibility		Perceived Ease of Use		Perceived Usefulness	
	Mean (SD)	P-value	Mean (SD)	P-value	Mean (SD)	P-value	Mean (SD)	P-value	Mean (SD)	P-value	Mean (SD)	P-value
Gender												
Male	9.95 (4.60)	0.13	7.38 (3.57)	0.26	8.74 (3.68)	0.62	8.42 (3.57)	0.60	10.08 (4.42)	0.27	7.64 (3.00)	0.31
Female	10.70 (4.92)		7.81 (3.73)		8.93 (4.06)		8.22 (3.58)		10.55 (4.50)		7.96 (3.27)	
Device												
PC-Laptop	10.12 (4.69)	0.18	7.31 (3.62)	< 0.05	8.50 (3.60)	0.052	8.00 (3.47)	< 0.05	9.84 (4.30)	< 0.01	7.55 (3.03)	0.06
Mobile-Tablet	10.76 (4.90)		8.06 (3.68)		9.31 (4.21)		8.72 (3.67)		11.04 (4.58)		8.17 (3.26)	
Kind of internet used												
Mobile	10.47 (4.67)	0.83	7.75 (3.58)	0.52	9.15 (4.0)	0.04	8.41 (3.47)	0.35	10.55 (4.43)	0.53	7.93 (3.05)	0.23
Modem	10.43 (4.93)		7.56 (3.76)		8.39 (3.63)		8.21 (3.66)		10.27 ± 4.49		7.65 (3.22)	
Grade												
BS	11.39 (4.92)	< 0.001	8.51 (3.67)	< 0.001	9.68 (4.27)	< 0.001	9.06 (3.82)	< 0.001	10.97 (4.42)	< 0.05	8.46 (3.27)	< 0.001
MDP	9.68 (4.57)		7.02 (3.53)		8.26 (3.50)		7.78 (3.31)		9.90 (4.45)		7.36 (3.00)	
Total score	10.37 (4.79)	-	7.62 (3.66)	-	8.85 (3.89)	-	8.31 (3.58)	-	10.35 (4.47)	-	7.82 (3.15)	-

SD: Standard Deviation

Table 3. Examining convergent and divergent validity Fornell and Larcker (HTMT ratio) and reliability of the model

Variables	Divergent Validity, Fornell and Larcker (HTMT ratio)						Convergent Validity and Reliability of the Model		
	Perceived Usefulness	Perceived Ease of Use	Perceived Accessibility	Computer Self-Efficacy	Behavioral Intention	Attitude Toward Using	Composite Reliability (CR)	Cronbach's Alpha (CA)	Average Variance Extracted (AVE)
Attitude Toward Using	0.920						0.846	0.939	0.956
Behavioral Intention	0.794 (0.86)	0.917					0.842	0.906	0.941
Computer Self-Efficacy	0.450 (0.478)	0.453 (0.491)	0.879				0.772	0.926	0.944
Perceived Accessibility	0.593 (0.639)	0.584 (0.639)	0.704 (0.764)	0.892			0.796	0.915	0.940
Perceived Ease of Use	0.807 (0.875)	0.746 (0.823)	0.453 (0.494)	0.580 (0.638)	0.879		0.773	0.902	0.931
Perceived Usefulness	0.536 (0.591)	0.525 (0.585)	0.708 (0.785)	0.744 (0.830)	0.518 (0.581)	0.846	0.715	0.867	0.909

Table 4. Results of hypothesis testing and lateral collinearity assessment

Hyps	Relationship	VIF	Path Coefficients (P-value)
H1	CSE → PEU	1.980	0.091 (0.062)
H2	CSE → PU	1.992	0.356 (< 0.001)*
H3	PA → PEU	1.980	0.516 (< 0.001)*
H4	PA → PU	2.384	0.432 (< 0.001)*
H5	PEU → AT	1.366	0.723 (< 0.001)*
H6	PEU → PU	1.516	0.106 (< 0.01)*
H7	PU → BI	1.446	0.139 (< 0.01)*
H8	PU → AT	1.366	0.162 (< 0.001)*
H9	AT → BI	3.031	0.719 (< 0.001)*

Discussion

The current study investigated the factors influencing the acceptance of online education by undergraduate students during the Covid-19 pandemic. Investigating these factors, especially in universities in developing countries with relatively little experience in offering online courses, will help policymakers with educational planning. The research hypotheses were tested using TAM with CSE and PA as the external factors.

The study results showed that students who used mobile phones or tablets to attend online courses had higher mean scores for all questionnaire constructs compared to students who used PCs or laptops. Moreover, the use of mobile internet had higher self-efficacy scores than use of a modem. The cheapness of the mobile phone, its availability, portability, and lightness compared to laptops, and having all the necessary tools including a microphone, webcam, etc., all at once in a small device compared to some desktop computers, made it easier for students to use mobile phones to take online courses. Various studies have also shown that the use of mobile phones can affect the satisfaction of students in taking online courses (35, 36). Other studies have suggested that students were significantly more likely to use laptops and smartphones for online courses and less likely to rely on desktop computers, indicating that the portability of a communication device is particularly important to students (37).

The data from the current study also showed that MDP students obtained significantly lower mean scores than undergraduate students in all the studied constructs. A greater number of practical courses are taken by MDP students than by undergraduate students (38). Studies have shown that it is more difficult to provide practical courses online than theoretical courses

(38). A systematic review compared the level of satisfaction of medical and non-medical students with online education during the Covid-19 pandemic in Iran and showed that 58.1% of medical students and 70.1% of non-medical students were satisfied with online education (38).

The results of the structure model showed that only CSE as an external variable did not significantly affect PEU. The findings also indicated that CSE significantly affected PU. Previous studies have shown a positive and significant relationship between CSE and PU (39). CSE as an external variable represents an individual variable. The more a person's individual skills to use online education increase, the more utility they perceive they will receive from the online education system. Contrary to previous studies (7, 15), the data in the current study revealed no significant relationship between PEU and CSE. It is probable that the use of a native platform and the problems of typing in Persian with Adobe-connect software caused even those students with computer skills to find learning through the online education system difficult.

The data in this study indicated that PA had a positive and significant effect on PEU and PU. Other studies have also confirmed this significant relationship (7). The greater the ease of access and use of the online education system by the users, the more likely users will be to perceive the ease of use and usefulness of the online education system (18). Effective and quality access may not have a direct relationship with students, but it can motivate learners to use the online education system more effectively and frequently (18).

The findings of the present study showed that PEU and PU significantly affect students' attitudes toward using the online learning system. Many studies have confirmed these results (40, 41). It can be expected that as the perceived usefulness and ease of use of the online learning system increases, so too will the students' positive attitude towards it. The data in the present study confirmed that students' attitudes and PU strongly influence their behavior in using the online education system. Most previous studies have confirmed the effect of attitudes and perceived usefulness on the intention to use the online education system (7, 26). It is expected that the greater the perceived usefulness and the more positive the students' attitudes towards using the online education system are, the more positive an effect they will have on students' usage behavior.

Limitations: This study had some limitations. First, the students' self-report bias could affect their responses, especially when their skills and performance are questioned. The second limitation was that only CSE and PA were taken as the external variables in the model.

Other factors may also affect students' behavioral intentions, but they were not addressed in this study.

Conclusion

The results of this study suggest that students are more likely to consider online educational systems that are easier to work to be more useful. The ease of use of the online education system will reduce the time spent on learning and, consequently, positively affect students' attitudes. Thus, when choosing an online education system, university officials should focus on the ease of learning and convenient use of mobile phones and pay enough attention to creating the necessary infrastructure for online educational services. Furthermore, professors and students should receive the training necessary to use the online education system. Today, with the experience gained by students and professors, universities can continue using online education even after the Covid-19 crisis.

Acknowledgements: The authors would like to thank Tehran University of Medical Sciences and all the participating students who made this research possible.

Conflict of interests: The authors have no conflicts of interest.

Ethical approval: The proposal of the present study was approved by the ethics committee of Kerman University of Medical Sciences, Kerman, Iran (reference 401000435). The ethical approval code is IR.KMU.REC.1401.269.

Funding/Support: This research was partially supported by Kerman University of Medical Sciences.

References

- Han JH, Sa HJ. Acceptance of and satisfaction with online educational classes through the technology acceptance model (TAM): The COVID-19 situation in Korea. *Asia Pacific Educ Rev*. 2022; 23(3): 403–415. doi: [10.1007/s12564-021-09716-7](https://doi.org/10.1007/s12564-021-09716-7). [PMCID: [PMC8442664](https://pubmed.ncbi.nlm.nih.gov/38442664/)]
- Ahmadi Gohari M, Chegeni M, Haghdoost AA, Mirzaee F, White L, Kostoulas P, et al. Excess deaths during the COVID-19 pandemic in Iran. *Infect Dis (Lond)*. 2022 Dec;54(12):909-917. doi: [10.1080/23744235.2022.2122554](https://doi.org/10.1080/23744235.2022.2122554). [PMID: [36121798](https://pubmed.ncbi.nlm.nih.gov/36121798/)]
- Nakhaeizadeh M, Eybpoosh S, Jahani Y, Gohari MA, Haghdoost AA, White L, et al. Impact of non-pharmaceutical interventions on the control of COVID-19 in Iran: a mathematical modeling study. *Int J Health Policy Manag*. 2022 Aug 1;11(8):1472-1481. doi: [10.34172/ijhpm.2021.48](https://doi.org/10.34172/ijhpm.2021.48). [PMID: [34273920](https://pubmed.ncbi.nlm.nih.gov/34273920/)] [PMCID: [PMC9808365](https://pubmed.ncbi.nlm.nih.gov/PMC9808365/)]
- Baber H. Modelling the acceptance of e-learning during the pandemic of COVID-19-A study of South Korea. *The International Journal of Management Education*. 2021 Jul; 19(2): 100503. doi: [10.1016/j.ijme.2021.100503](https://doi.org/10.1016/j.ijme.2021.100503). [PMCID: [PMC8040541](https://pubmed.ncbi.nlm.nih.gov/PMC8040541/)]
- Nurse-Clarke N, Joseph M. An exploration of technology acceptance among nursing faculty teaching online for the first time at the onset of the COVID-19 pandemic. *J Prof Nurs*. 2022 Jul-Aug;41:8-18. doi: [10.1016/j.profnurs.2022.04.002](https://doi.org/10.1016/j.profnurs.2022.04.002). [PMID: [35803663](https://pubmed.ncbi.nlm.nih.gov/35803663/)] [PMCID: [PMC9020791](https://pubmed.ncbi.nlm.nih.gov/PMC9020791/)]
- Hair Jr JF, Hult GTM, Ringle CM, Sarstedt M. A primer on partial least squares structural equation modeling (PLS-SEM). Thousand Oaks, California: Sage Pub; 2021. doi: [10.1007/978-3-030-80519-7](https://doi.org/10.1007/978-3-030-80519-7).
- Salloum SA, Alhamad AQM, Al-Emran M, Monem AA, Shaalan KJ. Exploring students' acceptance of e-learning through the development of a comprehensive technology acceptance model. *IEEE access*. 7; 128445-62. doi: [10.1109/ACCESS.2019.2939467](https://doi.org/10.1109/ACCESS.2019.2939467).
- Lazim C, Ismail NDB, Tazilah MD. Application of technology acceptance model (TAM) towards online learning during covid-19 pandemic: Accounting students perspective. *International Journal of Business, Economics and Law*. 2021;24(1):13-20.
- Al-Qaysi N, Mohamad-Nordin N, Al-Emran MJ. A systematic review of social media acceptance from the perspective of educational and information systems theories and models. *Journal of Educational Computing Research*. 2020;57(8): 2085-109. doi: [10.1177/0735633118817879](https://doi.org/10.1177/0735633118817879).
- Alshurafat H, Al Shbail MO, Obeid M, Masadeh WM, Dahmash F, Al-Msiedeem JM, et al. Factors affecting online accounting education during the COVID-19 pandemic: an integrated perspective of social capital theory, the theory of reasoned action and the technology acceptance model. *Educ Inf Technol (Dordr)*. 2021;26(6):6995-7013. doi: [10.1007/s10639-021-10550-y](https://doi.org/10.1007/s10639-021-10550-y). [PMID: [33935577](https://pubmed.ncbi.nlm.nih.gov/33935577/)] [PMCID: [PMC8072731](https://pubmed.ncbi.nlm.nih.gov/PMC8072731/)]
- Ansari S, Rezapoor M, Hematgar MA, Ghazi AS, Varmazyar S. Musculoskeletal disorders and its related risk factors among students of Qazvin university of medical sciences. *Journal of Human Environment and Health Promotion*. 2017;2(3):161-7. doi: [10.29252/jhehp.2.3.161](https://doi.org/10.29252/jhehp.2.3.161).
- Zobeidi T, Homayoon SB, Yazdanpanah M, Komendantova N, Warner LA. Employing the TAM in predicting the use of online learning during and beyond the COVID-19 pandemic. *Front Psychol*. 2023 Feb 17;14:1104653. doi: [10.3389/fpsyg.2023.1104653](https://doi.org/10.3389/fpsyg.2023.1104653). [PMID: [36874866](https://pubmed.ncbi.nlm.nih.gov/36874866/)] [PMCID: [PMC9982163](https://pubmed.ncbi.nlm.nih.gov/PMC9982163/)]
- Mailizar M, Burg D, Maulina SJE, Technologies I. Examining university students' behavioural intention to use e-learning during the COVID-19 pandemic: An extended TAM model. *Educ Inf Technol (Dordr)*. 2021; 26(6): 7057-7077. doi: [10.1007/s10639-021-10557-5](https://doi.org/10.1007/s10639-021-10557-5). [PMID: [33935579](https://pubmed.ncbi.nlm.nih.gov/33935579/)] [PMCID: [PMC8079853](https://pubmed.ncbi.nlm.nih.gov/PMC8079853/)]
- Sánchez RA, Hueros AD. Motivational factors that influence the acceptance of Moodle using TAM. *Computers in human behavior*. 2010;26(6):1632-40. doi: [10.1016/j.chb.2010.06.011](https://doi.org/10.1016/j.chb.2010.06.011).
- Kanwal F, Rehman M. Factors affecting e-learning adoption in developing countries—empirical evidence from Pakistan's higher education sector. *Ieee Access*. 2017;5:10968-78. doi: [10.1109/ACCESS.2017.2714379](https://doi.org/10.1109/ACCESS.2017.2714379).
- Al-Debei MM. The quality and acceptance of websites: an empirical investigation in the context of higher education.

- International Journal of Business Information Systems. 2014;15(2):170-88. doi: [10.1504/IJBIS.2014.059252](https://doi.org/10.1504/IJBIS.2014.059252).
17. Al-Aulamie A. (dissertation). Enhanced technology acceptance model to explain and predict learners' behavioural intentions in learning management systems. Buckinghamshire, England, UK: University of Bedfordshire; 2013.
 18. Almaiah MA, Jalil MA, Man M. Extending the TAM to examine the effects of quality features on mobile learning acceptance. *Journal of Computers in Education*. 2016;3(4):453-85. doi: [10.1007/s40692-016-0074-1](https://doi.org/10.1007/s40692-016-0074-1).
 19. Abbas TM. Human factors affecting university hospitality and tourism students' intention to use e-learning: A comparative study between Egypt and the UK. *Journal of Human Resources in Hospitality & Tourism*. 2017;16(4):349-66. doi: [10.1080/15332845.2017.1266866](https://doi.org/10.1080/15332845.2017.1266866).
 20. Joo YJ, Kim N, Kim NH. Factors predicting online university students' use of a mobile learning management system (m-LMS). *Educational Technology Research and Development*. 2016;64(4):611-30. doi: [10.1007/s11423-016-9436-7](https://doi.org/10.1007/s11423-016-9436-7).
 21. Davis FD. Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS quarterly*. 1989;3:19-40. doi: [10.2307/249008](https://doi.org/10.2307/249008).
 22. Khan MJ, Reddy LKV, Khan J, Narapureddy BR, Vaddamanu SK, Alhamoudi FH, et al. Challenges of E-Learning: Behavioral Intention of Academicians to Use E-Learning during COVID-19 Crisis. *J Pers Med*. 2023 Mar 20;13(3):555. doi: [10.3390/jpm13030555](https://doi.org/10.3390/jpm13030555). [PMID: [36983736](https://pubmed.ncbi.nlm.nih.gov/36983736/)] [PMCID: [PMC10056789](https://pubmed.ncbi.nlm.nih.gov/PMC10056789/)]
 23. Mahmudi M. The analysis of the factors affecting the acceptance of E-learning in higher education. *Interdisciplinary Journal of Virtual Learning in Medical Sciences*. 2017;8(1): e11158. doi: [10.5812/ijvlms.11158](https://doi.org/10.5812/ijvlms.11158).
 24. Kaplan KJ. On the ambivalence-indifference problem in attitude theory and measurement: A suggested modification of the semantic differential technique. *Psychological bulletin*. 1972;77(5):361. doi: [10.1037/h0032590](https://doi.org/10.1037/h0032590).
 25. Hussein Z. Leading to intention: The role of attitude in relation to technology acceptance model in e-learning. *Procedia Computer Science*. 2017;105:159-64. doi: [10.1016/j.procs.2017.01.196](https://doi.org/10.1016/j.procs.2017.01.196).
 26. Kusumadewi AN, Lubis NA, Prastioy R, Tamara DJ. Technology Acceptance Model (TAM) in the Use of Online Learning Applications During the Covid-19 Pandemic for Parents of Elementary School Students. *Edunesia: Jurnal Ilmiah Pendidikan*. 2021;2(1):272-92. doi: [10.51276/edu.v2i1.120](https://doi.org/10.51276/edu.v2i1.120).
 27. Leguina A. A primer on partial least squares structural equation modeling (PLS-SEM). *International Journal of Research & Method in Education*. 2015; 38(2): 220-1. doi: [10.1080/1743727X.2015.1005806](https://doi.org/10.1080/1743727X.2015.1005806).
 28. Hair Jr JF, Hult GTM, Ringle CM, Sarstedt M, Danks NP, Ray S. *Partial Least Squares Structural Equation Modeling (PLS-SEM) Using R*. Berlin, Germany: Springer Nature; 2021. doi: [10.1007/978-3-030-80519-7](https://doi.org/10.1007/978-3-030-80519-7).
 29. Marcoulides KM, Raykov T. Evaluation of Variance Inflation Factors in Regression Models Using Latent Variable Modeling Methods. *Educ Psychol Meas*. 2019 Oct;79(5):874-882. doi: [10.1177/0013164418817803](https://doi.org/10.1177/0013164418817803). [PMID: [31488917](https://pubmed.ncbi.nlm.nih.gov/31488917/)] [PMCID: [PMC6713981](https://pubmed.ncbi.nlm.nih.gov/PMC6713981/)]
 30. Cohen J. *Statistical power analysis for the behavioral sciences*. New York: Routledge; 2013. doi: [10.4324/9780203771587](https://doi.org/10.4324/9780203771587).
 31. Sarstedt M, Hair JF, Pick M, Liengaard BD, Radomir L, Ringle CM, et al. Progress in partial least squares structural equation modeling use in marketing research in the last decade. *Psychology & Marketing*. 2022;39(5):1035-64. doi: [10.1002/mar.21640](https://doi.org/10.1002/mar.21640).
 32. Cangur S, Ercan I. Comparison of model fit indices used in structural equation modeling under multivariate normality. *Journal of Modern Applied Statistical Methods*. 2015;14(1):14. doi: [10.22237/jmasm/1430453580](https://doi.org/10.22237/jmasm/1430453580).
 33. Henseler J, Sarstedt M. Goodness-of-fit indices for partial least squares path modeling. *Computational statistics*. 2013;28(2): 565-80. doi: [10.1007/s00180-012-0317-1](https://doi.org/10.1007/s00180-012-0317-1).
 34. Bollen KA. Overall fit in covariance structure models: Two types of sample size effects. *Psychological bulletin*. 1990;107(2):256. doi: [10.1037/0033-2909.107.2.256](https://doi.org/10.1037/0033-2909.107.2.256).
 35. Togaibayeva A, Ramazanova D, Yessengulova M, Yergazina A, Nurlin A, Shokanov R. Effect of mobile learning on students' satisfaction, perceived usefulness, and academic performance when learning a foreign language. *Frontiers in Education*. 2022; 7: 946102. doi: [10.3389/educ.2022.946102](https://doi.org/10.3389/educ.2022.946102).
 36. Alturki U, Aldraiweesh A. Students' perceptions of the actual use of mobile learning during COVID-19 pandemic in higher education. *Sustainability*. 2022;14(3):1125. doi: [10.3390/su14031125](https://doi.org/10.3390/su14031125).
 37. Gamage KA, Perera E. Undergraduate students' device preferences in the transition to online learning. *Social Sciences*. 2021;10(8):288. doi: [10.3390/socsci10080288](https://doi.org/10.3390/socsci10080288).
 38. Nakhoda K, Ahmady S, Fesharaki MG, Azar NG. COVID-19 pandemic and e-Learning satisfaction in medical and non-medical student: a systematic review and meta-analysis. *Iran J Public Health*. 2021 Dec;50(12):2509-2516. doi: [10.18502/ijph.v50i12.7933](https://doi.org/10.18502/ijph.v50i12.7933). [PMID: [36317038](https://pubmed.ncbi.nlm.nih.gov/36317038/)] [PMCID: [PMC9577163](https://pubmed.ncbi.nlm.nih.gov/PMC9577163/)]
 39. Usman O, Septianti A, Susita MJ. The Effect of Computer Self-efficacy and Subjective Norm on the Perceived Usefulness, Perceived Ease of Use and Behavioural Intention to Use Technology. *Journal of Southeast Asian Research*. 2020; 2020;11. doi: [10.5171/2020.753259](https://doi.org/10.5171/2020.753259).
 40. Abdullah F, Ward R, Ahmed E. Investigating the influence of the most commonly used external variables of TAM on students' Perceived Ease of Use (PEOU) and Perceived Usefulness (PU) of e-portfolios. *Computers in human behavior*. 2016;63:75-90. doi: [10.1016/j.chb.2016.05.014](https://doi.org/10.1016/j.chb.2016.05.014).
 41. Binyamin SS, Rutter M, Smith S. Extending the technology acceptance model to understand students' use of learning management systems in Saudi Higher Education. *International Journal of Emerging Technologies in Learning (ijET)*. 2019;14(03): 4-21. doi: [10.3991/ijet.v14i03.9732](https://doi.org/10.3991/ijet.v14i03.9732).

Psychometric Properties of the Context, Input, Process, and Product (CIPP) Model for the Evaluation of Medical Ethics Education

Habibeh Ahmadipour¹, Amirhossein Alirezaie², Mina Mobasher^{3*}

¹Associate Professor, Department of Community and Family Medicine, Afzalipour Faculty of Medicine, Kerman University of Medical Sciences, Kerman, Iran

²Medical Student, Afzalipour Faculty of Medicine, Kerman University of Medical Sciences, Kerman, Iran

³Assistant Professor, Department of Medical Ethics and History of Medicine, School of Persian Medicine, Kerman University of Medical Sciences, Kerman, Iran

Received: 2023 June 24

Revised: 2023 September 02

Accepted: 2023 September 18

Published online: 2023 September 19

***Corresponding author:**

Department of Medical Ethics and History of Medicine, School of Persian Medicine, Kerman University of Medical Sciences, Kerman, Iran.
Email: minamobasher96@gmail.com

Citation:

Ahmadipour H, Alirezaie A, Mobasher M. Psychometric Properties of CIPP Model for Evaluating of Medical Ethics Education. *Strides Dev Med Educ.* 2023 September; 20(1): 155-161.
doi:10.22062/sdme.2023.198729.1240

Abstract

Background: Medical ethics courses play a pivotal role in medical education, aiming to enhance the moral decision-making capabilities of medical students. As such, the evaluation of medical ethics education programs within medical faculties is of paramount importance for the improvement of these initiatives.

Objectives: This study aimed to appraise the psychometric properties of the Context, Input, Process, Product (CIPP) evaluation model in medical ethics education.

Methods: This cross-sectional study was conducted on 136 clerkship medical students, who were enrolled in a medical ethics course at Kerman University of Medical Sciences, Kerman, Iran. The participants completed a 40-item researcher-made questionnaire, which was designed based on the CIPP evaluation model. The questionnaire was divided into four distinct sections, each corresponding to the context, input, process, and product aspects of the model. The face and content validity of the instrument was established by an expert panel, consisting of 10 faculty members of medical education and medical ethics. The reliability of the questionnaire was also determined by calculating its internal consistency using Cronbach's alpha coefficient. Moreover, the construct validity of the questionnaire was assessed via confirmatory factor analysis, using the goodness of fit indices. Data were analyzed in SPSS version 19 and Lisrel 8.8.

Results: The content validity index and content validity ratio of the questionnaire were measured to be 0.97 and 0.89, respectively. The internal consistency of different sections of the questionnaire ranged between 0.71 and 0.87. In the confirmatory factor analysis, the model showed acceptable goodness of fit indices.

Conclusion: In this study, the psychometric properties of the CIPP evaluation model for medical ethics education were found to be acceptable and applicable.

Keywords: Medical Ethics, Education, Medical Students, CIPP Model

Background

Medical ethics courses are one of the key components of medical education due to the necessity of a humanistic approach in medical treatment, which mandates practitioners in clinical settings to continually develop and refine their knowledge, attitudes, and capabilities. Moreover, medical schools need to pay particular attention to medical ethics training programs that aim to improve medical students' moral decision-making capabilities (1). Recently, the increased complexity of the healthcare system has resulted in the establishment of

medical ethics training programs around the world (2, 3). In Iran, a significant reform project was undertaken by the Medical Ethics and History of Medicine Research Center of Tehran University of Medical Sciences (TUMS, Tehran, Iran) in 2005. This project, which was carried out in collaboration with the Medical Education Development Office, aimed to enhance the medical ethics programs. Following this reform, a paradigm shift in the approach to medical ethics education was reported by 2011 (4).

One of the most challenging aspects of education is assessing the quality and effectiveness of education and instruction. The evaluation of educational programs can provide insight into the degree to which the objectives of a program have been fulfilled (5). It is generally a crucial method for improving quality, enhancing strengths, and mitigating potential shortcomings (6, 7). Stufflebeam et al. developed the Context, Input, Process, and Product (CIPP) model in the late 1960's as a robust framework for evaluating educational initiatives (8). Over 200 doctoral dissertations, journal publications, and assessment studies related to the CIPP model have been identified, spanning across various countries and disciplines (9). Additionally, the CIPP model has been used in numerous research studies in Iran to assess educational initiatives, as seen in the long-term educational clinical faculty development program (10), the externship curriculum for public health courses by Yazd University of Medical Sciences (11), and the master's program in neonatal intensive care nursing (12).

Four elements make up the CIPP model, including context, input, process, and product evaluations. The needs of the intended audience and the setting in which the program is executed are evaluated through context evaluation. Input evaluation focuses on the program resources, including financing, employees, and materials. The process of program implementation is also examined in this model to determine if the program is proceeding according to the plan, and finally, product evaluation scrutinizes the outcomes of the program, assessing whether it has successfully achieved its intended objectives and goals (8).

The CIPP model offers a comprehensive framework for evaluating educational programs across all levels, ranging from individual classrooms to entire districts and even state-wide education systems. It is a comprehensive, flexible, interactive, and decision-making-focused model that can be tailored to the specific demands of any program (7). According to previous research, it is a decision-making model that can provide a comprehensive framework to promote the efficiency of educational programs by taking into account the context, input, process, and product areas (13). It can also help educators discover “the gap between theory and practice” in education programs (14).

Generally, the CIPP model serves as a versatile and practical framework that can be utilized by a diverse group of individuals, “including evaluators, program specialists, researchers, developers, policymakers, leaders,

administrators, committees, and even laypeople”. This model assists evaluators in identifying and improving program weaknesses (7). Overall, utilizing this instrument facilitates the recognition of four key aspects: the identification of significant needs, the justification of the developed program, the effective implementation of the program, and the substantial impact of the program (8).

Objectives

Kerman University of Medical Sciences (Kerman, Iran) has planned to offer medical ethics courses, using various creative educational approaches and a new curriculum, established and reformed by the Medical Ethics and History of Medicine Research Center of Tehran University of Medical Sciences (Tehran, Iran). The CIPP model was employed in this study to examine the quality of this program. This study also aimed to evaluate the psychometric characteristics of the CIPP model.

Methods

Study Design and Setting: This cross-sectional study was conducted on 136 medical students in the clerkship phase at Kerman University of Medical Sciences, Kerman, Iran, during 2022. The participants entered the study using the convenience sampling method. According to a study by Kyriazos (15), a sample size larger than 100 is necessary for a confirmatory factor analysis (CFA) model with three to four indicators per factor. For inclusion in the study, the participants must have completed the medical ethics course, which carries two credits according to the approved curriculum, at the onset of their clerkship period. Additionally, the participants were required to provide oral informed consent. If a student failed to answer more than 10% of the questions, they were excluded from the study.

Data Collection Tools: A researcher-made questionnaire was used to collect data from 136 out of 218 (62.4%) medical students in their clerkship phase at Kerman University of Medical Sciences. It was designed according to the CIPP model structure (7, 8) in line with the medical ethics curriculum in Iran (4) by reviewing the literature and relevant studies (5, 9, 10, 11, 13). This tool focuses on four key questions: “Have important needs been identified?”, “Is the program design justifiable?”, “Is the developed program functioning effectively?”, and “Has the program made a significant impact?”.

Considering the four domains of the model (i.e., context, input, process, and product), multiple

questions designed by the research team were assigned to each domain by an expert panel, including 10 faculty members of medical education and medical ethics. The context, input, process, and product sections of the tool contained thirteen, seven, eight, and nine items, respectively. However, two items of the process domain were removed due to a factor loading below 0.30. The response to each item was scored on a three-point scale (2 for “Yes”, 1 for “No idea”, and 0 for “No”). In the product domain, three items were reverse scored. In addition to the multiple-choice items, the product section of the tool also included three open-ended questions:

Question 38: What strategies can enhance the teaching of medical ethics?”

Question 39: What barriers hinder the achievement of this course objectives?

Question 40: Do you have any suggestions regarding the objectives of the medical ethics course? If so, please share them.

Validity and Reliability of the Questionnaire: To evaluate the construct validity of the questionnaire and verify the structural model proposed by the researchers, a confirmatory factor analysis was conducted. The goodness of fit indices used in this analysis included χ^2/df , root mean square error of approximation (RMSEA), standardized root means square residual (SRMR), incremental fit index (IFI), relative fit index (RFI), normed fit index (NFI), and comparative fit index (CFI). Data were analyzed using SPSS version 22. Lisrel version 8.8 was employed for the confirmatory factor analysis.

Ethical Considerations: After receiving the ethical approval code for the study (IR.KMU.AH.1400.019), the questionnaires were completed anonymously and voluntarily. The approximate time to complete the questionnaire was 15-20 minutes, and the researcher was available to provide necessary guidance while the students were filling out the questionnaire.

Results

Based on the content validity assessment, the content validity index of the tool utilized in this study was 0.97, and its content validity ratio was 0.89. In the confirmatory factor analysis, the factor loadings of all items were greater than or equal to 0.3, except for items 30 and 31 related to the product domain, which were removed from the model. Table 1 presents the factor loadings of the items, along with Cronbach's alpha, composite reliability, and the average variance explained (AVE). Almost all the fit indices of this model in the confirmatory factor analysis were at an acceptable level ($\chi^2/df=1090.83/557=1.96$,

$P=0.001$, $RMSEA=0.08$, $SRMR=0.09$, $CFI=0.93$, $IFI=0.93$, $RFI=0.90$, $NFI=0.9$).

Table 2 demonstrates the correlations between different dimensions of the medical ethics education evaluation tool based on the CIPP model. According to this table, all dimensions of the model were significantly correlated. However, in the path analysis, a significant correlation was only found between some of the dimensions.

Discussion

The present study evaluated the psychometric properties of a researcher-made questionnaire for medical ethics education based on the CIPP evaluation model from the perspective of students at Kerman University of Medical Sciences (Kerman, Iran). The results of the exploratory and confirmatory factor analyses showed that the questionnaire can be used to measure the quality of medical ethics education in four dimensions, including the context, input, process, and product of the CIPP model. The questionnaire was found to be valid and reliable for gathering data on students' experiences with medical ethics education.

To the best of our knowledge, no study has yet evaluated medical ethics training by using the CIPP model. However, some studies have applied other instruments to evaluate medical ethics training programs. For example, a cohort study surveyed 111 students at Glasgow University, using the vignettes of the Ethics in Health Care Survey Instrument (16). Moreover, an interactive online course of ethics education in pediatrics was evaluated by using the Constructivist On-Line Learning Environment Survey (COLLES) (17). Additionally, using a cross-sectional descriptive questionnaire survey, the ethics education programs at Turkish medical schools were reviewed (18). In another study that evaluated the quality of the medical ethics curriculum from the viewpoint of intern students in Mashhad, Iran, the internal quality was assessed using the nine facets of Frances Klein's model, while the Kirkpatrick model was employed to evaluate its external quality (19).

Table 1. The factor loadings, T values, Cronbach's alpha coefficients, Average Variance Extracted (AVE), and Composite Reliability (CR) of the different dimensions of the medical ethics education evaluation tool using the CIPP model

Factor	Item	Loading	T value	Cronbach's alpha coefficients	AVE	CR
Context	Is the goal of medical ethics education clear to you?	0.41	4.74	0.87	0.42	0.90
	Are instructional resources and materials used in medical ethics courses practical?	0.51	6.16			
	Is the volume of work offered in terms of quantity and content appropriate?	0.40	4.55			
	Are there appropriate and effective relationships between teachers and students?	0.42	4.90			
	Are you satisfied with the way you are evaluated in the medical ethics course?	0.52	6.34			
	Participating in medical ethics classes helped me learn how to perform ethical analysis in clinical settings.	0.73	9.68			
	Participating in medical ethics classes helped me learn how to use ethical analysis tools in clinical settings.	0.68	8.66			
	Attending medical ethics classes helped me understand the importance of respecting patients' rights, especially in the educational environment.	0.70	9.15			
	Participating in the medical ethics course helped me understand the importance of respecting other health services.	0.66	8.36			
	Participating in the medical ethics course helped me understand the importance of getting informed consent for effective communication between the doctor and the patient.	0.61	7.68			
	Participating in the medical ethics course helped me understand the importance of keeping the patient 's secrets and respecting his/her privacy in building an effective physician-patient relationship.	0.65	8.25			
Participating in the medical ethics course helped me understand the importance of managing conflicts of interest in preserving patient's confidence.	0.80	10.89				
Participating in the class on medical ethics helped me understand the importance the professional behavior in protecting public trust.	0.76	10.11				
Input	Are the contents of medical ethics course relevant to the educational goals of the general medical training programs?	0.62	6.23	0.76	0.41	0.83
	Is the content of medical ethics course adjusted to students ' needs?	0.61	6.19			
	Do you think that the medical ethics course meets the purpose of teaching this course?	0.60	6.05			
	Is the volume of medical ethics training proportionate to the unit's rate?	0.41	4.35			
	Do teachers qualify to teach medical ethics?	0.58	5.94			
	Are you motivated enough to study medical ethics?	0.46	4.88			
Process	In your opinion, do you can deal with the ethical issues and respond to the patient 's needs?	0.57	5.83	0.78	0.40	0.83
	Are the materials presented to you in the medical ethics course clear and understandable?	0.54	5.26			
	Do medical ethics teachers use auxiliary instructional methods (such as slides, movies, etc.) to better teach?	0.30	3.14			
	Do medical ethics professors use various and appropriate activities (such as problem solving, question and answer, group discussion, etc.) to engage the students?	0.42	4.22			
	Does your teaching hospital play a role or cooperates with the faculty in medical ethics education?	0.40	4.09			
	Are you satisfied with the services of the faculty providing medical ethics training course?	0.67	5.91			
	Do you think that the medical ethics course will be useful to you?	0.70	6.10			
Do you think that the educational experience you have gained during medical ethics has been satisfactory?	0.73	6.26				
Participating in the medical ethics course helped me understand the ethical challenges in providing health services.	0.63	5.68				

Table 1. The factor loadings, T values, Cronbach's alpha coefficients, Average Variance Extracted (AVE), and Composite Reliability (CR) of the different dimensions of the medical ethics education evaluation tool using the CIPP model (continue)

Factor	Item	Loading	T value	Cronbach's alpha coefficients	AVE	CR
Product	Attending medical ethics classes helped me be more prepared to accept my future role as an ethical physician.	0.50	4.13	0.71	0.40	0.80
	According to the medical ethics course materials: if patient tissue samples such as blood are used anonymously for research, there is no need to obtain the patient's consent.	0.34	3.28			
	According to the medical ethics course materials: in teaching hospitals, students' learning outcome should be the priority, not the patient's safety. However, there is a possibility of mistakes in the teaching hospital.	0.30	2.69			
	According to the medical ethics course materials: If I am going to talk with my colleagues about one of the patients in a multi-bed room, I should make sure that the other patients and their companions or other colleagues of mine do not hear our conversation.	0.61	4.85			
	According to the medical ethics course materials: if an error occurs during the treatment of a patient that leads to his/her injury, the patient must be aware of it.	0.77	5.42			
	According to the medical ethics course materials: If one of my colleagues behaves inappropriately toward patients, I must warn him/her or report the matter to the responsible authorities.	0.86	6.59			
	According to the medical ethics course materials: If the patient behaves inappropriately towards me and the medical staff, I will treat him/her like other patients.	0.40	3.41			

Table 2: Correlations between different dimensions of the medical ethics education evaluation tool based on the CIPP model

Factor	Item	Input	Context	Process	Product
Input	Correlation coefficient	1.000	.776**	.790**	.321**
	P	.	<0.001	<0.001	<0.001
Context	Correlation coefficient	.776**	1.000	.818**	.501**
	P	<0.001	.	<0.001	<0.001
Process	Correlation coefficient	.790**	.818**	1.000	.421**
	P	<0.001	<0.001	.	<0.001

Bold values indicate a significant correlation in the path analysis.

The CIPP evaluation model has been used to evaluate various educational programs in several studies. For instance, researchers at the Shiraz Medical School (Shiraz, Iran) utilized the CIPP model to evaluate the integrated basic sciences medical curriculum. This assessment focused on the quality of the connection between basic sciences and clinical courses, as well as the method of delivering these courses. The portfolio technique and semi-structured interviews were used to assess the product, and the portfolio technique was used to evaluate the students' learning and reflection. The semi-structured interviews were conducted to assess the students' perceptions of the curriculum effectiveness and the additional changes required to improve it (20). Considering the students' opinions and suggestions, the results of this study were similar to ours in terms of product assessment.

Moreover, in another study conducted at Babol Dental School (Babol, Iran), the CIPP model was employed to assess educational programs across three departments from the students' perspective, with a particular emphasis on the attainment of educational objectives (7). The researchers also used the CIPP model to evaluate faculty development programs for 80 clinical faculty members, and the features of the questionnaire were also examined psychometrically (10). Additionally, another study used the CIPP approach to survey 40 public health students for evaluating the externship curriculum of public health courses. The results showed that the CIPP model can be used to improve the scientific content and efficiency of this program (11). It appears that the CIPP evaluation model can determine the effectiveness, shortcomings, and strengths of educational programs.

Conclusion

The psychometric properties of the CIPP evaluation model were acceptable and applicable for medical ethics education programs. Therefore, this model can be effectively utilized to evaluate the quality of medical ethics education in a comprehensive and precise manner.

Acknowledgements: The authors wish to express their deepest gratitude and warmest appreciation to the medical students who in any way have contributed and inspired the researchers to the overall success of the undertaking. The authors are also grateful to guidance on the methodology by Dr Nouzar Nakhaee, Professor of Community Medicine, Health Services Management

Research Center, Institute for Futures Studies in Health, Kerman University of Medical Sciences. This manuscript was drafted based on the results of the dissertation of Amirhossein Alirezaei for receiving an MD degree approved by the Kerman University of Medical Sciences in 2019 with an ethics code IR.KMU.AH.1400.019 obtained from the National Ethics Committee in Biomedical Research.

Conflict of interests: The authors stated that there was no conflict of interest.

Ethical approval: All procedures performed in this study involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with ethical code: IR.KMU.AH.1400.019.

Funding/Support: There is no funding resource for this study.

References

1. Miles SH, Lane LW, Bickel J, Walker RM, Cassel CK. Medical ethics education: coming of age. *Acad Med.* 1989 Dec;64(12):705-14. doi: [10.1097/00001888-198912000-00004](https://doi.org/10.1097/00001888-198912000-00004). [PMID: 2686674]
2. Perkins HS, Geppert CM, Hazuda HP. Challenges in teaching ethics in medical schools. *Am J Med Sci.* 2000 May;319(5):273-8. doi: [10.1016/S0002-9629\(15\)40752-9](https://doi.org/10.1016/S0002-9629(15)40752-9). [PMID: 10830549]
3. Core Committee, Institute for International Medical Education. Global minimum essential requirements in medical education. *Med Teach.* 2002 Mar;24(2):130-5. doi: [10.1080/01421590220120731](https://doi.org/10.1080/01421590220120731). [PMID: 12098431]
4. Asghari F, Mirzazadeh A, Samadi A, Safa AN, Jafarian A, Farahani AV, et al. Reform in medical ethics curriculum: a step-by-step approach based on available resources. *J Med Ethics Hist Med.* 2011; 4:8. [PMID: 23908750] [PMCID: PMC3713913]
5. Tabari M, Nourali Z, Khafri S, Gharekhani S, Jahanian I. Evaluation of educational programs of pediatrics, orthodontics, and restorative departments of Babol dental school from the perspective of the students based on the CIPP model. *Caspian J Dent Res.* 2016;5(2):8-16.
6. Vatankeh S, Salemi A. A Study on Evaluation System of Hospitals Affiliated to Iran University of Medical Sciences Using Balance Score Cards, Tehran, Iran. *Journal of Health Administration.* 2010; 12(38): 49-58. [In Persian]
7. Stufflebeam DL, Coryn CLS. Daniel Stufflebeam's CIPP Model for Evaluation. In: Stufflebeam DL, Coryn CLS, eds. *Evaluation Theory, Models, and Applications.* 2nd ed. San Francisco CA: Jossey-Bass; 2014:309-13.
8. Stufflebeam DL. The Relevance of the CIPP Evaluation Model for Educational Accountability. *J Res Develop Edu.* 1971; 5:19-25.
9. Zhang G, Zeller N, Griffith R, Metcalf D, Williams J, Shea C, et al. Using the context, input, process, and product evaluation model (CIPP) as a comprehensive framework to guide the planning, implementation, and assessment of service-learning programs. *Journal of Higher Education Outreach and Engagement.* 2011; 15(4): 57-84.
10. Salajegheh M. Design, implementation, and evaluation of a long-term educational faculty development program for clinical

- faculty. *J Med Educ Dev.* 2022; 15(46): 54-60. doi: [10.52547/edcj.15.46.54](https://doi.org/10.52547/edcj.15.46.54).
11. Mazloomi Mahmoudabad SS, Moradi L. Evaluation of Externship curriculum for public health Course in Yazd University of Medical Sciences using CIPP model. *Educ Strategy Med Sci* 2018; 11(3): 28-36. [In Persian]
 12. Hemati Z, Irajpour A, Allahbakhshian M, Varzeshnejad M, AbdiShahshahani M. Evaluating the Neonatal Intensive Care Nursing MSc Program Based on CIPP Model in Isfahan University of Medical Sciences. *Iran J Med Educ.* 2018; 18: 324-32. [In Persian]
 13. Nasr VG, Guzzetta NA, Mossad EB. Fellowship training in pediatric cardiac anesthesia: history, maturation, and current status. *J Cardiothorac Vasc Anesth.* 2019 Jul;33(7):1828-1834. doi: [10.1053/j.jvca.2018.08.016](https://doi.org/10.1053/j.jvca.2018.08.016). [PMID: 30243872]
 14. Waters LD. (Dissertations). Outcome Measures of Graduates of a Master's Degree in Nursing Program: Assessing Congruence of Perceptions of Graduates and Employers. Newark, Delaware, USA: University of Delaware; 1987.
 15. Kyriazos TA. Applied psychometrics: sample size and sample power considerations in factor analysis (EFA, CFA) and SEM in general. *Psychology.* 2018; 9(08): 2207. doi: [10.4236/psych.2018.98126](https://doi.org/10.4236/psych.2018.98126).
 16. Goldie J, Schwartz L, McConnachie A, Morrison J. The impact of three years' ethics teaching, in an integrated medical curriculum, on students' proposed behaviour on meeting ethical dilemmas. *Med Educ.* 2002 May; 36(5): 489-97. doi: [10.1046/j.1365-2923.2002.01176.x](https://doi.org/10.1046/j.1365-2923.2002.01176.x). [PMID: 12028400]
 17. Kieszun A, Forth FA, Matheisl D, Busch F, Kaltbeitzel L, Kurz S. Ethics education in pediatrics: Implementation and evaluation of an interactive online course for medical students. *GMS J Med Educ.* 2022 Nov 15;39(5): Doc55. doi: [10.3205/zma001576](https://doi.org/10.3205/zma001576). [PMID: 36540566] [PMCID: PMC9733484]
 18. Volkan Kavas M, Isil Ulman Y, Demir F, Artvinli F, Eahiner M, Demiroren M, et al. The state of ethics education at medical schools in Turkey: taking stock and looking forward. *BMC Med Educ.* 2020 May 24;20(1):162. doi: [10.1186/s12909-020-02058-9](https://doi.org/10.1186/s12909-020-02058-9). [PMID: 32448274] [PMCID: PMC7245803]
 19. Mohebbi Amin S, Rabiei M, Keizoori A H. A review of students' evaluation of the medical ethics curriculum. *Iranian Journal of Medical Ethics and History of Medicine.* 2015; 8(3):77-86. [In Persian]
 20. Rooholamini A, Amini M, Bazrafkan L, Dehghani MR, Esmailzadeh Z, Nabeiei P, et al. Program evaluation of an integrated basic science medical curriculum in Shiraz Medical School, using CIPP evaluation model. *J Adv Med Educ Prof.* 2017;5(3):148-154. [PMID: 28761888] [PMCID: PMC5522906]

Investigating the Effectiveness of Blended Learning as a New Strategy for Teaching Anatomy to Medical Students: A Systematic Review

Zahra Karbasi^{1,2*}, Parisa Eslami³, Maryam Zahmatkeshan^{4,5}, Sadrieh Hajesmaeel Gohari¹

¹Assistant Professor of Health Information Management, Medical Informatics Research Center, Institute for Futures Studies in Health, Kerman University of Medical Sciences, Kerman, Iran

²Assistant Professor of Health Information Management, Department of Health Information Sciences, Faculty of Management and Medical Information Sciences, Kerman University of Medical Sciences, Kerman, Iran

³Ph.D. in Medical Informatics, Department of Health Information Management, School of Allied Medical Sciences, Tehran University of Medical Sciences, Tehran, Iran

⁴Assistant Professor of Health Information Management, Noncommunicable Diseases Research Center, Fasa University of Medical Sciences, Fasa, Iran

⁵Assistant Professor of Health Information Management, School of Allied Medical Sciences, Fasa University of Medical Sciences, Fasa, Iran

Received: 2023 July 16

Revised: 2023 September 30

Accepted: 2023 October 09

Published online: 2023 October 11

***Corresponding author:**

Medical Informatics Research Center,
Institute for Futures Studies in Health,
Kerman University of Medical
Sciences, Kerman, Iran.
Email: karbasizahra4@gmail.com

Citation:

Karbasi Z, Eslami P, Zahmatkeshan M, Hajesmaeel Gohari S. Investigating the Effectiveness of Blended Learning as a New Strategy for Teaching Anatomy to Medical Students: A Systematic Review. *Strides Dev Med Educ.* 2023 October; 20(1):162-172. doi:10.22062/sdme.2023.198828.1252

Abstract

Background: The combined use of electronic and traditional education is called blended learning. Anatomy is a major in medical education. Using this method creates flexible learning environments and more interaction in learning.

Objectives: The present study was conducted to investigate the effect of blended learning on teaching anatomy to medical students.

Methods: This comprehensive literature review was conducted on December 3, 2022. Our research was conducted by adhering to the PRISMA guidelines. Online databases PubMed, Eric, and Web of Science were systematically searched for relevant articles using predefined keywords. Using EndNote, all relevant literature published within the past five years was retrieved and further analyzed.

Results: Our comprehensive search strategy resulted in the retrieval of 351 articles. After screening the articles and selecting the articles based on the inclusion criteria, 22 articles were eligible and included in the study. Most of the studies were conducted in India (n = 5), China (n = 2), United Kingdom (n = 2), and Portugal (n = 2). The majority of studies were conducted in 2022 (n = 7). The most important finding of all reviewed articles was the effectiveness of blended learning, which is mentioned as an effective method for teaching anatomy.

Conclusion: Blended learning can improve performance and increase satisfaction and motivation in students. Identifying suitable learning resources with medical students' abilities improves learners' knowledge. Applying new learning methods can be very effective as some conditions, such as the COVID-19 crisis, limit access to corpses and physical presence.

Keywords: Blended Learning, Anatomy, Medical Education, E-Learning

Background

Medical education provides information in the medical sciences and clinical practice (1). Various methods are used for medical education, including traditional face-to-face instruction, e-learning, and blended learning. Teaching medical students in the clinical setting with real patients is a time-honored tradition. This technique is a crucial component of clinical training. The

traditional method allows medical students to engage in clinical activities and practice and become acquainted with the cultural and social aspects of the clinical environment. Direct observation and receiving feedback are two important factors in the successful education of medical students (2).

E-learning aims to provide distance health education using Information and Communication Technologies

(ICT) (3). With the outbreak of the Coronavirus Disease in 2019 (COVID-19), using this method of education has become more popular, particularly in medical education. However, practical issues, including unstable internet connectivity, a lack of computer laboratories, and the shortage of PCs and laptops, make it difficult to employ e-learning effectively (4).

The combined use of electronic and traditional education is called blended learning (5). Using this method creates flexible learning environments and more interaction in learning (6). Blended learning has different forms, which have a high potential to transfer content (7). Nowadays, various types of combined learning models, such as hybrid and flipped models, are among the most widely used educational methods in education and provide continuous and effective learning (8).

A study demonstrated that mobile applications could improve the performance of medical student learners (9). Another study showed that 3-dimensional (3-D) anatomical models could improve medical students' knowledge of ear anatomy more than traditional teaching methods (10). Although numerous studies have reported the benefits of e-learning in medical education, others have indicated that it cannot replace the traditional method. For instance, a study conducted in Greece revealed that traditional anatomy teaching is a more preferred and effective teaching method than e-learning. Remote learning cannot replace the conventional method of anatomy instruction, but it can be used as part of a blended learning approach (11).

According to the literature, blended learning can replace two other methods in medical education because it enhances the learning experience and the satisfaction of both students and teachers (12). It also enhances students' commitment by involving them in learning (13).

Anatomy is a major in medical education. Numerous studies have been conducted on the effectiveness of blended learning in anatomy courses (14-16). Based on our knowledge and investigations, despite various studies in this field, no study has examined the effect of blended learning on anatomy education.

Objectives

The present study was conducted to investigate the effect of blended learning on teaching anatomy to medical students.

Methods

This comprehensive literature review was conducted on December 3, 2022. Our research was conducted by adhering to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines.

Sources of Data: Online databases PubMed, Eric, and Web of Science were systematically searched for relevant articles using predefined keywords. Using EndNote, all relevant literature published within the past five years was retrieved and further analyzed. Table 1 summarizes the search strategy.

Table 1. Details of search strategy by databases

Databases	Search strategy
Web of Science	Blended learning (All Fields) or blended program (All Fields) or blended education (All Fields) or blended course (All Fields) or blended training (All Fields) or hybrid learning (All Fields) or hybrid program (All Fields) or hybrid education (All Fields) or hybrid course (All Fields) or hybrid training (All Fields) or computer-aided learning (All Fields) or Computer-assisted learning (All Fields) AND Anatomy (All Fields)
PubMed	((((((((((Blended learning) OR (blended program)) OR (blended education)) OR (blended course)) OR (blended training)) OR (hybrid learning)) OR (hybrid program)) OR (hybrid education)) OR (hybrid course)) OR (hybrid training)) OR (Computer-aided learning)) OR (Computer-assisted learning)) AND ("Anatomy"[Mesh])
Eric	(Blended learning) OR (blended program) OR (blended education) OR (blended course) OR (blended training) OR (hybrid learning) OR (hybrid program) OR (hybrid education) OR (hybrid course) OR (hybrid training) OR (Computer-aided learning) OR (Computer-assisted learning) AND Anatomy

Goals of Study: This study's primary objective was to investigate the effect of blended learning on teaching anatomy to medical students.

Inclusion criteria

- English studies.

- Studies reported the efficacy of using blended learning to teach anatomy to medical students.

Exclusion Criteria

- Lack of access to the article's full text.
- Non-English language articles.

- Articles that were not original, such as review articles, systematic reviews, letters to the editor, short communication, books, and commentaries.

Process of Study Selection: Related studies were reviewed through title and abstract screening by two authors independently.

Disagreements were mentioned and resolved through consensus in a joint meeting with the third reviewer. Then, the authors checked the full text of the articles based on the eligibility criteria, and finally, the information was extracted from the articles and collected in the relevant tables.

Data Extraction: Two investigators independently summarized and extracted the following data from the included publications: author, year, country, study aim, population, domain, intervention, study design, sample size, and main outcomes. The collected information is organized in the relevant tables.

Results

Our comprehensive search strategy resulted in the retrieval of 351 articles. After screening the articles and selecting the articles based on the inclusion criteria, 22 articles were eligible and included in the study. The details of the study selection process are presented in Figure 1. Most of the studies were conducted in India (n = 5), China (n = 2), United Kingdom (n = 2), and Portugal (n = 2). The distribution of articles in each country is presented in Figure 2 and Table 2.

Table 2. Frequency of reviewed articles per country

Country	Number of studies
India	5
China	2
Portugal	2
UK	2
Oman	1
France	1
Netherlands	1
Saudi Arabia	1
Germany	1
Georgia	1
Pakistan	1
Taiwan	1
Greece	1
South Carolina	1
New Zealand	1

According to the results obtained, the highest peak of the use of blended learning was in 2022. The frequency of articles published in different years is presented in Figure 3.

Also, most of the studies were experimental, the details of which are presented in Table 3. Since the study aimed to confirm the blended learning method in anatomy education, the investigated sub-branches of anatomy included histology, knee and shoulder anatomy, brainstem anatomy, gross anatomy, musculoskeletal and cardiovascular anatomy, anatomy pathology, nerve and head, and face radiology.

In the reviewed studies, different learning methods have been used, such as the flipped classroom, a variety of hybrid methods, online platforms, and electronic learning modules. The details of the learning models are presented in Figure 4.

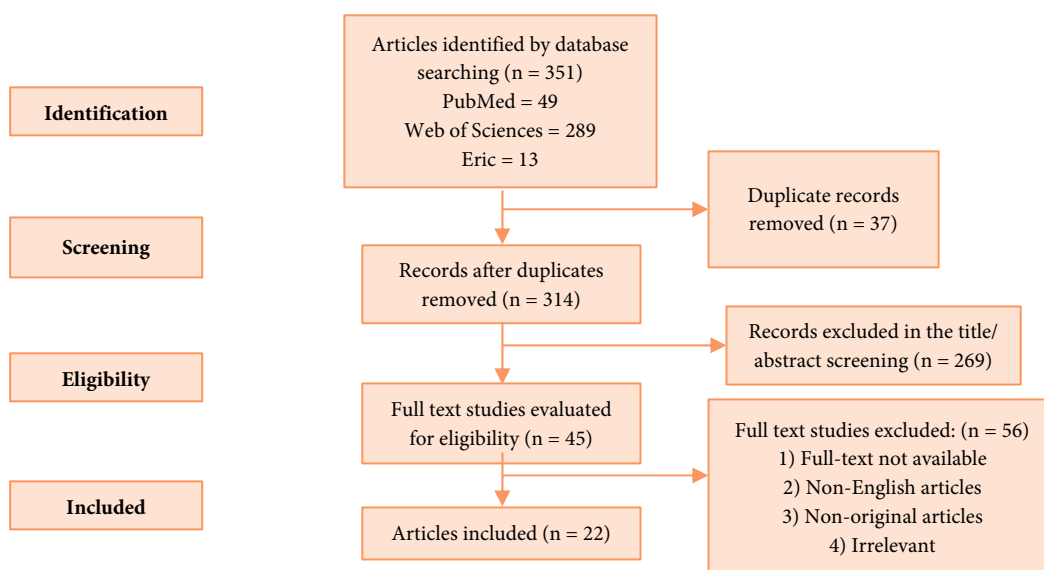


Figure 1. The process of selecting articles

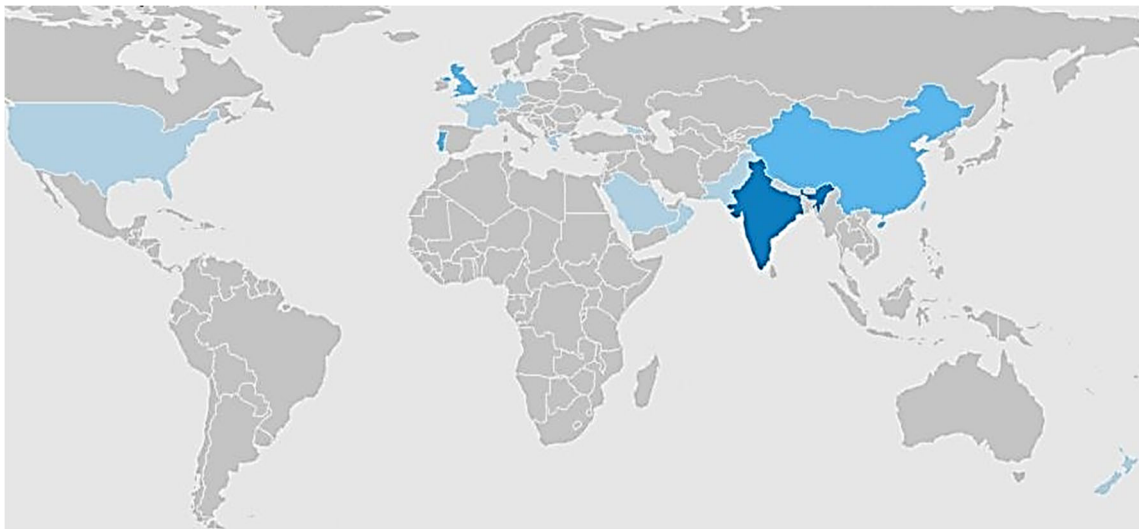
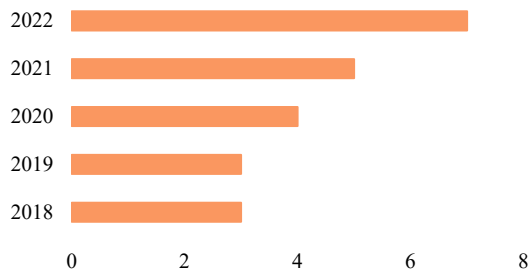


Figure 2. Distribution of articles per country



	2018	2019	2020	2021	2022
Number	3	3	4	5	7

Figure 3. Frequency of articles by publication year

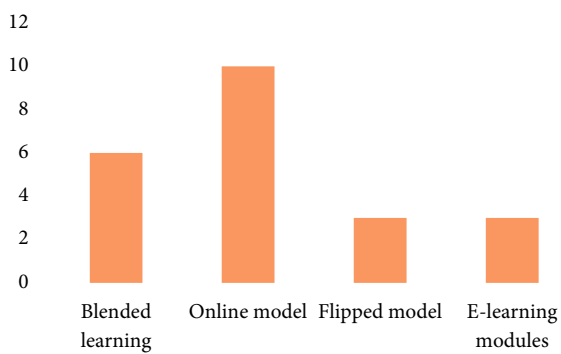


Figure 4. Frequency of blended learning models used in studies

Table 3. Summary of characteristics of the included studies

Author	Year	Country	Aim of study	Population	Domain	Intervention	Study design	Sample size	Main outcome
Albalushi et al. (17)	2022	Oman	To distinguish the effectiveness of on-line anatomy evaluation in contrast to face-to-face assessment.	Doctor of medicine and biomedical science students	Anatomy	Face-to-face & online	Retrospective study	Doctor of medicine (n = 465) and biomedical sciences students (n = 88)	Online evaluation of anatomy is considered as one of the good methods like traditional evaluation.
Aristotle et al. (18)	2021	India	To consider the effectiveness of flipped classroom in histology classes.	Medicine and bachelor of surgery students	Histology	Flipped classroom	Interventional study	One hundred fifty students of the 1st-year medicine and bachelor of surgery students	Flipped classroom methodology of instructing histology had a very stunning effect.
Bhat et al. (19)	2022	India	Designing an electronic module for teaching anatomy and evaluating it.	Bachelor of medicine, and bachelor of surgery students	Anatomy	E-learning module	Prospective, randomized, interventional study	N/A	The satisfactory effect of the blended learning method was one of the results of this study.
Bretagne et al. (20)	2022	France	Examining the effectiveness of simulators in improving students' performance.	Medical students	Shoulder and knee anatomy	Procedural simulators	Randomized controlled study	Thirty medical students	The students' self-assurance stage in arthrocentesis accelerated.
Cappellen van Walsum & Henssen (21)	2022	Netherlands	Evaluating the impact of brainstem anatomy e-learning.	Medical students	Brainstem anatomy	Three-dimensional	Cross-sectional	Thirty-eight medical students	Learning anatomy using three-dimensional modules was a valuable study method.
Chen & et al. (22)	2020	China	To discover students' perceptions of whether or not blended laboratory learning are useful.	Undergraduate medical students	Anatomy	Online blended courses	Experimental study	N/A	Blended laboratory learning was profitable.
Cheng & et al. (23)	2021	China	To consider the gross anatomy training in China all through the pandemic.	Teachers of medical schools	Gross anatomy	Online	Cross-sectional	Three hundred fifty-nine participants	A complete of 36.2% of respondents desired to put into effect online instructing of theoretical classes after the pandemic.

Chimmelgi & Hortsch (24)	2022	India	To decide the effectiveness of self-directed learning modules	First-year medical students	Histology	Online self-directed learning modules	Experimental study	One hundred fifty medical students	The use of self-directed learning was positively received by learners.
El Sadik, & Al Abdulmone m (25)	2020	Saudi Arabia	To decide the consequence of the flipped class room based totally on the student's degree of understanding.	First-year medical students	Anatomy	Flipped classroom	Experimental study	First group (n = 49) and second group (n = 46)	The findings of this study presented the benefits of the flipped classroom.
Golenhofen et al. (26)	2019	Germany	Evaluating the impact of using mobile learning for anatomy education.	First-year medical students	Anatomy	Mobile learning tool	Observational study	Three hundred twenty medical students	Superior students were more motivated to use the mobile learning.
Greene. (27)	2020	Georgia	Using dissection videos and checking its effectiveness in teaching anatomy.	First-year medical students	Anatomy	Online learning screencasts	Experimental study	Two hundred one first-year medical students	Medical students found the use of screencasts useful.
Guimaraes et al. (28)	2019	Portugal	Evaluating the impact of computer- assisted learning on anatomy education.	Medical students	Musculoskeletal and cardiovascular anatomy	Computer-assisted learning	Prospective cohort study	Six hundred seventy-one medical students	Computer- assisted learning increased students' competencies in anatomy.
Jamil et al. (29)	2018	Pakistan	Investigating the impact of three-dimensional software in teaching anatomy.	First year undergraduate medical students	Anatomy	Three-dimensional software	Experimental study	Sixty-seven medical students	Software program based on 3D technologies was effective tool.
Lee et al. (30)	2019	Taiwan	Investigating the effect of using a virtual platform to improve students' laboratory performance.	Medical students	Histology and pathology	Web-based virtual platform	Pilot study	Six hundred sixty-two third-year students	Using the virtual platform improved students' performance and showed a positive effect.
Mitrousias et al. (31)	2018	Greece	To investigate performance using three-dimensional software in education.	Undergraduate, first-year medical students	Anatomy	Three-dimensional software	Comparative study	Seventy-two medical students	The three-dimensional software program was a favorite among students as an educational tool.
Nagaraj et al. (15)	2020	India	Investigating the impact of blended learning on radiology anatomy education.	First year undergraduate medical students	Radiological anatomy	E-learning modules	Prospective study	One hundred fifty undergraduates' medical students	The level of students' satisfaction with the modules was high.

Nathaniel et al. (32)	2021	South Carolina	Investigating differences in traditional and blended learning methods for neuroscience education.	Medical students	Neuroanatomy	Blended online course	Experimental study	One hundred two medical students	The blended learning method was effective in improving the performance of medical students.
Perumal. (33)	2018	New Zealand	Development and analysis of a web-based anatomy teaching tool.	Third-year medical students	Anatomy	Online anatomy learning	Experimental study	Two hundred eighty-two medical students	Online anatomy learning enhanced the learning experience and academic performance of students.
Rajan & Pandit (34)	2022	UK	Examining the application of a neuroscience electronic module.	Medical students	Neuroanatomy	E-module	Randomized control trial	Thirty-two medical students	Electronic modules helped motivate learners and overcome problems related to neuroscience.
Santos et al. (35)	2021	Portugal	Examining students' performance in the anatomy course using computer- assisted learning tools.	Medical students	Anatomy	Computer-assisted learning	Experimental study	611 medical students	Computer-assisted learning use has a positive effect on anatomy performance.
Sarkar et al. (36)	2021	India	Inventing a new model of blended learning and checking its effectiveness.	First year medical students.	Head, face and neck	Lectures and videos	Cross-sectional descriptive study	125 medical students	Blended learning promotes increased engagement and deeper educational learning.
Stone et al. (37)	2022	The UK and Ireland	Examining students' experiences of learning anatomy online.	Medical students	Anatomy	Online learning	Experimental study	224 medical students	Students reported that online methods were effective.

One of the criteria that can be used to measure the quality and effectiveness of teaching and learning is the satisfaction of learners (38). In this study, the effectiveness is the subjective understanding that students have about the desired results of blended learning programs, that if they are successful in the blended learning program, they will be more satisfied than others (39). In some studies (15, 20, 25, 34), students' use of blended learning method has satisfied them significantly. In addition, in several studies (22, 31), a large proportion of students (more than half) participating were satisfied with blended learning methods.

Another criterion for evaluating the effectiveness of learning methods is improving learners' performance (40). Researchers used different methods to investigate performance improvement. The noteworthy point is that in the studies (15, 19, 21, 22, 24, 25, 27-29, 31-33, 35), performance improvement when working with a blended learning environment has been reported, indicating the correlation of performance with blended learning methods.

According to the review of articles in the last 5 years, several studies (17, 21, 23, 24, 32, 37) investigated the use of blended learning during the outbreak of COVID-19, all of which reported the positive effect of using this method. The most important finding of all reviewed articles was the effectiveness of blended learning, which is mentioned as an effective method for teaching anatomy.

Discussion

This study aimed to investigate the effectiveness of blended learning methods on the learning level of medical anatomy students. To this end, we focused on different learning methods and their impact on anatomy learning.

The search conducted yielded 351 results, of which we identified and included 22 unique papers. Overall, the studies sought to describe the development of hybrid e-learning interventions (19, 33), compare the efficacy of such interventions to traditional learning (17, 18, 32), and validate students' perceptions of hybrid e-learning (19, 22, 26, 37). These studies and the increasing number of papers published over the past five years indicate that the blended learning field is still evolving, with the primary emphasis on intervention efficacy and acceptability evaluation (17, 18, 20, 24, 35, 36). Because anatomy is a fundamental medical science course and anatomy learning programs are typically taught to medical students in their first and second years of study,

most reviewed interventions were primarily designed to educate first-year medical students (17, 18, 27). Interactive electronic modules were the most prevalent form of blended learning in the studies (15, 19, 21, 24, 34).

There were many functional similarities between the reviewed interactive e-modules, including the collection of clinical cases to aid student learning, the provision of interactive questions to encourage active participation, the recording of student progress for tracking student progress and performance, and the provision of individualized feedback to prevent students from making possible mistakes. However, developed interventions do not seem the same in different medical areas. For example, in neuroscience and surgery fields, more sophisticated features such as virtual reality and augmented reality have been introduced compared to other fields. This could be due to the more complicated nature of those fields in terms of domain and user-specific requirements (34, 41, 42).

Based on our study, two studies (32, 37) investigated the effect of blended learning in the COVID-19 crisis, pointing out the favorable effect of the blended learning method. According to the obtained results, it is inferred that the blended learning method is a practical and promising approach for the post-corona era (43). Restrictions on access to cadavers during the pandemic may affect the teaching and learning of anatomy. Therefore, digital learning may replace real cadavers shortly (44).

Blended learning has been used in various areas of anatomy education, such as histology, shoulder and knee anatomy, brainstem anatomy, gross anatomy, musculoskeletal and cardiovascular anatomy, radiological anatomy, head, face, and neck. In most cases, the results have been reported to be favorable. These results suggest that in addition to face-to-face training, using blended learning may promote active learning in different educational fields. Blended learning had an overall positive effect. Various techniques were used to teach anatomy, such as flipped classrooms, e-Learning modules, simulators, online blended courses, mobile learning, videos, computer-assisted learning, and three-dimensional software. All these techniques somehow improved the skills of medical students. According to Karbasi and Niakan, new educational methods are very effective in this field, considering the importance of medical education. New technologies have provided new opportunities for anatomy education (45).

Therefore, it can be claimed that blended learning is an effective process to increase the motivation of students to learn and participate, thereby improving the effectiveness of medical education.

Limitation: Based on the review and knowledge of the authors, this is the first systematic review of the effect of blended learning methods on anatomy learning for medical students. Hence, it is challenging to compare the results between studies. Since we investigated the effectiveness of anatomy on medical students, it limited the search results based on the keywords of combined learning and synonyms.

Conclusion

Blended learning can improve performance and increase satisfaction and motivation in students. Identifying suitable learning resources with medical students' abilities improves learners' knowledge. Applying new learning methods can be very effective as some conditions, such as the COVID-19 crisis, limit access to corpses and physical presence. Using the face-to-face method and new teaching methods and their combination can positively affect learning due to its high flexibility. It is suggested to conduct other studies to deal with various blended learning methods and compare them in another discipline.

Acknowledgements: We would like to express our gratitude to Institute for Future Studies in Health, Kerman University of Medical Sciences, for providing the research environment for this project.

Conflict of interests: The authors declare that they have no conflict of interests.

Ethical approval: The code of ethics approved under the number (IR.KMU.REC.1401.235) was obtained from the Ethics Committee of Kerman University of Medical Sciences.

Funding/Support: This study was funded by Kerman University of Medical Sciences with the research ID 401000325.

References

1. The Free Dictionary. Medical education. 2005. Available from: <https://medical-dictionary.thefreedictionary.com/medical+education>.
2. Burgess A, van Diggele C, Roberts C, Mellis C. Key tips for teaching in the clinical setting. *BMC Med Educ*. 2020 Dec 3;20(Suppl 2): 463. doi: [10.1186/s12909-020-02283-2](https://doi.org/10.1186/s12909-020-02283-2). [PMID: [33272257](https://pubmed.ncbi.nlm.nih.gov/33272257/)] [PMCID: [PMC7712575](https://pubmed.ncbi.nlm.nih.gov/PMC7712575/)]
3. Masic I. E-learning as new method of medical education. *Acta Inform Med*.2008;16(2):102-17.doi:[10.5455/aim.2008.16.102-117](https://doi.org/10.5455/aim.2008.16.102-117). [PMID: [24109154](https://pubmed.ncbi.nlm.nih.gov/24109154/)] [PMCID: [PMC3789161](https://pubmed.ncbi.nlm.nih.gov/PMC3789161/)]
4. Zalat MM, Hamed MS, Bolbol SA. The experiences, challenges, and acceptance of e-learning as a tool for teaching during the COVID-19 pandemic among university medical staff. *PLoS One*. 2021 Mar 26;16(3):e0248758. doi: [10.1371/journal.pone.0248758](https://doi.org/10.1371/journal.pone.0248758). [PMID: [33770079](https://pubmed.ncbi.nlm.nih.gov/33770079/)] [PMCID: [PMC7997029](https://pubmed.ncbi.nlm.nih.gov/PMC7997029/)]
5. Hege I, Tolks D, Adler M, Härtl A. Blended learning: ten tips on how to implement it into a curriculum in healthcare education. *GMS J Med Educ*. 2020 Sep 15;37(5):Doc45. doi: [10.3205/zma001338](https://doi.org/10.3205/zma001338). [PMID: [32984504](https://pubmed.ncbi.nlm.nih.gov/32984504/)] [PMCID: [PMC7499465](https://pubmed.ncbi.nlm.nih.gov/PMC7499465/)]
6. Lai C-L, Hwang G-J. A self-regulated flipped classroom approach to improving students' learning performance in a mathematics course. *Computers & Education*. 2016;100:126-40. doi: [10.1016/j.compedu.2016.05.006](https://doi.org/10.1016/j.compedu.2016.05.006).
7. Demirer V, Sahin I. Effect of blended learning environment on transfer of learning: An experimental study. *Journal of Computer Assisted Learning*. 2013;29(6):518-29. doi:[10.1111/jcal.12009](https://doi.org/10.1111/jcal.12009).
8. Rasheed RA, Kamsin A, Abdullah NA. Challenges in the online component of blended learning: A systematic review. *Computers & Education*. 2020;144:103701. doi: [10.1016/j.compedu.2019.103701](https://doi.org/10.1016/j.compedu.2019.103701).
9. Briz-Ponce L, Juanes-Méndez JA, García-Peñalvo FJ, Pereira A. Effects of mobile learning in medical education: a counterfactual evaluation. *J Med Syst*. 2016 Jun; 40(6): 136. doi: [10.1007/s10916-016-0487-4](https://doi.org/10.1007/s10916-016-0487-4). [PMID: [27098779](https://pubmed.ncbi.nlm.nih.gov/27098779/)]
10. Nicholson DT, Chalk C, Funnell WRJ, Daniel SJ. Can virtual reality improve anatomy education? A randomised controlled study of a computer-generated three-dimensional anatomical ear model. *Med Educ*. 2006 Nov; 40(11): 1081-7. doi: [10.1111/j.1365-2929.2006.02611.x](https://doi.org/10.1111/j.1365-2929.2006.02611.x). [PMID: [17054617](https://pubmed.ncbi.nlm.nih.gov/17054617/)]
11. Totlis T, Tishukov M, Piagkou M, Kostares M, Natsis K. Online educational methods vs. traditional teaching of anatomy during the COVID-19 pandemic. *Anat Cell Biol*. 2021 Sep30;54(3):332-9. doi: [10.5115/acb.21.006](https://doi.org/10.5115/acb.21.006). [PMID:[34031272](https://pubmed.ncbi.nlm.nih.gov/34031272/)] [PMCID: [PMC8493018](https://pubmed.ncbi.nlm.nih.gov/PMC8493018/)]
12. Kharb P, Samanta PP. Blended learning approach for teaching and learning anatomy: Students' and teachers' perspective. *Journal of the Anatomical Society of India*. 2016;65(1):43-7. doi:[10.1016/j.jasi.2016.06.001](https://doi.org/10.1016/j.jasi.2016.06.001).
13. López-Pérez MV, Pérez-López MC, Rodríguez-Ariza L. Blended learning in higher education: Students' perceptions and their relation to outcomes. *Computers & education*. 2011;56(3):818-26. doi:[10.1016/j.compedu.2010.10.023](https://doi.org/10.1016/j.compedu.2010.10.023).
14. Grønlien HK, Christoffersen TE, Ringstad Ø, Andreassen M, Lugo RG. A blended learning teaching strategy strengthens the nursing students' performance and self-reported learning outcome achievement in an anatomy, physiology and biochemistry course—A quasi-experimental study. *Nurse Educ Pract*. 2021 Mar;52:103046. doi: [10.1016/j.nepr.2021.103046](https://doi.org/10.1016/j.nepr.2021.103046). [PMID: [33853032](https://pubmed.ncbi.nlm.nih.gov/33853032/)]
15. Nagaraj C, Yadurappa SB, Anantharaman LT, Ravindranath Y, Shankar N. Effectiveness of blended learning in radiological anatomy for first year undergraduate medical students. *Surg Radiol Anat*. 2021 Apr; 43(4): 489-496. doi: [10.1007/s00276-020-02572-x](https://doi.org/10.1007/s00276-020-02572-x). [PMID: [32964270](https://pubmed.ncbi.nlm.nih.gov/32964270/)]
16. Wardana ING. Effectiveness Of Blended Learning In Human Anatomy Courses. *Jurnal Pendidikan Indonesia*. 2021;2(02): 209-19. doi:[10.36418/japendi.v2i2.102](https://doi.org/10.36418/japendi.v2i2.102).
17. Albalushi H, Al Mushaiqri M, Sirasanagandla SR, Das S. Students' Performance in Face-to-Face, Online, and Hybrid Methods of

- Teaching and Assessment in Anatomy. *Int J Environ Res Public Health*. 2022 Oct 15;19(20):13318. doi: [10.3390/ijerph192013318](https://doi.org/10.3390/ijerph192013318). [PMID: [36293903](https://pubmed.ncbi.nlm.nih.gov/36293903/)] [PMCID: [PMC9602488](https://pubmed.ncbi.nlm.nih.gov/PMC9602488/)]
18. Aristotle S, Subramanian S, Jayakumar S. Effectiveness of flipped classroom model in teaching histology for first-year MBBS students based on competency-based blended learning: An interventional study. *J Educ Health Promot*. 2021 May 20;10:152. doi: [10.4103/jehp.jehp_467_20](https://doi.org/10.4103/jehp.jehp_467_20). [PMID: [34222527](https://pubmed.ncbi.nlm.nih.gov/34222527/)] [PMCID: [PMC8224505](https://pubmed.ncbi.nlm.nih.gov/PMC8224505/)]
 19. Bhat GM, Bhat IH, Shahdad S, Rashid S, Khan MA, Patloo AA. Analysis of feasibility and acceptability of an e-learning module in anatomy. *Anat Sci Educ*. 2022 Mar;15(2):376-391. doi: [10.1002/ase.2096](https://doi.org/10.1002/ase.2096). [PMID: [33914418](https://pubmed.ncbi.nlm.nih.gov/33914418/)]
 20. Bretagne V, Delapierre A, Cerasuolo D, Bellot A, Marcelli C, Guillois B. Randomized Controlled Study of a Training Program for Knee and Shoulder Arthrocentesis on Procedural Simulators with Assessment on Cadavers. *ACR Open Rheumatol*. 2022 Apr;4(4):312-321. doi: [10.1002/acr2.11400](https://doi.org/10.1002/acr2.11400). [PMID: [34989181](https://pubmed.ncbi.nlm.nih.gov/34989181/)] [PMCID: [PMC8992473](https://pubmed.ncbi.nlm.nih.gov/PMC8992473/)]
 21. Cappellen van Walsum AMv, Henssen DJ. E-Learning Three-Dimensional Anatomy of the Brainstem: Impact of Different Microscopy Techniques and Spatial Ability. *Anat Sci Educ*. 2022 Mar;15(2):317-329. doi: [10.1002/ase.2056](https://doi.org/10.1002/ase.2056). [PMID: [33507593](https://pubmed.ncbi.nlm.nih.gov/33507593/)] [PMCID: [PMC9292761](https://pubmed.ncbi.nlm.nih.gov/PMC9292761/)]
 22. Chen J, Zhou J, Wang Y, Qi G, Xia C, Mo G, et al. Blended learning in basic medical laboratory courses improves medical students' abilities in self-learning, understanding, and problem solving. *Adv Physiol Educ*. 2020 Mar 1;44(1):9-14. doi: [10.1152/advan.00076.2019](https://doi.org/10.1152/advan.00076.2019). [PMID: [31821032](https://pubmed.ncbi.nlm.nih.gov/31821032/)]
 23. Cheng X, Chan LK, Pan SQ, Cai H, Li YQ, Yang X. Gross anatomy education in China during the Covid-19 pandemic: A national survey. *Anat Sci Educ*. 2021 Jan;14(1):8-18. doi: [10.1002/ase.2036](https://doi.org/10.1002/ase.2036). [PMID: [33217164](https://pubmed.ncbi.nlm.nih.gov/33217164/)]
 24. Chimmalgi M, Hortsch M. Teaching Histology Using Self-Directed Learning Modules (SDLMs) in a Blended Approach. *Med Sci Educ*. 2022 Nov 7; 32(6): 1455-1464. doi: [10.1007/s40670-022-01669-9](https://doi.org/10.1007/s40670-022-01669-9). [PMID: [36407816](https://pubmed.ncbi.nlm.nih.gov/36407816/)] [PMCID: [PMC9640883](https://pubmed.ncbi.nlm.nih.gov/PMC9640883/)]
 25. El Sadik A, Al Abdulmonem W. Improvement in student performance and perceptions through a flipped anatomy classroom: Shifting from passive traditional to active blended learning. *Anat Sci Educ*. 2021 Jul;14(4):482-490. doi: [10.1002/ase.2015](https://doi.org/10.1002/ase.2015). [PMID: [32881423](https://pubmed.ncbi.nlm.nih.gov/32881423/)]
 26. Golenhofen N, Heindl F, Grab-Kroll C, Messerer DA, Böckers TM, Böckers A. The use of a mobile learning tool by medical students in undergraduate anatomy and its effects on assessment outcomes. *Anat Sci Educ*. 2020 Jan;13(1):8-18. doi: [10.1002/ase.1878](https://doi.org/10.1002/ase.1878). [PMID: [30913369](https://pubmed.ncbi.nlm.nih.gov/30913369/)]
 27. Greene SJ. The use and effectiveness of interactive progressive drawing in anatomy education. *Anat Sci Educ*. 2018 Sep;11(5):445-460. doi: [10.1002/ase.1784](https://doi.org/10.1002/ase.1784). [PMID: [29624896](https://pubmed.ncbi.nlm.nih.gov/29624896/)] [PMCID: [PMC6314192](https://pubmed.ncbi.nlm.nih.gov/PMC6314192/)]
 28. Guimarães B, Firmino-Machado J, Tsisar S, Viana B, Pinto-Sousa M, Vieira-Marques P, et al. The role of anatomy computer-assisted learning on spatial abilities of medical students. *Anat Sci Educ*. 2019 Mar;12(2):138-153. doi: [10.1002/ase.1795](https://doi.org/10.1002/ase.1795). [PMID: [29762903](https://pubmed.ncbi.nlm.nih.gov/29762903/)]
 29. Jamil Z, Saeed AA, Madhani S, Baig S, Cheema Z, Fatima SS. Three-dimensional visualization software assists learning in students with diverse spatial intelligence in medical education. *Anat Sci Educ*. 2019 Sep;12(5):550-560. doi: [10.1002/ase.1828](https://doi.org/10.1002/ase.1828). [PMID: [30376698](https://pubmed.ncbi.nlm.nih.gov/30376698/)]
 30. Lee BC, Hsieh ST, Chang YL, Tseng FY, Lin YJ, Chen YL, et al. A web-based virtual microscopy platform for improving academic performance in histology and pathology laboratory courses: A pilot study. *Anat Sci Educ*. 2020 Nov;13(6):743-758. doi: [10.1002/ase.1940](https://doi.org/10.1002/ase.1940). [PMID: [31883209](https://pubmed.ncbi.nlm.nih.gov/31883209/)]
 31. Mitrousias V, Varitimidis SE, Hantes ME, Malizos KN, Arvanitis DL, Zibis AH. Anatomy learning from prosected cadaveric specimens versus three-dimensional software: A comparative study of upper limb anatomy. *Ann Anat*. 2018 Jul;218:156-164. doi: [10.1016/j.aanat.2018.02.015](https://doi.org/10.1016/j.aanat.2018.02.015). [PMID: [29669259](https://pubmed.ncbi.nlm.nih.gov/29669259/)]
 32. Nathaniel TI, Goodwin RL, Fowler L, McPhail B, Black AC, Black Jr AC. An Adaptive Blended Learning Model for the Implementation of an Integrated Medical Neuroscience Course During the Covid-19 Pandemic. *Anat Sci Educ*. 2021 Nov;14(6):699-710. doi: [10.1002/ase.2097](https://doi.org/10.1002/ase.2097). [PMID: [33915035](https://pubmed.ncbi.nlm.nih.gov/33915035/)] [PMCID: [PMC8239699](https://pubmed.ncbi.nlm.nih.gov/PMC8239699/)]
 33. Perumal V. A sectional anatomy learning tool for medical students: development and user–usage analytics. *Surg Radiol Anat*. 2018 Nov;40(11):1293-300. doi: [10.1007/s00276-018-2082-5](https://doi.org/10.1007/s00276-018-2082-5). [PMID: [30116840](https://pubmed.ncbi.nlm.nih.gov/30116840/)]
 34. Rajan KK, Pandit AS. Comparing computer-assisted learning activities for learning clinical neuroscience: a randomized control trial. *BMC Med Educ*. 2022 Jul 3; 22(1): 522. doi: [10.1186/s12909-022-03578-2](https://doi.org/10.1186/s12909-022-03578-2). [PMID: [35780115](https://pubmed.ncbi.nlm.nih.gov/35780115/)] [PMCID: [PMC9250740](https://pubmed.ncbi.nlm.nih.gov/PMC9250740/)]
 35. Santos RS, Carvalho AC, Tsisar S, Bastos AR, Ferreira D, Ferreira MA, et al. How computer-assisted learning influences medical Students' performance in anatomy courses. *Anat Sci Educ*. 2021 Mar;14(2):210-220. doi: [10.1002/ase.1997](https://doi.org/10.1002/ase.1997). [PMID: [32564474](https://pubmed.ncbi.nlm.nih.gov/32564474/)]
 36. Sarkar S, Sharma S, Raheja S. Implementation of blended learning approach for improving anatomy lectures of phase i MBBS students–learner satisfaction survey. *Adv Med Educ Pract*. 2021 Apr 23;12:413-420. doi: [10.2147/AMEP.S301634](https://doi.org/10.2147/AMEP.S301634). [PMID: [33935527](https://pubmed.ncbi.nlm.nih.gov/33935527/)] [PMCID: [PMC8079801](https://pubmed.ncbi.nlm.nih.gov/PMC8079801/)]
 37. Stone D, Longhurst GJ, Dulohery K, Campbell T, Richards A, O'Brien D, et al. A Multicentre Analysis of Approaches to Learning and Student Experiences of Learning Anatomy Online. *Med Sci Educ*. 2022 Sep 19; 32(5): 1117-1130. doi: [10.1007/s40670-022-01633-7](https://doi.org/10.1007/s40670-022-01633-7). [PMID: [36160292](https://pubmed.ncbi.nlm.nih.gov/36160292/)] [PMCID: [PMC9483883](https://pubmed.ncbi.nlm.nih.gov/PMC9483883/)]
 38. Halverson LR, Graham CR, Spring KJ, Drysdale JS, Henrie CR. A thematic analysis of the most highly cited scholarship in the first decade of blended learning research. *The internet and higher education*. 2014;20:20-34. doi: [10.1016/j.iheduc.2013.09.004](https://doi.org/10.1016/j.iheduc.2013.09.004).
 39. Lo CC. How student satisfaction factors affect perceived learning. *Journal of the Scholarship of Teaching and Learning*. 2010; 10(1):47-54.
 40. Min W, Yu Z. A Systematic Review of Critical Success Factors in Blended Learning. *Education Sciences*. 2023;13(5):469. doi: [10.3390/educsci13050469](https://doi.org/10.3390/educsci13050469).
 41. Kugelmann D, Stratmann L, Nühlen N, Bork F, Hoffmann S, Samarbarksh G, et al. An augmented reality magic mirror as additive teaching device for gross anatomy. *Ann Anat*. 2018 Jan;215:71-77. doi: [10.1016/j.aanat.2017.09.011](https://doi.org/10.1016/j.aanat.2017.09.011). [PMID: [29017852](https://pubmed.ncbi.nlm.nih.gov/29017852/)]
 42. Svirko E, Mellanby J. Teaching neuroanatomy using computer-aided learning: What makes for successful outcomes? *Anat Sci Educ*. 2017 Nov;10(6):560-569. doi: [10.1002/ase.1694](https://doi.org/10.1002/ase.1694). [PMID: [28431201](https://pubmed.ncbi.nlm.nih.gov/28431201/)]
 43. Atwa H, Shehata MH, Al-Ansari A, Kumar A, Jaradat A, Ahmed J, et al. Online, Face-to-Face, or Blended Learning? Faculty and Medical Students' Perceptions During the COVID-19 Pandemic: A Mixed-Method Study. *Front Med (Lausanne)*. 2022 Feb

- 3:9:791352. doi: [10.3389/fmed.2022.791352](https://doi.org/10.3389/fmed.2022.791352). [PMID: [35186989](https://pubmed.ncbi.nlm.nih.gov/35186989/)] [PMCID: [PMC8850343](https://pubmed.ncbi.nlm.nih.gov/PMC8850343/)]
44. Singal A, Bansal A, Chaudhary P. Cadaverless anatomy: Darkness in the times of pandemic Covid-19. *Morphologie*. 2020 Sep;104(346):147-150. doi: [10.1016/j.morpho.2020.05.003](https://doi.org/10.1016/j.morpho.2020.05.003). [PMID: [32518047](https://pubmed.ncbi.nlm.nih.gov/32518047/)] [PMCID: [PMC7254017](https://pubmed.ncbi.nlm.nih.gov/PMC7254017/)]
45. Karbasi Z, Niakan Kalhori SR. Application and evaluation of virtual technologies for anatomy education to medical students: A review. *Med J Islam Repub Iran*. 2020 Dec 3;34: 163. doi: [10.47176/mjiri.34.163](https://doi.org/10.47176/mjiri.34.163). [PMID: [33816362](https://pubmed.ncbi.nlm.nih.gov/33816362/)] [PMCID: [PMC8004573](https://pubmed.ncbi.nlm.nih.gov/PMC8004573/)]

Medical Specialty Choice and Effective Factors: A Cross-Sectional Survey of Last-Year Medical Students

Ghazal Mansouri¹, Zeinab Sadat Rooholamini², Fatemeh Karami Robati^{3*}

¹Assistant Professor, Department of Obstetrics and Gynecology, School of Medicine, Afzalipour Hospital, Kerman University of Medical Sciences, Kerman, Iran

²MD, School of Medicine, Kerman University of Medical Sciences, Kerman, Iran

³MSc. in Medical Library and Information Sciences, Clinical Research Development Unit, Afzalipour Hospital, Kerman University of Medical Sciences, Kerman, Iran

Received: 2023 March 11

Revised: 2023 August 23

Accepted: 2023 October 16

Published online: 2023 October 19

***Corresponding author:**

Clinical Research Development Unit,
Afzalipour Hospital, Kerman University
of Medical Sciences, Kerman, Iran.
Email: f.karami@kmu.ac.ir

Citation:

Mansouri Gh, Rooholamini ZS, Karami Robati F. Medical Specialty Choice and Effective Factors: A Cross-Sectional Survey of Last-Year Medical Students. *Strides Dev Med Educ.* 2023 October; 20(1):173-178.
doi:10.22062/sdme.2023.198300.1165

Abstract

Background: Choosing a medical specialty is an important choice for medical students and the healthcare system.

Objectives: This study aimed to investigate the interest of last-year medical students in choosing a future medical specialty and determine effective factors in it.

Methods: A descriptive cross-sectional study of 201 medical students was performed in Iran in 2019. All medical students who completed the internship period by the end of September 2020 were selected by census method. A questionnaire was applied, the validity and reliability of which had already been registered in the Statistics Center of Afzalipour Hospital, Kerman, Iran. Data analysis was performed using descriptive methods, including frequency, percentage, mean, and standard deviation, and SPSS software (version 20). A significance level of $P < 0.05$ was considered statistically significant.

Results: About 98% of students intended to choose a future medical specialty. The highest number of interested students were female (66%) and single (83.2%), with a mean age of 26.69 ± 12.22 years. The parents' educational level of most students interested in continuing education was a bachelor's degree or lower (52.3%). "Achieving a better economic position" (91.4%) was the most important factor for choosing a specialty. Most participants were interested in ophthalmology (18.2%). The factors "specific working hours" and "easy residency period" were indicated most frequently as effects on the preference for ophthalmology.

Conclusion: The present findings provide significant insight into creating strategies to attract a number of medical students in other specialties based on the needs of the Iranian healthcare system.

Keywords: Education; Medical; Graduate; Medicine; Students; Iran

Background

Medical education is one of the main parts of the educational system of any country, which aims to train physicians who are able to play their special role in professional fields. These physicians must act based on work conscience, good manners, and human behavior, and in addition to respect for their peers, must adhere to the quality of service and avoid discrimination. Therefore, choosing a medical specialty is not only a personal process but is an important choice for both students and the healthcare system (1).

According to international studies, there is a variety of factors that lead students to choose a particular career.

These factors have been changing in recent decades (2). Identifying the factors that provide a basis for choosing fields can provide a better understanding of students' priorities for choosing a particular specialty and might develop intervention strategies according to the needs of healthcare systems (1). In a time of shortage of physicians, it is important to be aware of the interests and expectations of the next generation of physicians when choosing their profession (3). Studying career preferences can provide important information for planning educational programs, determining priorities, and offering appropriate healthcare. The evaluation of the choice of specialized fields by medical students is a

controversial topic because it affects several important factors in the provision of health services (4).

In some studies, the motivations for choosing a specialty have been studied at the individual and structural levels. At the individual level, female students consider aspects of work, time, and patient orientation; nevertheless, their male peers consider technical challenges, income, career prospects, and prestige (5). It has also been shown that medical students and young physicians of both genders care about lifestyle factors and consider the balance between work and private life (6). At a more structural level, the lack of social support and the scarcity of role models have been shown to affect the specialty priorities of males and females (7).

In Levailant et al.'s study, the main factors influencing the choice of specialty were lifestyle, work-life balance, and discipline interest, with variations across different countries. Gender has a great impact on students' willingness to work in specific specialties (8). Another study showed that the factors influencing medical students' choice of subspecialty training mainly included academic interests, competencies, controllable lifestyles or flexible work schedules, patient service orientation, medical teachers or mentors, career opportunities, workload or working hours, income, length of training, prestige, advice from others, and student debt (9).

All around the world, specialty choices and the distribution of medical specialties are increasing because these choices might not meet the needs of society and lead to a shortage of physicians in some specialties, which might be problematic in some countries (10). This might cause a lack of availability and access to medical care for the community. As such, there should be a particular focus on the next generation of physicians. This knowledge can help improve the recruitment of future physicians. Without the awareness of the effective factors, they cannot be considered when attracting new residents. Therefore, it is essential to understand whether there are changes in specialty preferences over time.

Objectives

This study aimed to investigate the factors affecting the interest of last-year medical students in choosing a future medical specialty at Kerman University of Medical Sciences (KMU), Kerman, Iran.

Methods

A descriptive cross-sectional study was performed in KMU in 2019 to investigate the interest of last-year

medical students in choosing a future medical specialty and determine the effective factors in it. All medical students who completed the internship period by the end of September 2020 were selected by census method. Guest students at KMU and students who were unable to complete the questionnaire for any reason, including vacation, were excluded.

The students were asked to complete an informed consent form before starting the study. A questionnaire was applied, the reliability and validity of which had already been registered in the Statistics Center of Afzalipour Hospital in Kerman (Cronbach's alpha = 0.91, content validity index [CVI] = 0.86). The first section included demographic data (i.e., age, gender, average score, marital status, type of university, place of residence, parents' educational level, and year of university entrance). The second section consisted of 8 factors related to the reasons for choosing a future medical specialty, 9 factors about the reasons for students' interest in not continuing education, and 9 factors influencing the preference for a given medical specialty. Scoring of the items was based on the use of a three-point Likert scale, where the important option had three points, and the unimportant option had one point. Questionnaires were given in person to students who were willing to participate in the study. By explaining the objectives and importance of the study, the researcher assured the participants that their responses would remain confidential.

Data analysis was performed using descriptive methods, including frequency, percentage, mean, and standard deviation, and SPSS software (version 20). The significance level was considered $P < 0.05$.

Results

This study comprised 201 last-year medical students of KMU. Most students were female (66.6%) and interested in continuing education (98%). Among students interested in continuing education, 130 subjects (66%) were female. The mean age of these students was 26.69 ± 12.22 years, and their mean score was 16.52 ± 0.86 . The parents' educational level of most students intended to continue education was a bachelor's degree or lower (52.3%) (Table 1).

"Achieving a better economic position" (91.4%) and then "increasing information" (89.9%), "obtaining social status" (89.3%), "better service to the community" (74.1%), "better access to connect with individuals" (55.3%), and "family advice" (45.2%) were the most important factors for choosing a specialty. Most participants were interested in "ophthalmology" (18.2%)

and then “radiology” (16.4%) and “cardiology” (10.1%). Factors influencing specialty choice among medical students interested in ophthalmology were “specific working hours” and “easy residency period” (Table 2).

Table 1. Demographic Characteristics of Students Interested in Continuing Education

Variable		No.	%
Gender	Male	67	34
	Female	130	66
Marital status	Single	164	83.2
	Married	33	16.8
Type of university	Governmental	135	68.5
	Non-profit	62	31.5
Place of residence	Private home with friends	44	22.3
	Dormitory	60	30.5
	Private home with parents or spouse	93	47.2
Parents' education level	Doctoral degree and above	38	19.3
	MSc	56	28.4
	Bachelor and lower	103	52.3
Year of university entrance	2010	6	3
	2011	9	4.6
	2012	10	5.1
	2013	88	44.7
	2014	84	42.6

Discussion

This study investigated the interest of last-year medical students in choosing a future medical specialty and determined effective factors in it. The average age of these students was 26.69 ± 12.22 years. In Grasreiner et al.'s study, the median age of the participants was 24 years (range: 18-44 years), compared to a median age of 24.9 years of the total population of medical students in Jena, Germany (11). It should be noted that, according to the present study, most students interested in continuing education were female, as reported previously by Correia Lima de Souza et al. (1).

In the present study, it was observed that more than 50% of students interested in continuing education had parents with a bachelor's degree or lower. Nevertheless, in the study by Correia Lima de Souza et al., a high percentage of the respondents had parents who were physicians, and their specialty was highly related to their parents' specialties. This consistency might be the result of the effect of the family and the admiration of their parents' specialty (1). In Kataria's study, nearly 16.6% of the students' fathers and 5.9% of the students' mothers had professional education (12).

The current study demonstrated that 98% of students intended to choose a future medical specialty. Most participants were interested in “ophthalmology”,

“radiology”, “cardiology”, and “dermatology”. In Grasreiner et al.'s study, between 40% and 50% of students preferred “internal medicine”. About 25% were interested in “surgery”. A high percentage (about 18%) remained undecided (11). In Nayef et al.'s study, the most preferred specialties were “radiology” and “ultrasound”, “gynecology and obstetrics”, “surgery”, “internal medicine”, “dermatology”, and “pediatrics”. Interest in clinical specialties was statistically higher than in basic medical sciences (13). In Awadi et al.'s study, 22.4% of medical students were undecided about their future specialty. In the aforementioned study, surgical specialties, internal medicine, and basic science specialties were the most preferred. Being a general practitioner was the least preferred for students. Regarding specific specialty choices, the most commonly chosen field was general surgery, followed by internal medicine and neurosurgery. The least chosen specialty was forensic medicine (14).

In Kataria's study, the majority of participants were willing to pursue their postgraduation (93.4%). In addition, the majority of participants intended to do their postgraduation in medicine and allied specialties in the aforementioned study (47.6%). Only 1.7% of participants intended to do their postgraduation in community medicine/public health (12). In Mohamed's study, 81 students (58.7%) expressed their future preference for a specialty. Internal medicine and then general surgery were the most preferred specialties in the aforementioned study (15).

In the current study, the factors “specific working hours” and “easy residency period” were indicated most frequently as influences on the preference for “ophthalmology”. Grasreiner et al. demonstrated that “surgery” has important features, including promising career prospects, a high workload, and a good reputation (11). According to Khader et al., predominantly male students prefer “surgery”, a choice that is heavily influenced by factors such as prestige and income (4). According to Harris et al., female physicians often choose fields such as “general medicine” or “internal medicine”, because they associate them with family friendship (16). Takeda et al. and Correia Lima de Souza et al. stated that surgical specialties (e.g., surgery and neurosurgery) have the least time to achieve life goals; nevertheless, other specialties, such as “ophthalmology”, “radiology”, or “dermatology”, have more time to pursue personal goals (1, 17).

Table 2. Effective Factors in Specialty Selection in Different Fields (Part I)

Specialty preferred	Nuclear medicine N (%)	Internal medicine N (%)	Neurosurgery N (%)	Infectious diseases N (%)	Traditional medicine N (%)	Urology N (%)	Dermatology N (%)	Social medicine N (%)	Radiology N (%)	Pathology N (%)	Gynecology & obstetrics N (%)
Influencing factors	10 (2)	12 (2.1)	11 (2)	2 (0.4)	2 (0.4)	2 (0.4)	49 (10)	2 (0.4)	66 (16.4)	36 (8.3)	18 (4.2)
Pure interest in the field	8 (80)	10 (83.33)	6 (54.54)	2 (100)	2 (100)	2 (100)	48 (97.9)	2 (100)	66 (100)	30 (83.33)	15 (83.33)
Economic aspect	10 (100)	7 (58.33)	11 (100)	1 (50)	1 (50)	1 (50)	49 (100)	1 (50)	66 (100)	33 (91.66)	18 (100)
Family advice	6 (60)	7 (85.33)	5 (45.45)	0	1 (50)	0	25 (51.02)	0	50 (75.75)	20 (55.55)	7 (38.88)
Better service to the community	9 (90)	9 (75)	7 (73.63)	2 (100)	2 (100)	2 (100)	20 (40.81)	1 (50)	50 (75.75)	20 (55.55)	12 (66.66)
Encounter of professors	0	6 (50)	4 (36.36)	2 (100)	0	2 (100)	49 (100)	2 (100)	55 (83.33)	28 (77.77)	10 (55.55)
Specific working hours	10 (100)	2 (16.66)	6 (54.54)	1 (50)	2 (100)	1 (50)	49 (100)	2 (100)	60 (90.90)	34 (94.44)	0
Easy residency period	10 (100)	0	0	1 (50)	2 (100)	1 (50)	49 (100)	2 (100)	65 (98.48)	30 (83.33)	3 (16.66)
More likely to be accepted	4 (40)	8 (66.66)	8 (73.72)	2 (100)	1 (50)	2 (100)	10 (20.4)	2 (100)	16 (24.24)	25 (69.44)	12 (66.66)
Social status	10 (100)	10 (93.33)	11 (100)	1 (50)	1 (50)	1 (50)	49 (100)	1 (50)	66 (100)	36 (100)	12 (66.66)

Table 2. Effective Factors in Specialty Selection in Different Fields (Part II)

Specialty preferred	General surgery N (%)	Occupational medicine N (%)	Pediatrics N (%)	Ophthalmology N (%)	Orthopedics N (%)	Psychiatry N (%)	Emergency medicine N (%)	Cardiology N (%)	Neurology N (%)	Ear nose and throat N (%)
Influencing factors	10 (2)	9 (1.9)	13 (2.1)	87 (18.2)	33 (6.5)	21 (4)	4 (0.8)	52 (10.1)	21 (4)	19 (3.8)
Pure interest in the field	10 (100)	7 (77.77)	10 (76.92)	70 (80.45)	20 (60.60)	21 (100)	2 (50)	45 (86.53)	18 (85.71)	13 (68.42)
Economic aspect	10 (100)	5 (55.55)	8 (61.53)	78 (89.65)	33 (100)	15 (71.42)	3 (75)	50 (96.15)	18 (85.71)	19 (100)
Family advice	3 (30)	5 (55.55)	6 (46.15)	75 (86.20)	25 (75.75)	10 (47.61)	3 (75)	38 (73.07)	10 (47.61)	11 (57.89)
Better service to the community	7 (70)	7 (77.77)	11 (84.61)	75 (86.20)	20 (60.60)	18 (85.71)	4 (100)	50 (96.15)	17 (80.95)	13 (68.42)
Encounter of professors	5 (50)	6 (66.66)	9 (69.23)	80 (91.95)	8 (24.24)	13 (61.90)	3 (75)	48 (92.30)	18 (85.71)	15 (78.94)
Specific working hours	0	9 (100)	13 (100)	87 (100)	0	21 (100)	4 (100)	13 (25)	12 (57.14)	19 (100)
Easy residency period	0	9 (100)	8 (61.53)	87 (100)	0	21 (100)	2 (50)	10 (19.23)	12 (57.14)	16 (84.21)
More likely to be accepted	8 (80)	9 (100)	13 (100)	5 (5.74)	28 (84.84)	15 (71.42)	4 (100)	40 (76.92)	18 (85.71)	12 (63.15)
Social status	8 (80)	5 (55.55)	10 (76.92)	80 (91.95)	33 (100)	9 (42.85)	1 (25)	52 (100)	20 (95.23)	19 (100)

The relative preferences of physicians working in Basra, Iraq, for choosing “dermatology” can be attributed to less training program, low number of tasks (overnight), very good financial rewards, and relatively normal working weeks (18). In Mohamed’s study, most students stated that the provision of a good future is a major reason behind specialty selection, followed by the presence of a challenging specialty (15). Probably one of the reasons for the difference in the choice of expertise in the current study from other studies is that most of the subjects in the present study were female.

In general, this study showed that “achieving a better economic position” followed by “increasing information” were the most important factors for choosing a specialty. Several studies have reported that experiences in medical school, career aspects (e.g., prestige and income), and personal aspects (e.g., personal ability, aspirations, work-life balance, and interests) are the main factors influencing the choice of specialty (4, 19-21). In Correia Lima, de Souza et al.’s study, “perceived ability” and “way of work” were the important factors in choosing a specialty among Brazilian students that were non-interfering factors. “Internship”, “role models”, and “financial reason” also played a role as intervening factors in choosing a specialty to continue education (1). In Grasreiner et al.’s study, students often considered the consistency between work and family life, career goals, and the amount of work anticipated for choosing a specialty (11). In Kataria’s study, interest in the subject was the major reason for choosing a particular medical specialty/subject for postgraduation (12). According to Nayef et al., anticipating more abilities and ensuring the development of skills in the future are the most important factors in choosing a specialty. Gender differences, social contexts, patterns, and focus on emergency care are significantly related to specialty priorities (13).

Among the limitations of the present study was the non-cooperation of some students. The cross-sectional design might have limited the scope of this study. A small sample size and single-center study might limit external generalizability. This study was conducted at one university; the results will be of more importance if conducted among several universities in a country.

Conclusion

According to the present study’s results, there are differences between students’ interests in choosing medical specialties. These differences are mostly related

to the individual aspects of the students. Several factors appear to increase the choice of medical specialty in the future. A good understanding of this process can help planners of graduate courses. Future studies can examine the impact of career planning interventions in medical schools by tracking the status of physicians (those who have received such interventions and those who have not). In addition, these studies can show whether the decision to continue education and choose a specialty, both psychologically and functionally, is related to success in the basic science course or not. Further studies and expanded factors are suggested on this topic on a large sample to obtain findings with more precision and external validation.

Acknowledgements: The authors thank the staff and participants of this study for their important contributions.

Conflict of interests: The authors report no conflicts of interest.

Ethical approval: This study was approved by the ethics committee of Kerman University of Medical Sciences in Iran (ethical code: IR.KMU.AH.REC.1398.179).

Funding/Support: None.

References

1. Correia Lima de Souza L, Mendonça VR, Garcia GB, Brandão EC, Barral-Netto M. Medical specialty choice and related factors of Brazilian medical students and recent doctors. *PLoS One*. 2015 Jul 24;10(7):e0133585. doi: [10.1371/journal.pone.0133585](https://doi.org/10.1371/journal.pone.0133585). [PMID: 26208007] [PMCID: PMC4514603]
2. Nguyen VAT, Könings KD, Wright EP, Kim GB, Luu HN, Scherpbier AJ, et al. Why do graduates choose to work in a less attractive specialty? A cross-sectional study on the role of personal values and expectations. *Hum Resour Health*. 2020 May 4;18(1):32. doi: [10.1186/s12960-020-00474-y](https://doi.org/10.1186/s12960-020-00474-y). [PMID: 32366327] [PMCID: PMC7197171]
3. Hertling SF, Back DA, Wildemann B, Schleußner E, Kaiser M, Graul I. Is student mentoring career-defining in surgical disciplines? A comparative survey among medical schools and medical students for mentoring programs. *Front Med (Lausanne)*. 2022 Nov 23;9:1008509. doi: [10.3389/fmed.2022.1008509](https://doi.org/10.3389/fmed.2022.1008509). [PMID: 36507512] [PMCID: PMC9726918]
4. Khader Y, Al-Zoubi D, Amarin Z, Alkafagei A, Khasawneh M, Burgan S, et al. Factors affecting medical students in formulating their specialty preferences in Jordan. *BMC Med Educ*. 2008 May 23;8:32. doi: [10.1186/1472-6920-8-32](https://doi.org/10.1186/1472-6920-8-32). [PMID: 18501004] [PMCID: PMC2423351]
5. Drinkwater J, Tully MP, Dornan T. The effect of gender on medical students’ aspirations: a qualitative study. *Med Educ*. 2008 Apr;42(4):420-6. doi: [10.1111/j.1365-2923.2008.03031.x](https://doi.org/10.1111/j.1365-2923.2008.03031.x). [PMID: 18338995]
6. Diderichsen S, Andersson J, Johansson EE, Verdonk P, Lagro-Janssen A, Hamberg K. Swedish medical students’ expectations of

- their future life. *Int J Med Educ.* 2011; 2: 140–6. doi: [10.5116/ijme.4ec5.92b8](https://doi.org/10.5116/ijme.4ec5.92b8). [PMCID: [PMC4205516](https://pubmed.ncbi.nlm.nih.gov/PMC4205516/)]
7. Boulis AK, Jacobs JA. The changing face of medicine: women doctors and the evolution of health care in America. New York, US: Cornell University Press; 2011.
 8. Levaillant M, Levaillant L, Lerolle N, Vallet B, Hamel-Broza J-F. Factors influencing medical students' choice of specialization: A gender based systematic review. *EClinicalMedicine.* 2020 Oct 24;28:100589. doi: [10.1016/j.eclinm.2020.100589](https://doi.org/10.1016/j.eclinm.2020.100589). [PMID: [33134904](https://pubmed.ncbi.nlm.nih.gov/33134904/)] [PMCID: [PMC7588859](https://pubmed.ncbi.nlm.nih.gov/PMC7588859/)]
 9. Yang Y, Li J, Wu X, Wang J, Li W, Zhu Y, et al. Factors influencing subspecialty choice among medical students: a systematic review and meta-analysis. *BMJ Open.* 2019 Mar 7;9(3):e022097. doi: [10.1136/bmjopen-2018-022097](https://doi.org/10.1136/bmjopen-2018-022097). [PMID: [30850399](https://pubmed.ncbi.nlm.nih.gov/30850399/)] [PMCID: [PMC6429728](https://pubmed.ncbi.nlm.nih.gov/PMC6429728/)]
 10. Brotherton SE, Etzel SI. Graduate medical education, 2020–2021. *JAMA.* 2021 Sep 21;326(11):1088–1110. doi: [10.1001/jama.2021.13501](https://doi.org/10.1001/jama.2021.13501). [PMID: [34546319](https://pubmed.ncbi.nlm.nih.gov/34546319/)]
 11. Grasreiner D, Dahmen U, Settmacher U. Specialty preferences and influencing factors: a repeated cross-sectional survey of first- to sixth-year medical students in Jena, Germany. *BMC Med Educ.* 2018 May 9;18(1):103. doi: [10.1186/s12909-018-1200-8](https://doi.org/10.1186/s12909-018-1200-8). [PMID: [29743057](https://pubmed.ncbi.nlm.nih.gov/29743057/)] [PMCID: [PMC5944057](https://pubmed.ncbi.nlm.nih.gov/PMC5944057/)]
 12. Kataria GM. Future career aspiration and specialty choices among undergraduate medical students of a medical college in Jammu and Kashmir, India – A cross-sectional study. *Journal of Health Sciences.* 2023 Apr 1;11(2):160–3. doi: [10.4103/mjhs.mjhs_175_22](https://doi.org/10.4103/mjhs.mjhs_175_22).
 13. Nayef HJ, Al-Mosawie HAH. Which medical specialty do I choose? The answer of Iraqi graduated doctors working in Basra. *Iraqi new medical Journal.* 2016;2:37–46.
 14. Awadi S, Al Sharie S, Faiyoumi BA, Alzu'bi E, Hailat L, Al-Keder B. Factors affecting medical student's decision in choosing a future career specialty: A cross-sectional study. *Ann Med Surg (Lond).* 2022 Jan 27;74:103305. doi: [10.1016/j.amsu.2022.103305](https://doi.org/10.1016/j.amsu.2022.103305). [PMID: [35145673](https://pubmed.ncbi.nlm.nih.gov/35145673/)] [PMCID: [PMC8818518](https://pubmed.ncbi.nlm.nih.gov/PMC8818518/)]
 15. Mohamed EY. Specialty preferences and factors affecting the choices of postgraduate specialty among undergraduate medical students. *Pak J Med Sci.* 2022 Jul-Aug;38(6):1431–1435. doi: [10.12669/pjms.38.6.5571](https://doi.org/10.12669/pjms.38.6.5571). [PMID: [35991256](https://pubmed.ncbi.nlm.nih.gov/35991256/)] [PMCID: [PMC9378383](https://pubmed.ncbi.nlm.nih.gov/PMC9378383/)]
 16. Harries RL, Gokani VJ, Smitham P, Fitzgerald JEF. Less than full-time training in surgery: a cross-sectional study evaluating the accessibility and experiences of flexible training in the surgical trainee workforce. *BMJ Open.* 2016 Apr 18;6(4):e010136. doi: [10.1136/bmjopen-2015-010136](https://doi.org/10.1136/bmjopen-2015-010136). [PMID: [27091819](https://pubmed.ncbi.nlm.nih.gov/27091819/)] [PMCID: [PMC4838701](https://pubmed.ncbi.nlm.nih.gov/PMC4838701/)]
 17. Takeda Y, Morio K, Snell L, Otaki J, Takahashi M, Kai I. Characteristic profiles among students and junior doctors with specific career preferences. *BMC Med Educ.* 2013 Sep 12;13:125. doi: [10.1186/1472-6920-13-125](https://doi.org/10.1186/1472-6920-13-125). [PMID: [24028298](https://pubmed.ncbi.nlm.nih.gov/24028298/)] [PMCID: [PMC3847686](https://pubmed.ncbi.nlm.nih.gov/PMC3847686/)]
 18. Huda N, Yousuf S. Career preference of final year medical students of Ziauddin Medical University. *Educ Health (Abingdon).* 2006 Nov;19(3):345–53. doi: [10.1080/13576280600984087](https://doi.org/10.1080/13576280600984087). [PMID: [17178516](https://pubmed.ncbi.nlm.nih.gov/17178516/)]
 19. Chang P-Y, Hung C-Y, Wang K-I, Huang Y-H, Chang K-J. Factors influencing medical students' choice of specialty. *J Formos Med Assoc.* 2006 Jun;105(6):489–96. doi: [10.1016/s0929-6646\(09\)60189-3](https://doi.org/10.1016/s0929-6646(09)60189-3). [PMID: [16801037](https://pubmed.ncbi.nlm.nih.gov/16801037/)]
 20. Van der Horst K, Siegrist M, Orlov P, Giger M. Residents' reasons for specialty choice: influence of gender, time, patient and career. *Med Educ.* 2010; 44(6): 595–602. doi: [10.1111/j.1365-2923.2010.03631.x](https://doi.org/10.1111/j.1365-2923.2010.03631.x). [PMID: [20604856](https://pubmed.ncbi.nlm.nih.gov/20604856/)]
 21. Cruz JAS, Sandy NS, Vannucchi TR, Gouveia EM, Passerotti CC, Bruschini H, et al. Defining factors for choosing medical specialty in Brazil. *Rev Med (São Paulo).* 2010 Mar 19;89(1):32–42. doi: [10.11606/issn.1679-9836.v89i1p32-42](https://doi.org/10.11606/issn.1679-9836.v89i1p32-42).

Challenges, Opportunities and Future Directions of Dental Education in COVID-19 Pandemic: A Qualitative Study

Arghavan Etebarian¹, Leila Sadati², Somayeh Khoramian Tusi³, Kamran Farjad^{4*}

¹Assistant Professor, Department of Oral and Maxillofacial Pathology, School of Dentistry, Alborz University of Medical Sciences, Karaj, Iran
²PhD in Medical Education, Department of Operating Room, School of Allied Medical Sciences, Alborz University of Medical Sciences, Karaj, Iran

³Assistant Professor, Department of Pediatric Dentistry, School of Dentistry, Alborz University of Medical Sciences, Karaj, Iran

⁴Doctor of Dental Surgery (D.D.S), Student Research Committee, Alborz University of Medical Sciences, Karaj, Iran

Received: 2023 June 24

Revised: 2023 September 28

Accepted: 2023 October 21

Published online: 2023 October 27

*Corresponding author:

Student Research Committee, Alborz University of Medical Sciences, Karaj, Iran.

Email: kamranfarjad1996@gmail.com

Citation:

Etebarian A, Sadati L, Khoramian Tusi S, Farjad K. Challenges, Opportunities and Future Directions of Dental Education in COVID-19 Pandemic: A Qualitative Study. *Strides Dev Med Educ.* 2023 October; 20(1):179-186.
doi:10.22062/sdme.2023.198754.1242

Abstract

Background: With the onset of the COVID-19 pandemic and the impossibility of face-to-face learning, universities sought alternative methods to continue education and adapt to the upcoming conditions. Although technology development and virtual education methods created many opportunities in dental education, these modern solutions were not free of problems.

Objectives: The current study explored the challenges, opportunities, and future directions of dental education from the experience of dental students, faculty members, and the dean of Alborz Dental School during the COVID-19 pandemic.

Methods: The current qualitative study was conducted in 2021 using the content analysis method and in-depth semi-structured interviews with faculty members and students of Alborz Dental School. Purposive sampling was implemented to collect data with maximum variability in the faculty and student groups. In addition, 19 semi-structured interviews were transcribed verbatim immediately after each interview. The results were analyzed using MAXQDA version 10 software through the content analysis method.

Results: The results of data analysis in the evaluation of challenges and opportunities of dental education from the experience of dental students, faculty members, and the dean of Alborz Dental School during the COVID-19 pandemic detected three emerging categories: opportunities, challenges, and future direction with subcategories of e-learning, clinical training, infrastructures, and personal life.

Conclusion: Despite creating new learning opportunities during the COVID-19 pandemic, faculty members and dental students faced many challenges. Therefore, identifying these challenges, taking advantage of opportunities, and using faculty members' and students' experiences and suggestions can improve the learning experience and quality of education during the post-pandemic era.

Keywords: Dental Education; COVID-19; Online Learning; Qualitative

Background

COVID-19 is a novel acute respiratory infection that started in Wuhan, China, in December 2019 and has spread globally. WHO declared COVID-19 a public health emergency of international concern (1). Coronavirus is transmitted via droplets and aerosols in human-to-human contacts, making it more likely to spread in gatherings (2). One of the most important ways to prevent COVID-19 is social distancing. Based on disease trends and governmental public health policies, many countries implemented lockdowns for

their population and temporarily closed schools and educational institutions, which affected many students and instructors (3-5).

Dental curriculum changes follow a similar pattern in many countries. Lectures were switched online using different platforms, including video-based programs (like WebEx®, Zoom®, Jitsi®, Google Classroom, Google Meet, and Skype®), MOOCs (massive open online courses), Moodle (Modular Object-Oriented Dynamic Learning Environment), social media (like Facebook®, Instagram®, YouTube®, WhatsApp®, Telegram®) and

many more (6). Like most dental schools worldwide, Alborz stopped preclinical and clinical activities and focused on theoretical courses via national online platforms like Navid and Skyroom. Navid (7) is an online learning platform initiated in 2016. In Navid, instructors can share materials (text or multimedia), enable student collaboration and discussion, manage assignments and quizzes, and assign grades. Skyroom (8) is a web conferencing service that allows instructors to hold virtual classes featuring audio conferencing, screen and file sharing, and discussion sessions. This service was developed during the pandemic to substitute for international platforms like Zoom.

Students and staff members face many challenges via online learning worldwide. One of the most significant challenges reported in the literature was financial resources. The infrastructure needed for this sudden change was not affordable for many countries. Otherwise, technical problems like internet connection issues, inadequate computer skills of senior faculty members, lack of time and preference for old teaching habits, and lack of direct contact between students and faculties were another reason to resist new methods (9-12). However, adaptation to COVID-19 created many opportunities for dental students and faculty members, like improving personal skills and self-management (13). As Hasanzade et al. discussed, 86.4% of students were satisfied with the new online methods (14). Moreover, Alrashdi et al. reported comfort, accessibility, and flexible administration of educational content as advantages of e-learning (15).

Many countries like the U.S., Brazil, Italy, China, Jordan, and Chile discussed the impact of COVID-19 on dental education and the changes made (16-20).

Objectives

Due to the lack of classified experience in Iran and the significant impact of the pandemic on dental education, we aimed to explore the challenges, opportunities, and future directions of dental education from the experience of dental students, faculty members, and the dean of Alborz Dental School through a qualitative study.

Methods

Research Design: The present qualitative content analysis study was conducted after receiving the ethical confirmation code from Alborz University of Medical Sciences. Key informants were selected and interviewed among 283 dental students and 40 faculty members in March 2021. To enrich the data, we tried to include samples with maximum variability in the students (age,

gender, academic semester, educational level.) and the faculty member's group (age, gender, experience, field of expertise, Medical Science education background.). Eight faculty members and 11 students were involved in this study. Interviews were performed during the lockdown and also after the dental school re-opening.

Sample and Data Collection: Semi-structured interviews with open-ended questions were conducted in person and online (according to conditions) through the Sky Room platform between April and November 2021, including the lockdown and re-opening period. The interviews began with questions such as the following:

- What is your idea on the opportunities and challenges of the COVID-19 pandemic in dental education?
- What are the possible solutions for the existing challenges?
- What measures can be taken for the future?

Furthermore, based on the answers received from the participants, a more detailed interview was followed under sequential questioning. The interviews ranged from 45 to 60 minutes, according to the participant's responses and experiences.

Data Analysis: The data was analyzed using the steps proposed by Zhang and Wildemuth via content analysis (21).

First, the researcher read each interview transcript several times to gain familiarity with the data and develop a preliminary understanding of the related concepts. The codes were compiled to form categories and subcategories using continuous comparison, evaluation, feedback, and interpretation. The dates were analyzed using MAXQDA version 10 through the content analysis method. The saturation point was reached after the 11th interview with students and the eighth one with faculty members. To strengthen the data, the researchers used Guba and Lincoln's credibility, transferability, dependability, and conformability criteria (22).

The credibility was promoted by prolonged engagement with participants and contact with them for a long time. During the study, the interview transcripts and the extracted codes were sent to the participants to ensure they were consistent with their experience. Furthermore, maximum diversity was considered for both groups (age, gender, academic semester, and years of experience) to enrich the information. Also, dependability and conformability were determined through a review of the data and peer code review in the data-gathering process. Regarding transferability, the characteristics of the participants and the study process

were described clearly and accurately so that other researchers could use them.

Results

Faculty members were between 32 and 50 years old (Mean 39.7). Seven were females (87.5%), and one was male (12.5%). Also, students were between 20 and 34 years old (Mean 24.8), of which four were female (36.36%) and seven were male (63.64%). Student participants were from the first year to the sixth year.

After analyzing and reviewing transcripts, 133 codes, eight subcategories, and four main categories emerged from faculty members interviews, and 123 codes, seven subcategories, and four main categories emerged from students interviews. The main categories, subcategories, and some of the primary codes are shown in [Tables 1](#) and [2](#).

The following section describes the main categories and subcategories extracted from Faculty members' interviews.

1. Opportunities

This category comprises two subcategories, "Advances in E-learning" and "Self-improvement."

The interviewees expressed opportunities for virtual learning during the pandemic. Many interviewees believed that educational justice could be achieved by high-quality educational content that can be shared worldwide. Also, E-learning can provide more opportunities for students (*"commuting in big cities can waste the time of the students, saving this time can help students to focus more on studying," said a 46-year-old female faculty member*).

Table 1. Emerging categories and subcategories from faculty members interviews regarding Challenges, Opportunities, and Future Direction of Dental Education in the COVID-19 pandemic

Main Categories	Subcategories	Primary codes
1. Opportunities	Advances in E-learning	Time-saving
		Educational justice
		Flexibility
		Self-learning
	Self-improvement	Social media usage
		Enhanced creativity
2. Challenges	New to E-learning	Improved I.T. knowledge
		lack of interactions
		I.T. skill shortage
		Learning content copyright
	Insufficient clinical training	Cheatings
		Decreased number of patients
		Poor clinical skills
	Lack of infrastructures	Lack of clinical education substitutes
		Internet access
		Lack of domestic content creation tools
		Undermanning content creators
	Personal struggles	Online platform problems
		Lack of modern technology
		Contracting COVID-19
Learning loss		
Increased workload		
3. Future Directions	Accepting E-learning	Time management
		Blended Learning
		Updated learning contents
		Using new technologies
		Providing infrastructures of modern lab training
	Transformation in clinical education	Instructor/ Teacher assistants
		Implementing faculty empowerment programs
		Extending school working hours
		Small group training
		Providing P.P.E. to staff and students
Using simulation and mannequins		

P.P.E: Personal Protective Equipment

Table 2. Emerging categories and subcategories from students interviews regarding Challenges, Opportunities, and Future Directions of Dental Education in the COVID-19 pandemic

Main Categories	Subcategories	Primary codes
1. Opportunities	Advances in E-learning	Time-saving
		Flexibility
		Easy access and higher-quality content
		Using social media
2. Challenges	New to E-learning	Lack of face-to-face interactions
		Limited library access
		Learning loss
	Lack of clinical training	Decreased the number of patients
		Poor clinical skills
		Fewer faculty members in the clinic
	Difficulties in personal life	Contracting COVID-19
		Learning loss
		Low self-confidence in clinical practice
		Prolonged Study duration
		Priorities modification
		Family adaptability
		Internet access
	Lack of infrastructure	Online platform problems
3. Future Directions	Future of E-learning	Blended Learning
		Using new technologies
	Working on clinical training	Extending school working hours
		Reducing treatment costs
		Adding supplementary courses

Although some faculty members believed that students were not ready for E-learning, others believed that virtual education and content strengthened students' self-learning skills and trained them to become more knowledgeable. Such a phenomenon changed teacher-centered learning to student-centered learning. Another opportunity was to use the potential of social media for communication and education, which was experienced more during this period.

Based on the faculty members experience, new conditions forced them to improve their skills and creativity to use social media for better connections and incorporate new teaching methods, such as related videos and other available E-contents. Maybe these skills would not be strengthened to such an extent in everyday situations and face-to-face learning (“... shifting to online learning created the opportunity to consider the potential of multimedia to deliver virtual content, said a 40-year-old male faculty member”).

2. Challenges

This category consists of four subcategories, "New to E-learning, "Insufficient clinical training," Lack of Infrastructures, "and "Personal struggles."

Faculty members stated challenges in E-learning include maintaining the copyrights in educational contents, reducing the faculty member-student interactions, and cheating in the virtual exams (*"this type of student evaluation created fake grades that were not reliable feedback of their knowledge level."* said a 41-year-old female faculty member). In addition, the faculty members were unfamiliar with virtual content creation software at the beginning of this era, as a 36-year-old faculty member said (*"We were not very familiar with the virtual system ... We did not know how to create suitable educational content"*).

According to many interviewees, clinical education was one of the essential areas severely affected during the pandemic. Many patients postponed their dental treatment because they feared contracting COVID-19. As a result, the number of patients decreased significantly after the school re-opening. On the other hand, there were few alternative methods to compensate for this shortage in clinical training. As a result, students faced many problems. They did not acquire the necessary practical skills (*"Unfortunately, the experience of close contact, hands-on training, and interaction with the patient is an important point that had been lost*

during the pandemic," said a 36-year-old female faculty member).

Regarding educational infrastructure, the interviewees mentioned the lack of native content creation software, content creation support team, modern technologies, technical problems with our native virtual systems (NAVID and Skyroom), and difficulties accessing high-speed Internet in Iran. Most faculties faced many issues with internet access and could not easily upload their content or hold online classes. In addition, problems such as limitations in uploading contents, system logging difficulties, concerns about sharing contents, and inability to supervise students learning were mentioned (*"There are some modern learning tools such as virtual patient and students can practice a range of dental preparations. Unfortunately, these facilities are not available in Iran" said a 46-year-old female faculty member*).

Many faculty members shared similar concerns. The decrease in students' learning due to virtual education and the risk of students contracting COVID-19 were among the problems they mentioned. (*A 32-year-old female faculty member told us, "The main concern is that students get infected by the coronavirus from their patients."*) Higher workload and challenges in time management were also among other issues during this era (*"Checking students assignments took much time from me, after a while I began to schedule one of my weekdays for feedback and could manage the process better" said a 33-year-old female faculty member*).

3. Future Directions

This category comprises two subcategories, "Accepting E-learning" and "Transformation in clinical education".

Future directions were expressed in virtual education, including using new technologies, having teacher assistants and I.T. team support, continuously updating educational content, and the faculty members' empowerment programs. Faculty members believed that to create perfect E-content, they must work hard as educational designers, I.T., and content professionals (*"Not only working with a supporting team including teacher assistants will ease our workload, but also enhance the quality of learning," said a 46-year-old female faculty member*).

Faculty members suggested extending the school's working hours during the re-opening period. They also recommend conducting small group activities, providing P.P.E. for students and faculty members, and using modern simulators and mannequins for training and clinical activities, as a 40-year-old male faculty

member said (*"Simulators are new and helpful technology that can be implemented during the lockdown"*).

This section describes the main categories and subcategories extracted from students' interviews.

1. Opportunities

This category consists of one subcategory, "Advances in E-learning."

Like faculty members, students also mentioned opportunities for dental education during the pandemic. According to interviews, with E-learning, they could study whenever they wanted, less commuting, and have more time to learn. Based on one of the interviewees, social media was also helpful during this period (*"Several faculty members opened up a topic in WhatsApp groups, then they started to discuss and ask questions," said a 25-year-old female student*). They also mentioned better access to high-quality educational content. As a 22-year-old male student mentioned, students grades increased in various subjects.

2. Challenges

This category consists of four subcategories, "New to E-learning, "Lack of clinical training," Difficulties in personal life, "and "Lack of Infrastructures".

On the other hand, many students stated that E-learning had reduced their learning and productivity due to the lack of interaction with the faculty members and problems such as lack of library access.

One of the primary students concerns in this era was clinical education. Due to social distancing, the number of faculty members and patients in each department was low; therefore, students faced problems with clinical training (*"In the time of school re-opening, we had problems finding patients, which affected our clinical training," said a 24-year-old male student*).

Most students are worried about themselves or their families getting infected with COVID-19. In addition, most students were deeply concerned about their lack of hand skills during the lockdown (*"I may not have acquired the skills I need, and I do not have confidence treating patients," said a 24-year-old male student*). One of the interviewees also mentioned his concern about continuing the pandemic and prolonged study duration. For some students, it was difficult for their families to adapt to the new conditions, and they could hardly keep the home environment quiet for studying or online classes. The students priorities were also modified, and instead of studying, many did their tasks and entertainment during the school closure. An interviewee from the first year stated that due to the quarantine, he did not have the opportunity to get to know the school

environment and his peers (*"Due to lockdown, I wasn't able to meet my peers and experience the school atmosphere" said a 20-year-old male student*).

Internet access was also challenging for students during this era, and many had problems participating in online classes or accessing educational content. Our native platforms were not ready enough, and students faced many technical issues using them. In addition, due to filtering and sanction problems in Iran, we did not have easy access to other international platforms such as Zoom or Moodle.

3. Future Directions

This category comprises two subcategories, "Future of E-learning" and "Working on clinical training."

The use of new technologies for teaching, was among the suggestions made by the students for the future. (*"One of the ways for long-lasting learning is to upload the content offline first, then hold an online class to discuss and resolve the learning problems based on those offline sessions," said a 34-year-old male student*).

Also, students suggested that the school working hours should be extended with the re-opening, and additional clinical courses could be programmed to compensate for any lack in this field. Also, the number of patients could be increased if the treatment costs are reduced.

Discussion

The COVID-19 pandemic has affected the academic community and dental education. Faculty members and dental students worldwide faced many challenges in adopting E-learning. Still, despite the challenges, they have shown remarkable adaptability, and the pandemic has created many opportunities for dental education (6).

In the participants opinion, E-learning helped students study high-quality content whenever and wherever they wanted and guided them to international barrier-free content, especially in developing countries. Likewise, Chang et al. stated that collaboration among dental schools worldwide could make the best instructors around the globe available, and it is a big help for schools with a lack of teaching staff, especially in developing countries (6).

In our study, students and faculty members reported that using social media provides an environment for interaction and learning theoretical courses and believed social media could be used to enhance learning quality. Further, Sachin et al. suggested that WhatsApp can improve students performance and clear their doubts much faster, thus speeding the learning process (23). One

of the opportunities mentioned by Loch et al. was infection control improvement in dentistry during the COVID-19 era, which can prepare us for future pandemics (24).

As mentioned by interviewees, lack of interaction and difficulties in monitoring students, I.T. skill shortage, national platforms problems, internet connection problems, and learning loss were among the challenges in implementing E-learning. Other authors have reported unaffordable modern educational hardware and software, internet connection issues, inadequate computer skills, preference for old teaching habits, decreased sense of presence, and psychomimetic effects of 3D software (9-11). Hung et al. also reported that the pandemic affected the mental health of students and faculty members, such as concern and anxiety about financial instability (25).

Another critical challenge that all the participants mentioned was clinical and preclinical training during this time. They believed students couldn't develop practical skills during the lockdown and school closures. The number of patients in school was low; furthermore, there wasn't a suitable substitute for these clinical courses. However, faculty members used videos, virtual journal clubs, and case reports to deliver these courses. Modern simulation technology could have helped students and faculty members experience less challenge. Simulation technology brings a variety of possibilities for clinical education and can be considered an effective method during the pandemic (26); therefore, dental schools must invest in these modern technologies.

All students and faculty members stated concerns arising from COVID-19. They were worried about contracting COVID-19 and their families well-being. Students were also concerned about delayed graduation, insufficient practical skills, and their future careers. Moreover, Deery et al. reported that poor mental health status negatively impacted students learning during the pandemic (27). In this case, students can benefit from school-supportive psychological counseling.

Participants made some suggestions to improve educational quality during COVID-19 and beyond. Faculty members described getting help from an I.T. supporting team that can edit and upload educational content and having teacher assistants send feedback to students assignments could have saved their time and enhanced the E-learning experience for students. Students and faculty members recommended extended clinical and preclinical programs and blended learning for theoretical courses to benefit E-learning

opportunities. Further, Ghai et al. suggested that dental schools must consider high-standard infection control protocols for students' and faculty members' well-being (28). It is believed that students and faculty members could benefit from changes in courses like infection control in the dental curriculum and prepare for upcoming pandemics (29).

Finally, COVID-19 taught us that teaching and delivering courses should not always be in person and face-to-face. The dental educational curriculum should be more flexible and modified to adapt to crises like pandemics. This modification in the dental curriculum has to be beyond the COVID-19 pandemic, and all students must be trained for any other crisis in the future. At the time of writing this article, Iran's Ministry of Health and Medical Education has officially implemented E-learning in the dental curriculum and clearly defined the aims and means of this method in each of its theoretical and clinical courses.

Conclusion

This qualitative study captured the expressive information of faculty members and students on challenges, opportunities, and future directions of dental education during the COVID-19 pandemic, including new insights on E-learning, clinical training, infrastructures, and changes in personal life. Regardless of the obstacles, the pandemic created many options, such as boosting E-learning, that would not be possible without this sudden shift. All faculty members need to embrace lessons learned from the pandemic and focus on new methods that could be implemented for more adaptive, dynamic, and creative learning. These steps can be the beginning of flexible learning and a significant change in the future of dental curricula worldwide.

Acknowledgements: We sincerely thank all the faculty members and students who participated in this study. We also appreciate the Clinical Research Development Unit of the Dental school, Alborz University of Medical Sciences, for its technical and financial support.

Conflict of interests: The authors declare that they have no competing interests.

Ethical approval: The Alborz University of Medical Sciences Ethics Committee approved the study protocol. All methods followed relevant guidelines and regulations, and informed consent was obtained from all subjects.

Funding/Support: Included in submitted data. (Alborz University of Medical Sciences, Iran).

References

- Guo YR, Cao QD, Hong ZS, Tan YY, Chen SD, Jin HJ, et al. The origin, transmission and clinical therapies on coronavirus disease 2019 (COVID-19) outbreak - an update on the status. *Mil Med Res.* 2020 Mar 13;7(1):11. doi: [10.1186/s40779-020-00240-0](https://doi.org/10.1186/s40779-020-00240-0). [PMID: [32169119](https://pubmed.ncbi.nlm.nih.gov/32169119/)] [PMCID: [PMC7068984](https://pubmed.ncbi.nlm.nih.gov/PMC7068984/)]
- Huang C, Wang Y, Li X, Ren L, Zhao J, Hu Y, et al. Clinical features of patients infected with 2019 novel coronavirus in Wuhan, China. *Lancet.* 2020 Feb 15;395(10223):497-506. doi: [10.1016/S0140-6736\(20\)30183-5](https://doi.org/10.1016/S0140-6736(20)30183-5). [PMID: [31986264](https://pubmed.ncbi.nlm.nih.gov/31986264/)] [PMCID: [PMC7159299](https://pubmed.ncbi.nlm.nih.gov/PMC7159299/)]
- Liu X, Zhou J, Chen L, Yang Y, Tan J. Impact of COVID-19 epidemic on live online dental continuing education. *Eur J Dent Educ.* 2020 Nov;24(4):786-789. doi: [10.1111/eje.12569](https://doi.org/10.1111/eje.12569). [PMID: [32648989](https://pubmed.ncbi.nlm.nih.gov/32648989/)] [PMCID: [PMC7405200](https://pubmed.ncbi.nlm.nih.gov/PMC7405200/)]
- Wu DT, Wu KY, Nguyen TT, Tran SD. The impact of COVID-19 on dental education in North America-Where do we go next? *Eur J Dent Educ.* 2020 Nov;24(4):825-827. doi: [10.1111/eje.12561](https://doi.org/10.1111/eje.12561). [PMID: [32654328](https://pubmed.ncbi.nlm.nih.gov/32654328/)] [PMCID: [PMC7404882](https://pubmed.ncbi.nlm.nih.gov/PMC7404882/)]
- UNESCO. Education: From disruption to recovery. [cited 2021 May]. Available from: <https://en.unesco.org/covid19/educationresponse>.
- Chang TY, Hong G, Paganelli C, Phantumvanit P, Chang WJ, Shieh YS, et al. Innovation of dental education during COVID-19 pandemic. *J Dent Sci.* 2021 Jan;16(1):15-20. doi: [10.1016/j.jds.2020.07.011](https://doi.org/10.1016/j.jds.2020.07.011). [PMID: [32839668](https://pubmed.ncbi.nlm.nih.gov/32839668/)] [PMCID: [PMC7437532](https://pubmed.ncbi.nlm.nih.gov/PMC7437532/)]
- Alborz University of Medical Sciences. NAVID. [cited 2022 Sep]. Available from: <https://abzumsnavid.smums.ac.ir>.
- SKYROOM. Available from: <https://skyroom.online>.
- Reynolds PA, Mason R, Harper J. The many faces of interaction. *Br Dent J.* 2008 May 24;204(10):565-70. doi: [10.1038/sj.bdj.2008.409](https://doi.org/10.1038/sj.bdj.2008.409). [PMID: [18500305](https://pubmed.ncbi.nlm.nih.gov/18500305/)]
- Salgado H, Castro-Vale I. Clinical Communication Skills Training in Dental Medical Education: The COVID-19 Pandemic Challenge. *Healthcare (Basel).* 2020 Oct 25;8(4):429. doi: [10.3390/healthcare8040429](https://doi.org/10.3390/healthcare8040429). [PMID: [33113808](https://pubmed.ncbi.nlm.nih.gov/33113808/)] [PMCID: [PMC7712077](https://pubmed.ncbi.nlm.nih.gov/PMC7712077/)]
- Eaton KA, Reynolds PA, Grayden SK, Wilson NH. A vision of dental education in the third millennium. *Br Dent J.* 2008 Sep 13;205(5):261-71. doi: [10.1038/sj.bdj.2008.736](https://doi.org/10.1038/sj.bdj.2008.736). [PMID: [18791586](https://pubmed.ncbi.nlm.nih.gov/18791586/)]
- Hillenburg KL, Cederberg RA, Gray SA, Hurst CL, Johnson GK, Potter BJ. E-learning and the future of dental education: opinions of administrators and information technology specialists. *Eur J Dent Educ.* 2006 Aug;10(3):169-77. doi: [10.1111/j.1600-0579.2006.00413.x](https://doi.org/10.1111/j.1600-0579.2006.00413.x). [PMID: [16842592](https://pubmed.ncbi.nlm.nih.gov/16842592/)]
- Mosalanejad L, Dastpak M, Kheshti F. Students' Academic Lifestyle in COVID-19 Crisis: A Qualitative Study with a Phenomenological Analysis. *Strides Dev Med Educ.* 2022; 19(1): 51-8. doi: [10.22062/sdme.2022.196790.1087](https://doi.org/10.22062/sdme.2022.196790.1087).
- Hasanzade M, Aminishakib P, Mortaz Hejri S, Kharazifard MJ, Siadat H. Re-opening of a school of dentistry in the era of COVID-19 pandemic, "Step-by-step" approach. *Eur J Dent Educ.* 2023 Feb;27(1):167-173. doi: [10.1111/eje.12789](https://doi.org/10.1111/eje.12789). [PMID: [35233898](https://pubmed.ncbi.nlm.nih.gov/35233898/)] [PMCID: [PMC9111837](https://pubmed.ncbi.nlm.nih.gov/PMC9111837/)]
- Alrashdi M, Hameed A, Aljabr A. COVID-19 and a call to adapt dental education. *Frontiers in Dental Medicine.* 2021;2:664460. doi: [10.3389/fdmed.2021.664460](https://doi.org/10.3389/fdmed.2021.664460).

16. Iyer P, Aziz K, Ojcius DM. Impact of COVID-19 on dental education in the United States. *J Dent Educ.* 2020 Jun;84(6): 718-722. doi: [10.1002/jdd.12163](https://doi.org/10.1002/jdd.12163). [PMID: [32342516](https://pubmed.ncbi.nlm.nih.gov/32342516/)]
17. Machado RA, Bonan PRF, Perez D, Martelli JÚnior H. COVID-19 pandemic and the impact on dental education: discussing current and future perspectives. *Braz Oral Res.* 2020 Jun 29;34:e083. doi: [10.1590/1807-3107bor-2020.vol34.0083](https://doi.org/10.1590/1807-3107bor-2020.vol34.0083). [PMID: [32609144](https://pubmed.ncbi.nlm.nih.gov/32609144/)]
18. Bennardo F, Buffone C, Fortunato L, Giudice A. COVID-19 is a challenge for dental education-A commentary. *Eur J Dent Educ.* 2020 Nov; 24(4): 822-824. doi: [10.1111/eje.12555](https://doi.org/10.1111/eje.12555). [PMID: [32542796](https://pubmed.ncbi.nlm.nih.gov/32542796/)] [PMCID: [PMC7323383](https://pubmed.ncbi.nlm.nih.gov/PMC7323383/)]
19. Guo H, Zhou Y, Liu X, Tan J. The impact of the COVID-19 epidemic on the utilization of emergency dental services. *J Dent Sci.* 2020 Dec;15(4):564-567. doi: [10.1016/j.jds.2020.02.002](https://doi.org/10.1016/j.jds.2020.02.002). [PMID: [32296495](https://pubmed.ncbi.nlm.nih.gov/32296495/)] [PMCID: [PMC7156222](https://pubmed.ncbi.nlm.nih.gov/PMC7156222/)]
20. Hattar S, AlHadidi A, Sawair FA, Alraheem IA, El-Ma'aitha A, Wahab FK. Impact of COVID-19 pandemic on dental education: online experience and practice expectations among dental students at the University of Jordan. *BMC Med Educ.* 2021 Mar 8;21(1):151. doi: [10.1186/s12909-021-02584-0](https://doi.org/10.1186/s12909-021-02584-0). [PMID: [33685451](https://pubmed.ncbi.nlm.nih.gov/33685451/)] [PMCID: [PMC7938292](https://pubmed.ncbi.nlm.nih.gov/PMC7938292/)]
21. Wildemuthm BM. Applications of social research methods to questions in information and library science. California, USA: Libraries and the Academy; 2016.
22. Lincoln Y, Guba E. Naturalistic inquiry. California: SAGE; 1985.
23. Sarode S, Sarode S. WhatsApp use in dentistry: Future prospects. *Journal of Dental Research and Review.* 2016;3(1): 3-4. doi: [10.4103/2348-2915.180104](https://doi.org/10.4103/2348-2915.180104).
24. Loch C, Kuan IBJ, Elsalem L, Schwass D, Brunton PA, Jum'ah A. COVID-19 and dental clinical practice: Students and clinical staff perceptions of health risks and educational impact. *J Dent Educ.* 2021 Jan;85(1):44-52. doi: [10.1002/jdd.12402](https://doi.org/10.1002/jdd.12402). [PMID: [32914437](https://pubmed.ncbi.nlm.nih.gov/32914437/)]
25. Hung M, Licari FW, Hon ES, Lauren E, Su S, Birmingham WC, et al. In an era of uncertainty: Impact of COVID-19 on dental education. *J Dent Educ.* 2021 Feb; 85(2): 148-156. doi: [10.1002/jdd.12404](https://doi.org/10.1002/jdd.12404). [PMID: [32920890](https://pubmed.ncbi.nlm.nih.gov/32920890/)]
26. Scalse RJ, Obeso VT, Issenberg SB. Simulation technology for skills training and competency assessment in medical education. *J Gen Intern Med.* 2008 Jan;23 Suppl 1(Suppl 1):46-9. doi: [10.1007/s11606-007-0283-4](https://doi.org/10.1007/s11606-007-0283-4). [PMID: [18095044](https://pubmed.ncbi.nlm.nih.gov/18095044/)] [PMCID: [PMC2150630](https://pubmed.ncbi.nlm.nih.gov/PMC2150630/)]
27. Deery C. The COVID-19 pandemic: implications for dental education. *Evid Based Dent.* 2020 Jun;21(2):46-47. doi: [10.1038/s41432-020-0089-3](https://doi.org/10.1038/s41432-020-0089-3). [PMID: [32591653](https://pubmed.ncbi.nlm.nih.gov/32591653/)] [PMCID: [PMC7317244](https://pubmed.ncbi.nlm.nih.gov/PMC7317244/)]
28. Ghai S. Are dental schools adequately preparing dental students to face outbreaks of infectious diseases such as COVID-19? *J Dent Educ.* 2020 Jun;84(6):631-633. doi: [10.1002/jdd.12174](https://doi.org/10.1002/jdd.12174). [PMID: [32391578](https://pubmed.ncbi.nlm.nih.gov/32391578/)] [PMCID: [PMC7272995](https://pubmed.ncbi.nlm.nih.gov/PMC7272995/)]
29. Etebarian A, Khoramian Tusi S, Momeni Z, Hejazi K. Impact of educational intervention regarding COVID-19 on knowledge, attitude, and practice of students before dental school re-opening. *BMC Oral Health.* 2023 Mar 18;23(1):156. doi: [10.1186/s12903-023-02845-y](https://doi.org/10.1186/s12903-023-02845-y). [PMID: [36934228](https://pubmed.ncbi.nlm.nih.gov/36934228/)] [PMCID: [PMC10024005](https://pubmed.ncbi.nlm.nih.gov/PMC10024005/)]

Design and Evaluation of the Effectiveness of the Writing Workshop on Promoting the Research Skills of Basic and Clinical Students based on Kirkpatrick's Model

Ensieh Lotfali^{1,2}, Hossein Tayebi³, Zohreh Khoshgoftar^{4*}

¹Master of Medical Education, School of Medical Education and Learning Technologies, Shahid Beheshti University of Medical Sciences, Tehran, Iran

²Assistant Professor of Medical Mycology, Department of Medical Parasitology and Mycology, School of Medicine, Shahid Beheshti University of Medical Sciences, Tehran, Iran

³Medical Student, School of Medicine, Shahid Beheshti University of Medical Sciences, Tehran, Iran

⁴Assistant Professor of Medical Education, School of Medical Education and Learning Technologies, Shahid Beheshti University of Medical Sciences, Tehran, Iran

Received: 2023 June 11

Revised: 2023 September 20

Accepted: 2023 November 04

Published online: 2023 November 07

***Corresponding author:**

Department of Medical Education,
School of Management and Medical
Education, Shahid Beheshti University
of Medical Sciences, Tehran, Iran.
Email: bkhoshgoftar7@gmail.com

Citation:

Lotfali E, Tayebi H, Khoshgoftar Z.
Design and Evaluation of the
Effectiveness of the Writing Workshop
on Promoting the Research Skills of
Basic and Clinical Students based on
Kirkpatrick's Model. *Strides Dev Med
Educ.* 2023 November; 20(1):187-192.
doi:10.22062/sdme.2023.198716.1234

Abstract

Background: An increasing number of workshops are held yearly to educate medical students on academic writing and research methodology. However, the actual impact of such training programs on students' proficiency in academic research cannot be assessed without thorough evaluation.

Objectives: Herein, Kirkpatrick's model was adopted to evaluate the efficiency of a workshop held for medical students on research methodology.

Methods: This cross-sectional study collected data from 280 medical students participating in seven workshops. Herein, two levels from Kirkpatrick's model were evaluated (reaction and learning). A 12-item questionnaire was filled out by participants immediately after the workshop to assess their reactions. Two questionnaires were used before and after the workshop to evaluate learning, each consisting of 25 items.

Results: Concerning the first level of Kirkpatrick's model, all students showed a generally high level of satisfaction in terms of the content, the lecturer, and the organization of the workshop. As for the learning scores, both basic and clinical students demonstrated significant ($P < 0.001$) improvement within groups. However, there was no significant difference between the two groups (basic and clinical).

Conclusion: The high level of satisfaction experienced by the participants and their significantly improved knowledge of research methodology, suggest that such workshops can indeed put medical students on the right track toward a productive academic and clinical career. So, the workshops should be considered a necessary component of education in medical sciences.

Keywords: Research, Scientific Writing, Training Evaluation

Background

The research plays a significant role in medicine development. Medical students need to keep themselves updated with the newest findings. Moreover, they should be able to contribute to their fields of interest by actively engaging in academic research (1). Several models have been offered for the assessment of academic training. One of the most recognized frameworks is Kirkpatrick's evaluation model, which evaluates the effectiveness of education (2, 3). This model sorts the

outcomes into four levels: reaction, learning, behavior changes, and results (4). In other words, it evaluates the outcome of any program in terms of its effect on the performance of those attending the program (2). The first level of the model (reaction) requires the participants to fill in a questionnaire after the course to express their overall impression of the program (5). This level of evaluation is supposed to assess how much the course fulfills the participants' expectations. The second level (learning) can be assessed utilizing questionnaires

completed before and after participating in the program. This level evaluates how the participants can apply their learning in actual practice (6). Several workshops have been held in recent years to instruct medical students on research skills and scientific writing (7). The evaluation of such workshops is essential as it can demonstrate whether or not a particular workshop has led to improved performance among the participants (7). In this study, two levels of Kirkpatrick's model were adopted to evaluate the effectiveness of a workshop on scientific writing held for medical students.

Objectives

The objectives of this study could be summarized as follows:

- To examine the background knowledge of students regarding research methodology;
- To assess the effectiveness of the workshop in improving the participants' understanding of research processes;
- To determine any possible association between participation in a workshop on scientific research and an improvement in the level of knowledge among participants;
- To determine whether or not there is any significant difference between basic and clinical students in terms of their reaction to the workshop and the improvement in their knowledge.

Methods

Study Design: This was a cross-sectional study for 14 months (December 2021 to February 2023) conducted for medical sciences students. The sample size included all general medical students of Shahid Beheshti University of Medical Sciences who are in the basic level (from the 1st to 4th academic semester) and the clinical level (from the 5th semester to the end of the 13th semester). Data was collected through questionnaires completed by participants before and after the workshop (4, 8). Immediately after the workshop, the participants filled out a questionnaire on how satisfied they were with the workshop's content, design, and outcome. Two questionnaires (4-choice questions and self-assessment) were used to assess level two of the model. The questionnaire included several items concerning various aspects of paper composition. The score difference between the questionnaires for each participant demonstrated the efficiency of the training program.

Population: This study is approved by the ethics committee of Shahid Beheshti University of Medical Sciences (SBMU) IR.SBMU.SME.REC.1400.079. A total

of seven workshops were held in this period, with 40 students attending each workshop, amounting to 280 students of medical sciences. All seven courses' teacher, conditions, and content were the same. Informed consent and being a student of medical sciences were the prerequisites for enrolment.

Workshop: The duration of each workshop was ten hours, which was held over two days for 5 hours to increase the workshop's efficiency. At the beginning of the first session, workshop outline was briefly introduced to ensure that the students had a general image of what they should expect from the training program. At the end of each workshop, a Q&A was held to discuss any issue that might have remained unclear for some students.

Sampling Tools: Before and after the workshop, evaluations were made to assess improvements in general understanding of the basic concepts of scientific research in medical sciences. The questionnaires were designed based on the content and objectives of the workshop. Regarding determining the validity and reliability of the questionnaire, after designing and preparing the questions, the questionnaire was approved by the supervisor. Therefore, it had validity, and due to the questions were designed according to the research objectives, it also had structural validity. Also, during the two stages of the experimental study and measurement on 20 students, the Cronbach's alpha value for the raw scores of the questions was determined to be 96%.

To evaluate the first level (reaction), a researcher-made questionnaire consisting of two parts was used. The first part was concerned with demographic information, such as name, age, and email of the participants, and the second part contained 12 questions. These questions concerned with the workshop's content, the lecturer, and the overall organization of the workshop. Answers were given on a scale of 1-5, with 1 being the highest and 5 being the lowest score based on Likert Scale.

To evaluate the second level (learning), two questionnaires were used. 1) A 4-choice question containing 25 questions about the workshop's content. 2) The self-assessment questionnaire based on the likert scale, which included 25 questions, was filled in before the workshop and one month later. Participants reported familiarity with these 25 questions on a scale of 1 to 9. If they did not know about the issue, they would score from 1 to 3. If they were familiar with the issue but not entirely, they would score from 4 to 6. Finally, if they

were completely well-informed, they would have scored 7 to 9.

Statistical Analysis: Kolmogorov-Smirnov test assessed the normal distribution of reaction and learning levels items. A comparison of reaction and learning levels items between basic and clinical student groups was conducted using an Independent-Samples t-test. Also, comparing learning levels items before and after the workshop was conducted using a Paired-Samples t-test. The Significant level was assigned 0.05. The calculations were carried out using SPSS version 21.

Results

The demographics of the study. Of the 280 students of medical sciences participating in the current study, 162 (57.8%) were men (basic and clinical, 95 and 67 persons respectively), and 118 (42.2%) were women (basic and clinical, 65 and 53 persons respectively).

The normal test showed that reaction level items in each group had a normal distribution. Because p-values were above 0.05(P-Values for items 1 to 12 in per group: 0.23, 0.14, 0.20, 0.09, 0.08, 0.12, 0.34, 0.16, 0.20, 0.07, 0.32, 0.21; 0.11, 0.15, 0.27, 0.25, 0.19, 0.30, 0.26, 0.18, 0.23, 0.24, 0.19, 0.36). Also, scores of learning levels based on 4 choice questions and Self-assessment had normal distribution (P-Values for before and after per group: 0.20, 0.18, 0.20, 0.20; 0.20, 0.20, 0.20, 0.06).

Level 1: Reaction

As shown in Table 1, the average score for all the 12 questions concerning the first level is 1.59 ± 0.57 , which shows that, in general, the workshop managed to leave a good impression on the basic students. In terms

of the content of the workshop, the highest score was given to the applicability of the contents, with a mean score of 1.69 ± 0.58 . Regarding the lecturer’s qualities, the highest score was obtained for the competency and expertise of the lecturer over the contents of the workshop, with a mean score of 1.83 ± 0.58 . Finally, according to basic students, the maintenance of order and discipline throughout the workshop achieved the highest score concerning the organization of the workshop, with a mean of 1.69 ± 0.59 . On the other hand, clinical students showed their overall reaction to the workshop with an average score of 1.63 ± 0.54 , which shows a good level of satisfaction in general.

Regarding the workshop's content, the highest score was given to the diversity and novelty of the contents, with a mean score of 1.68 ± 0.48 . Regarding the lecturer’s qualities, the highest score was given to the presentation and communication of the contents, with a mean score of 1.78 ± 0.61 . Finally, regarding the organization of the workshop, motivating and encouraging the learners to engage in more research activities received the highest score with a mean of 1.69 ± 0.48 .

Level 2: Learning

As shown in Table 2, according to two questionnaires (4 choice and self-assessment), the values for the Paired-Samples t-test and p-value ($P < 0.0001$) indicate significant improvement within groups in the learning of both basic and clinical students. The results for the Independent-Samples t-test and p values ($P = 0.008, 0.011, \text{ and } < 0.0001$) didn’t indicate significant differences between basic and clinical students in the learning scores.

Table 1. Scores of Basic and Clinical Students for the First Questionnaire (Reaction Level)

	Evaluated Items	Mean (SD)*		P value
		Basic students	Clinical students	
Content	1 Applicability of the contents	1.69(0.58)	1.59(0.43)	0.09
	2 Diversity and novelty of the contents	1.61(0.53)	1.68(0.48)	0.24
	3 Consistency of the contents with the syllabus of the workshop	1.5(0.54)	1.58(0.57)	0.23
Lecturer	4 Presentation and communication of the contents	1.69(0.54)	1.78(0.61)	0.20
	5 Competency and expertise of the lecturer over the contents of the workshop	1.83(0.58)	1.64(0.48)	0.003*
	6 Ability to answer related questions in a proper manner	1.47(0.54)	1.67(0.55)	0.003*
	7 Proper appearance	1.52(0.53)	1.62(0.53)	0.11
	8 On-time presence in the class and effective time management in presenting the contents	1.49(0.58)	1.51(0.52)	0.76
	9 Interaction with the learners and eliciting their participation	1.59(0.7)	1.57(0.61)	0.79
	10 Motivating and encouraging the learners to engage in more research activity	1.49(0.53)	1.69(0.48)	0.001**
Organization	11 Maintenance of order and discipline throughout the workshop	1.69(0.59)	1.63(0.52)	0.36
	12 Facilities of the conference room (lighting, acoustics, air conditioning, etc.)	1.65(0.7)	1.68(0.71)	0.72
Total		1.59±0.57	1.63±0.54	-

*SD: Standard Deviation; ** Significant at 0.05

Table 2. Scores of Learning Levels

Workshop	4 choice questions			Self-assessment		
	Basic	Clinical	Statistics*** (P-Value)	Basic	Clinical	Statistics*** (P-Value)
	Mean (SD)*			Mean (SD)*		
Before	8(2.13)	9(3.84)	-2.66 (0.008*)	12.54(3.49)	11.42(3.84)	2.55 (0.011)*
After	25(2.81)	27(1.16)	-7.95 (< 0.0001)**	18.32(1.25)	19.45(1.08)	-7.96 (< 0.0001)**
Statistics**** (P-Value)	-60.63 (< 0.0001)**	-47.30 (< 0.0001)**	-	-19.81 (< 0.0001)**	-22.49 (< 0.0001)**	-

*SD: Standard Deviation;; **Significant at 0.05; P-Value <0.0001 is very small. For example, in self-assessment for clinical group, p-value for comparing of before and after workshop was 1.13×10^{-44} ; ***Independent-Samples t-test; ****Paired-Samples t-test

Discussion

Medical sciences and related areas of study are rapidly developing. To keep up with these developments, one needs to be actively involved in the academic discussion around their fields of interest by following the latest research. Workshops on academic research are frequently held to educate medical students on the basics of scientific writing and publication. The growing number of such workshops calls for objective methods to evaluate the efficiency of the training programs. The current study evaluated to assess of a workshop on academic research in terms of the participants’ reactions and learning.

Similar to our findings, other results were achieved by Pourjahromi et al., showing that age and sex had no significant impact on reaction, learning, and behavior changes (9).

The assessment of reaction in this study showed that participants were generally satisfied with the workshop's design, presentation, and content. This was reflected in the results obtained from the first questionnaire, which returned a mean value of 1.59 ± 0.57 (in basic students) and 1.63 ± 0.54 (in clinical students). Dorri et al. reported the overall reaction of the nurses participating in training on cardiopulmonary resuscitation (CPR) as useful (10). Participants of a workshop held for a dental faculty on writing multiple-choice questions also reacted favorably to the overall design and content of the workshop (11). Similarly, a workshop for nurses on how to operate a DC shock device resulted in the general satisfaction of the participants with the content, lecturer, and educational facilities (9). The assessment of educational workshops for librarians by Shirazi et al showed the participants’ general satisfaction, which encouraged the organizers to hold more workshops and encouraged more librarians to participate in the following workshops (12). In contrast, results from an evaluation of courses on coaching and refereeing by Bakhshandeh et al. showed that participants from some

particular sports were not satisfied with the overall design and content of the programs, while courses on other sports had managed to elicit a more positive reaction from the participants. Bakhshandeh attributes the low level of satisfaction with some of the courses to the prioritization of financial issues over the quality of the education by some organizers (13).

The learning results showed significant improvement in the scores among both basic and clinical students. These results highlight the positive effect of participation in the workshop on the medical students’ knowledge of research methodology. To promote research, it is necessary to encourage "participation in the workshop" and increase research skills. The study on the efficiency of training on CPR indicated a desirable change in the staff’s knowledge level (10). The participants’ knowledge was also substantially increased due to a workshop on writing multiple-choice questions (11). The workshop held for librarians caused an increase in the general knowledge, expertise, and technical proficiency of the participants (12).

It can be argued that educational workshops generally improve participants’ knowledge, and participants react positively to such training programs. The only limitation of our study is the lack of a control group (the group that did not receive training through the workshop).

Conclusion

In the present study, all students showed a generally high level of satisfaction in terms of the content, the lecturer, and the workshop organization. As for the learning scores, both basic and clinical students significantly improved within groups. But there was no significant difference between the two groups (basic and clinical). A comprehensive evaluation of the quality of such training programs can help organizers improve the quality of their programs. Based on our findings, the high level of satisfaction experienced by the participants

and their significantly improved knowledge of research methodology suggest that such workshops can indeed put medical students on the right track toward a productive academic and clinical career. On the other hand, more studies are needed to evaluate the efficiency of similar workshops to determine each program's positive and negative aspects.

In this study, a control group could have increased the validity of the results as participants could be compared with fellow students. Besides, more participants could increase the reliability of the survey by decreasing random errors. Finally, participants could be followed up for longer periods to evaluate the third and fourth levels of Kirkpatrick's model (i.e., behavior change and results). For example, the number of papers published by the participants in the following months could indicate the workshop's success in bringing about significant changes in behavior and tangible results among the participants.

Acknowledgements: The authors would like to thank all workshop's students of this study.

Conflict of interests: The authors report no conflicts of interest.

Ethical approval: The ethics committee of the Shahid Beheshti University of Medical Sciences approved this study under the approval code IR.SBMU.SME.REC.1400.079.

Funding/Support: This study received no funding support.

References

- Bydder S, Packer D, Semmens J. The value of a scientific writing training workshop for radiologists and radiation oncologists. *Australas Radiol.* 2006 Feb; 50(1): 29-32. doi: [10.1111/j.1440-1673.2005.01543.x](https://doi.org/10.1111/j.1440-1673.2005.01543.x). [PMID: 16499724]
- Abdulghani HM, Shaik SA, Khamis N, Al-Drees AA, Irshad M, Khalil MS, et al. Research methodology workshops evaluation using the Kirkpatrick's model: translating theory into practice. *Med Teach.* 2014 Apr;36 Suppl 1:S24-9. doi: [10.3109/0142159X.2014.886012](https://doi.org/10.3109/0142159X.2014.886012). [PMID: 24617780]
- Clark CM, Ahten SM, Macy R. Using problem-based learning scenarios to prepare nursing students to address incivility. *Clinical Simulation in Nursing.* 2013; 9(3): e75-e83. doi:[10.1016/j.ecns.2011.10.003](https://doi.org/10.1016/j.ecns.2011.10.003).
- Bates R. A critical analysis of evaluation practice: the Kirkpatrick model and the principle of beneficence. *Evaluation and Program Planning.* 2004; 27(3): 341-7. doi: [10.1016/j.evalprogplan.2004.04.011](https://doi.org/10.1016/j.evalprogplan.2004.04.011).
- Smidt A, Balandin S, Sigafoos J, Reed VA. The Kirkpatrick model: A useful tool for evaluating training outcomes. *J Intellect Dev Disabil.* 2009 Sep; 34(3): 266-74. doi: [10.1080/13668250903093125](https://doi.org/10.1080/13668250903093125). [PMID: 19681007]
- Kirkpatrick J. An introduction to the new world Kirkpatrick model. Georgia, Newnan :Kirkpatrick Partners; 2019.
- Ghasemi R, Akbarilakeh M, Fattahi A, Lotfali E. Evaluation of the Effectiveness of Academic Writing Workshop in Medical Students Using the Kirkpatrick Model. In *Workshop in Medical Students Using the Kirkpatrick Model.* Novel Biomed; 2020: 8(4):182-95.
- Johnson RB, Dick W. Evaluation in instructional design: The impact of Kirkpatrick's four-level model. In: Reiser RA, Dempsey JV. *Trends and issues in instructional design and technology.* 3rd Ed. New York: PEARSON; 2012: 96-104.
- Nezamian Pourjahromi ZN, Ghafarian Shirazi H, Ghaedi H, Momeninejad M, Mohamadi Baghmolae M, Abasi A, et al. The Effectiveness of Training Courses on "How to Work with DC Shock Device" for Nurses, Based on Kirkpatrick Model. *Iran J Med Educ.* 2012; 11(8): 896-902. [In Persian]
- Dorri S, Akbari M, Sedeh MD. Kirkpatrick evaluation model for in-service training on cardiopulmonary resuscitation. *Iran J Nurs Midwifery Res.* 2016 Sep-Oct;21(5):493-497. doi: [10.4103/1735-9066.193396](https://doi.org/10.4103/1735-9066.193396). [PMID: 27904633] [PMCID: PMC5114794]
- AlFaris E, Naeem N, Irfan F, Qureshi R, Saad H, Al Sadhan Re, et al. A one-day dental faculty workshop in writing multiple-choice questions: an impact evaluation. *J Dent Educ.* 2015 Nov; 79(11): 1305-13. doi:[10.1002/j.0022-0337.2015.79.11.tb06026.x](https://doi.org/10.1002/j.0022-0337.2015.79.11.tb06026.x). [PMID: 26522635]
- Shirazi A, Poor Ahmad A, Hassani M. The effectiveness of the educational workshops held by the Iranian Library and Information Science Association of Khorasan Branch based on Kirk Patrick Model. *Library and Information Science Research.* 2016;6(2):244-60.
- Bakhshandeh H, Ahmadi HR, Behnam M, Hamidi M. Evaluating the effectiveness of coaching and refereeing courses from university students' viewpoints based on Kirk Partric's model. *Sport Management Journal.* 2014;5(4):161-78.

Leveraging the Pygmalion Effect to Unlock Student Potential in Medical Education

Ramin Homayouni-Zand¹, Masomeh Kalantarion^{2*}

¹MD, Department of Medical Education, School of Medical Education and Learning Technologies, Shahid Beheshti University of Medical Sciences, Tehran, Iran

²PhD of Medical Education, Department of Medical Education, School of Medical Education and Learning Technologies, Shahid Beheshti University of Medical Sciences, Tehran, Iran

Received: 2023 October 04; **Revised:** 2023 November 21; **Accepted:** 2023 December 09; **Published online:** 2023 December 11

***Corresponding author:** Department of Medical Education, School of Medical Education and learning Technologies, Shahid Beheshti University of Medical Sciences, Tehran. Email: kalantarion65@gmail.com

Citation: Homayouni-Zand R, Kalantarion M. Leveraging the Pygmalion Effect to Unlock Student Potential in Medical Education. Strides Dev Med Educ. 2023 December; 20(1):193-194. doi: 10.22062/sdme.2023.199113.1294.

Keywords: Pygmalion Effect, Medical Education, Student Performance, Teacher Expectations

Dear Editor,

Studying the Pygmalion effect and becoming well-acquainted with the advantages of utilizing it encourages medical educators to consider it a practical approach for motivating students and tapping their enormous potential to benefit their future achievements.

The Pygmalion is a psychological phenomenon involving situations where high expectations lead to improved performance and low expectations lead to worsened performance. It refers broadly to the effects of interpersonal expectations, especially when the interpersonal expectancy effects occur in an educational context (1). The term “Pygmalion effect” is used to describe the impact of positive or negative expectations on the performance of an individual or a group. The underlying idea is that when a leader, authority figure, or role model believes we can succeed in a certain area, we will work hard to meet their expectations. This also implies that we do better when more is expected of us. This mechanism is mostly subconscious; however, it can be used to intentionally enable the development of individuals, such as students, employees, or athletes. Although the Pygmalion effect was originally observed in the classroom, it also has been applied to in the fields of management, business, and sports psychology. The Pygmalion effect has both academic and practical

implications. For example, a team whose manager believes in its members’ abilities will outperform one whose manager believes the opposite, even if the two teams are equally skilled (2).

In an educational context, the Pygmalion effect describes how teacher expectations boost student performance through increased motivation, confidence, and self-efficacy. Harnessing this phenomenon presents a valuable opportunity to enhance medical education (3).

Studies have shown that faculty assumptions become self-fulfilling prophecies (3). However, inflated projections introduce bias (4); thus, moderation is key, as extreme assumptions become self-defeating (5). A well-trained educator is a key component of success in reaching anticipated results. Training programs should be designed and implemented to empower them to achieve ultimate expectations and to avoid unwanted results (6).

Some disadvantages, however, can be expected, such as students being misled by an educator’s unrealistic predictions about them. Other students may also experience negative effects not addressed by the educator, making them feel unworthy.

Strategies to optimally utilize the Pygmalion effect in medical education include training faculty to set appropriately high expectations, framing incoming

students as capable future physicians, using standardized patients to provide encouraging feedback, assigning mentors to struggling students to nurture self-efficacy, and reserving desired opportunities (e.g., assisting in surgery) as incentives for promising students.

The application of these strategies does not have distinct lines separating it from other tasks and duties of a faculty member; it should simply be embedded in an educator's routine teaching encounters, like clinical and classroom settings and mentorship / preceptorship programs. Proper training and prior preparation will facilitate the utilization of these strategies. One study found that senior medical students performed better on exams when faculty utilized encouraging language, emphasized growth opportunities, and displayed confidence in their abilities (7).

Another approach is to present pre-tests as assessments of baseline knowledge rather than deficiencies to motivate stronger performance. Institutions can also audit for preceptor bias by analyzing trends in which students consistently under/over-perform projections (8).

Additional research on expectation mechanisms is still needed. However, thoughtfully leveraging the Pygmalion effect provides a powerful opportunity to cultivate growth mindsets and help students reach their full potential.

In this letter, we suggest some practical strategies for harnessing the Pygmalion effect in medical education based on the existing literature and our own experience. We believe that these strategies can help us create a supportive and inclusive learning environment, where our students feel valued and respected, and where they can develop the skills and attitudes that are essential for becoming competent and compassionate physicians.

First, we should identify the students who need more support and encouragement, especially those who are struggling academically or clinically, or who belong to underrepresented or marginalized groups. They should be provided with constructive and specific feedback that highlights their strengths and areas for improvement. We should also guide these students to access the resources and opportunities that can help them overcome their challenges and achieve their goals.

Second, we should set realistic but challenging goals for our students and monitor their progress and achievements. We should communicate our expectations clearly and consistently and align them

with the learning objectives and outcomes of the curriculum. We should also encourage our students to set their own goals and to reflect on their learning process and outcomes. We should celebrate their successes and help them learn from their failures.

Third, we should model the behaviors and attitudes that we want our students to adopt, such as curiosity, resilience, and collaboration. We should demonstrate our passion and enthusiasm for learning and teaching, and share our challenges and achievements. We should also show respect and empathy for our students, colleagues, and patients, and foster a culture of diversity and inclusion. We should invite our students to participate in meaningful and authentic learning activities, such as research projects, clinical cases, and community service.

By following these strategies, we can use the Pygmalion effect to enhance the motivation, confidence, and self-efficacy of our students, and ultimately improve their academic and clinical performance.

Conflict of interests: The authors declare that they have no conflicts of interests.



Ethical approval: Not applicable.

Funding/Support: There were no sources of funding for the research.

References

- Rosenthal R. Pygmalion Effect. The Corsini Encyclopedia of Psychology. 2010: 1-2. doi: [10.1002/9780470479216.corpsy0761](https://doi.org/10.1002/9780470479216.corpsy0761).
- Nikolopoulou K. What Is the Pygmalion Effect? [cited 2023 Nov 3]. Available from: URL: <https://www.scribbr.com/research-bias/pygmalion-effect/>.
- Rosenthal, R., & Jacobson, L. Pygmalion in the classroom. The Urban Review. 1968; 3(1), 16–20. doi: [10.1007/BF02322211](https://doi.org/10.1007/BF02322211).
- Schaedig D. Selffulfilling prophecy and the pygmalion effect; 2020. [cited 2023 Oct 24]. Available from: URL: <https://www.simplypsychology.org/self-fulfilling-prophecy.html>.
- Madon S, Jussim L, Eccles J. In search of the powerful self-fulfilling prophecy. J Pers Soc Psychol. 1997 Apr;72(4):791-809. doi: [10.1037//0022-3514.72.4.791](https://doi.org/10.1037//0022-3514.72.4.791). [PMID: 9108695]
- Salamat P. Pygmalion effect. Iran J Med Educ. 2022; 22 :360-1. doi: [10.48305/22.1](https://doi.org/10.48305/22.1). [In Persian]
- Cleland J, Leggett H, Sandars J, Costa MJ, Patel R, Moffat M. The remediation challenge: theoretical and methodological insights from a systematic review. Med Educ. 2013 Mar;47(3):242-51. doi: [10.1111/medu.12052](https://doi.org/10.1111/medu.12052). [PMID: 23398010]
- Wenrich M, Jackson MB, Scherpbier AJ, Wolfhagen IH, Ramsey PG, Goldstein EA. Ready or not? Expectations of faculty and medical students for clinical skills preparation for clerkships. Med Educ Online. 2010 Aug 6:15. doi: [10.3402/meo.v15i0.5295](https://doi.org/10.3402/meo.v15i0.5295). [PMID: 20711483] [PMCID: PMC2919534]

Effect of Communication Skills Virtual Module Based on the Calgary-Cambridge Model on the Attitude and Performance of Medical Students

Ghobad Ramezani¹, Khadijeh Khoshokhan², Eshagh Moradi³, Seyed Kamran Soltani Arabshahi², Davood Rasouli^{2*}

¹Education Development Center, Kermanshah University of Medical Sciences, Kermanshah, Iran

²Center for Educational Research in Medical Sciences (CERMS), Department of Medical Education, School of Medicine, Iran University of Medical Sciences (IUMS), Tehran, Iran

³Education Development Center (EDC), Urmia University of Medical Sciences, Urmia, Iran

Received: 2023 July 24

Revised: 2023 November 07

Accepted: 2023 December 10

Published online: 2023 December 13

***Corresponding author:**

Center for Educational Research in Medical Sciences (CERMS), Department of Medical Education, School of Medicine, Iran University of Medical Sciences, Tehran, Iran.

Email: dr.rasouli24@gmail.com

Citation:

Ramezani Gh, Khoshokhan Kh, Moradi E, Soltani Arabshahi SK, Rasouli D. Effect of Communication Skills Virtual Module Based on the Calgary-Cambridge Model on the Attitude and Performance of Medical Students. Strides Dev Med Educ. 2023 December; 20(1):195-203.
doi:10.22062/sdme.2023.198860.1260

Abstract

Background: Good physician-patient communication improves health outcomes. However, many medical students lack effective communication skills.

Objectives: This study was done to evaluate a virtual education module for teaching communication skills to medical students in Iran.

Methods: The pre-test-post-test experimental design was conducted with simple random sampling using random number generation software to compare the virtual module of communication skills. Iran University of Medical Sciences students' attitudes were assessed with the Communication Skills Attitude Scale (CSAS) and clinical performance was assessed with the Calgary Cambridge checklist. A total of 50 students in each group have completed the course. The virtual module was designed and developed with the steps of the Calgary Cambridge model and was taught using PowerPoint, posters, pamphlets, and podcasts. Independent t-test samples, and analysis of covariance (ANCOVA) were utilized for data analysis using SPSS software.

Results: The mean age of participants in the Conventional group was 23.92 ± 3.27 , and in the virtual module group was 24.02 ± 3.16 . The mean difference in attitude toward communication between the two groups was 25.62 ± 5.45 , and performance was 6.23 ± 1.61 , which was statistically significant. The statistical analysis revealed a statistically significant difference in the mean attitude and performance of students before and after the virtual module ($P < 0.05$).

Conclusion: The virtual module significantly improved students' communication skills, attitude, and performance compared to conventional education. The implementation of virtual education modules can effectively enhance the teaching of communication skills in medical schools. Further studies are needed to assess the long-term impacts on physician-patient communication.

Keywords: Education, Physician-Patient Relations, Medical, Student

Background

Medicine is a combination of art and science. A good doctor should have the art of communicating with the patient and awareness of the medical sciences. Establishing a good relationship between physician and patient also leads to positive therapeutic outcomes. In the recent two decades, major changes have occurred in the physician-patient relationship, shifting the focus of medical decisions towards the patients and their values. In patient-centered care, physicians treat patients as

human beings and consider their attitudes, beliefs, and concerns in addition to the clinical diagnosis. Professors have always been concerned about the need to pay attention to the clinical practice and the attitude of medical students. At this stage, students should practice what they have learned independently. Also, considering the importance of their attitudes and their impact on academic progress and clinical performance, it is more necessary than ever to address these two categories among medical students (1). The practice of

medical students and physicians and the skill and ability of a medical student or resident are reflected in communicating and interacting with patients and their families, health care staff, and nurses. To obtain these communication skills, the medical student or resident should effectively establish a strong information exchange with patients and their companions, coworkers, and professors. It is expected to know effective listening skills, information analysis, non-verbal interpretations, writing skills, and cooperation with attending physicians or health managers. Professional and communication skills are vital for establishing an effective relationship, particularly with patients, since it improves their health outcomes and satisfaction; conversely, unprofessional behaviors and poor communication skills lead to wrong therapeutic approaches (2). Appropriate communication with the patient requires understanding the patient not just as a collection of symptoms and impaired organs; rather, the physician should consider the patient with their concerns and aspirations who has approached the physician with confidence and reassurance in search of help and recovery (3). Learning and teaching communication skills are vital. There are serious issues in the physician-patient relationship, which may be solved in two ways: learning the skills, or the skills taught. Teaching medical students communication skills lets them communicate more effectively with their patients. Role models are important to maintain or enhance the skills since many professors have not received communication skills training. Thus, more professors must support "effective" communication with the patients and present good role models for medical students. Observing the live communication of the professors and patients in the patient interview scene is very useful for the medical student (4). Several studies have shown that the inability of health care workers, particularly physicians and nurses, to establish an appropriate relationship with patients not only results in high costs but also leads to patient's dissatisfaction with the treatment process, non-adherence to the physician's treatment instructions, deciding to change the physicians, and having a negative attitude towards treatment and health care organizations in general (5). Studies have demonstrated that examinations below 10 minutes avoid proper communication, compassionate examination, and patient satisfaction. Many physicians have a positive attitude towards communicating with patients, though they don't have the proper communication skills. Communication is one of the

human skills and is an integral part of the clinical skills of physicians; thus, communication skills courses should be included in educational courses or communication skills workshops should be held for health care professionals, especially physicians, and nurses, to assist rapid and successful treatment of patients (6). Studies have shown that 60-80% of disease diagnosis and treatment decisions are based on information obtained from medical interviews (7), in which communication skills play a key role. Several studies have demonstrated that a good physician-patient relationship positively affects the patient's health status prognosis. Also, the patient's satisfaction with health services highly depends on the effective physician-patient relationship (8). Proper communication positively affects patients, e.g., improving their vital signs, reducing their pain and anxiety, increasing their satisfaction, enhancing treatment outcomes, and improving their participation in treatment programs. Effective communication in the healthcare care sector is vital for patient safety, interpersonal relationships of the members of the treatment teams, and the satisfaction of patients and their families (9). Therefore, according to the importance of communication skills, various educational methods are used to teach communication skills to medical students, including the longitudinal theme of communication skills and its inclusion in the educational curriculum of medicine, holding workshops (10), using a trained simulated patient, recording video and its representation, role-playing, using checklists and computer training, for teaching this skill in different clinical situations, continuous education (11), etc. Effective physician-patient communication is critical for quality healthcare, yet many studies have shown doctors' communication skills deficiencies. While various educational interventions have been tried, there is limited research on innovative virtual training methods. Based on the Calgary-Cambridge model, an evidence-based framework, we hypothesize the module will improve students' communication skills. Demonstrating the efficacy of virtual training could provide an important new tool for communication skills education in undergraduate medical curricula. This has the potential to enhance physician-patient relationships and improve healthcare delivery ultimately. The objective of this study was to evaluate the effectiveness of a virtual education module based on the Calgary-Cambridge model for improving communication skills, knowledge, attitudes, and practices among medical students in Iran in 2021.

Objectives

This study was done to evaluate a virtual education module for teaching communication skills to medical students in Iran.

Methods

The present experimental study used the pre and –post-test design. The independent variable was communication skills training using two methods: Virtual module and conventional method, and the dependent variable was the attitude and performance of medical students.

Sampling Method: Sampling was done based on the complete census. The sample size was estimated to be 100 people placed in two groups of 50 people by simple random method. The informed consent form was obtained from all participants.

Inclusion criteria: obtaining informed consent from the sample, fourth-year students, and willingness to participate in the study.

Exclusion criteria: non-cooperation, unwillingness to participate in the study, or due to defects in completing the questionnaire and guest students and first to third-year students.

Study Setting: According to the Calgary-Cambridge model, the intervention group's virtual training method (educational module) was designed in pamphlets, posters, PowerPoint slides, and podcasts. This content was prepared according to the Calgary-Cambridge guide with the approval of 4 expert faculty members in physician-patient communication skills; on the other hand, the conventional course was in the control group. The conventional course in Iran is the normal course where medical students learn how to communicate with patients from medical teachers during the seven years of the course, and do not have formal and academic training to communicate with patients effectively. After the final proposal approval and obtaining the ethics code for this study, the researcher accessed the number of 4th-year medical students by referring to the education office of the faculty, and the students were selected by census and were randomly divided into two groups of 50. (For randomization, students were randomly selected and placed in two different groups, and each had an equal chance) (Simple random Sampling Using random number generation software). First, participants of both groups filled out the online valid and reliable CSAS questionnaire (electronic form in Porsline) as a pre-test, and their communication practice was assessed by two trained observers, one of

whom was their classmate, and the other was an anonymous person. The Calgary-Cambridge checklist was completed only once for the participating students by attending the hospital through observation for students in the clinical setting in the electronic form (e-form). In examining the clinical performance, the evaluator was completely anonymous among the students and entered the names and observations of each person in different clinical situations with several patients in the mobile software. No student has noticed the evaluation.

Simultaneously, the participants in the first group entered the hospital based on the conventional method and communicated with the patients. In this method, medical students enter the hospital after passing the basic science course and communicate with the patients by observing the attending physicians. The intervention in the second group was communication skills training based on the virtual training based on the Calgary-Cambridge model by virtual training method (training module). The training module included two podcasts prepared by the researcher, and the guiding professor posted in a virtual group. The researcher also prepared posters and PowerPoints and sent them to a virtual group. Therefore, participants of both groups filled out the online valid reliable CSAS questionnaire (electronic form in Porsline) as post-test. Their communication practice was assessed by two trained observers, one of whom was their classmate, and the other was anonymous. The time between pre-test and post-test was 3 to 6 months.

The following three tools were used in the present study for data collection:

1. The first part included questions related to demographic and educational information, including gender and age.
2. The second part included the Student's Attitudes towards Learning Communication Skills (CSAS), which Rees, Sheard designed, and Davies in 2002 to assess students' attitudes toward learning communication skills in medical school. This scale consists of 26 items in two parts. The first part, is the Positive Attitude Scale (PAS), referring to students' appreciation of communication skills as a scientific subject and their belief in respecting patients' rights and the significance of communication with patients. It includes 13 items (4, 5, 7, 9, 10, 12, 14, 16, 18, 21, 22, 23, and 25). The second part was the Negative Attitude Scale (NAS), which assesses the negative aspects of communication skills training,

which also consists of 13 items (1, 2, 3, 6, 8, 11, 13, 15, 17, 19, 20, 24, and 26). Answers were given on a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree) (12). The possible scores varied from 13 to 65; a higher score indicated a stronger attitude. The psychometric properties of the CSAS questionnaire were assessed with the participation of 410 medical students. The reliability (100 & 0.82 & 0.91) and validity (face, content (0.79) and structural validity) of this tool have been proven in several studies in Iran (13).

- The third part of the Calgary-Cambridge Guide (13) is the physician communication practical skills. Karimi Monghi checked the validity and reliability of the Calgary-Cambridge checklist in 2013 (14). The checklist consists of 13 items, 10 of which have three options: "complete skill performance, incomplete skill performance, and lack of skill performance." The remaining three items have only two options (complete skill performance and lack of skill performance). The three options mentioned were assigned scores of 1, 0.5, and zero in the first 10 items, respectively, and 1 or zero in the later 3 items. The maximum score of the checklist was 13, which was calculated from 20 as the maximum final score of the country's educational system (so the maximum final score was 20). A higher score indicated better communication skills for the students. Content validity was used to define the communication skills checklist's validity. Therefore, the checklist was given to 10 experienced expert professors in communication skills to confirm its validity. Also, to determine its reliability, an experimental study was performed on 10 medical students with two observers other than the research samples. The correlation coefficient of the scores of the two observers was 0.89, showing the acceptable reliability of the checklist. This checklist is derived from the Calgary-Cambridge checklist, the reliability of which has been confirmed; on the other hand, all parts of this questionnaire are objective. Thus, it can be stated that the reliability of the questionnaire is confirmed by the reliability of its items and overall reliability; though, due to the reliability of the reliability and documentation, its reliability was determined by the retesting method, which showed a coefficient of 0.85, which is acceptable.

To evaluate the research results, the data obtained from the research units were coded and analyzed by the

SPSS 16 statistical software, using descriptive statistics methods (frequency distribution tables, mean, standard deviation) and analytical statistics methods. Normality, Paired t-tests, independent t-tests, and covariance tests were used.

Declarations ethics approval and consent to participate: This study was approved by the Ethical Board of Iran Medical Sciences University. Verbal informed consent was obtained from all participants. All methods were carried out according to relevant guidelines and regulations. The privacy of the participants was well protected. Participants were voluntary, with consent at the beginning of the questionnaires. Only participants who signed the informed consent document could complete the questionnaires. The questionnaires did not include names and personal identification information. In the present study, all sample subjects answered the informed consent form.

Results

This study has shown that the mean age of participants in the conventional group was 23.92 ± 3.27 and in the virtual module group was 24.02 ± 3.16 . Most participants in the two groups were female and lived with their parents. There is no significant difference between the two groups in demographic variables (Table 1).

Table 1. Mean and Standard Deviation of Age in Two Groups and Gender Frequency of the Study Participants

Variable	Group			
	Intervention Mean (SD)		Control Mean (SD)	
Age	23.99 (3.27)		24.04 (3.16)	
	Frequency	%	Frequency	%
Gender				
Male	22	44.0	20	40.0
Female	28	56.0	30	60.0
Total	50	100.0	50	100.0

Also, in both groups mainly reside in their houses, reaching nearly 80%.

The results showed that in the Female group, the attitude and performance level was better than that of the Male (p-value=0.01) (Table 2).

Table 2. Comparison of Mean (SD) Attitude and Performance

Scale	Variables	Mean (SD)	P-value
Attitude	Male	2.89 (1.17)	<0.01
	Female	3.92 (2.64)	
Performance	Male	2.59 (1.19)	<0.01
	Female	3.77 ()	

Table 3. Comparison of Before and After Mean Scores of Attitude and Performance Between both Groups Using Independent Sample T-Test

Scale	Variables	Group	Mean (SD)	t	P-value
Attitude	Before	Conventional	26.08(6.04)	1.31	0.364
		virtual module	25.62(5.45)		
	After	Conventional	29.14(7.23)	4.57	<0.0001
		virtual module	44.59(7.36)		
Performance	Before	Conventional	6.59(1.12)	1.29	0.472
		virtual module	6.23(1.61)		
	After	Conventional	8.21(1.91)	5.23	<0.0001
		virtual module	13.82(1.61)		

Before the intervention, the mean score of students' attitudes toward communication in the virtual module group was 25.62 ± 5.45 , and in the conventional group was 26.08 ± 6.04 . Students' performance mean score in the virtual module group was 6.23 ± 1.61 , and in the conventional group was 6.59 ± 1.12 , which wasn't statistically significant.

According to the results of the obtained significance level of the research variables (>0.05), the data of all the variables are normal, and parametric tests can be used to test each of the variables.

After the intervention, the mean score in the virtual module group was 44.59 ± 7.36 , and in the conventional group raised to 29.14 ± 7.23 . The mean score of student's performance in the virtual module group was 13.82 ± 1.61 , and in the conventional group, it was 8.21 ± 1.91 which was statistically significant (Table 3).

There was a significant statistical relationship between mean scores of pre-test and post-test in attitude and performance of students about communication in the virtual module group, while in the conventional group was not significant (Table 4).

Table 4. Comparison of Before and After Mean Scores of Attitudes and Performance Within both Groups Using Paired T-Test

Scale	Group	Variables	Mean (SD)	t	P-value
Attitude	Conventional	Before	26.08(6.04)	1.26	0.536
		After	29.14(7.23)		
	virtual module	Before	25.62(5.45)	6.93	<0.0001
		After	44.59(7.36)		
Performance	Conventional	Before	6.59(1.12)	1.39	0.158
		After	8.21(1.91)		
	virtual module	Before	6.23(1.61)	4.82	0.001
		After	13.82(1.61)		

Results of the analysis of covariance in Table 5 demonstrate a significant difference between the attitude of medical students towards communication with patients in the intervention and control groups ($P < 0.01$, $F = 25.77$). The effect size is 0.59, indicating that 59% of the attitude of medical students towards communication with patients belongs to the virtual education of the Calgary-Cambridge model. In other

words, physician-patient communication skills education based on the Calgary-Cambridge model affects medical students' attitudes. In comparison, only the effect size for the routine course is 0.09, indicating that only 9% of the changes in the mean scores of medical students' attitudes toward communication with patients belong to the routine courses.

Table 5. Results of the Analysis of Covariance in the Intervention and Control Groups in Terms of Medical Students' Attitudes

Students' attitudes	Sum of Squares	Degree of freedom	Mean of squares	F value	Sig	Effect size	Statistical power
Post-test (intervention group)	18.30	1	48.50	25.77	0.001	0.59	0.05
Post-test (control group)	12.95	98	28.35	10.31	0.1	0.09	-
Group	8.316	1	6.429	28.11	0.000	-	0.01
Error	26.92	40	34.08	-	-	-	-
Total	255.99	86	-	-	-	-	-

Table 6 shows that the interaction between pre-test and group scores is significant, because the significance value is smaller than 0.05. There is a significant difference between the performance of medical students in terms of communicating with patients in the intervention and comparison groups ($P < 0.01$) and $F (28.98)$, its square is equal to 0.61; that is, 61% of the performance of medical

students in communicating with the patient is related to the implementation of virtual education based on the Calgary-Cambridge model. In other words, it can be said that teaching doctor-patient communication skills based on the Calgary-Cambridge model is effective in the performance of general medical students.

Table 6. Results of the Analysis of Covariance in the Intervention and Control Groups in Terms of Medical Students' Performance

Students' attitudes	Sum of Squares	Degree of freedom	Mean of squares	F value	Sig	Effect size	Statistical power
Post-test (intervention group)	28.98	1	28.98	23.64	0.001	0.61	0.05
Post-test (control group)	12.95	96	28.35	10.31	0.1	0.09	-
Group	6.353	1	7.902	9.34	0.000	-	0.01
Error	18.39	2	24.58	-	-	-	-
Total	35.333	97	-	-	-	-	-

Discussion

The mean scores of medical students' attitudes toward communication with the patient in the pre-test and post-test showed significant differences between the two groups. However, the two groups had nearly identical mean scores in the pre-test, indicating no statistically significant difference.

After the routine course, the mean score of medical students' attitudes toward communication with patients in the case group slightly improved, but this difference was not statistically significant. On the other hand, the comparison of medical students' attitudes towards communication with the patient before and after the virtual training intervention based on the Calgary-Cambridge model showed a statistically significant difference. Similarly, the difference in mean scores of medical students' practice in communication with the patient in the post-test was statistically significant between the two groups. In contrast, there was no statistically significant difference between the groups in the pre-test. Furthermore, comparing medical students' performance in communicating with the patient in the control group before and after the conventional course showed a slight difference, but the mean difference was not statistically significant.

A comparison of medical students' performance in communicating with the patient before and after the intervention by virtual training according to the Calgary-Cambridge model showed a statistically significant difference. There was a significant difference between the attitude of medical students towards communication with the patient in the intervention group and the control group. In other words, it may be

stated that teaching communication skills according to the Calgary-Cambridge model affects the attitude of medical students. Moreover, for conventional courses, the impact equals 9%, indicating that 9% of the changes in the mean scores of medical students in the control group occurred due to conventional courses. Moreover, a significant difference was found between the practice of medical students in communicating with the patient in the intervention group and the control group. In other words, it may be stated that teaching communication skills according to the Calgary-Cambridge model affects the clinical practice of medical students.

Moreover, for conventional courses, the impact equals 16%, indicating that 16% of the changes in the mean scores of medical students in the control group occurred due to conventional courses. Using communication skills by physicians is directly associated with patients' satisfaction and treatment adherence; on the other hand, it increases the physician's acceptance by the patient. Instructors often act as the main role models for their students in professional communication and ethical behavior. Patients often complain regarding the quality of communication in health care. Communication skills training should improve before graduation and graduate education both from the perspective of instructors and trainees. The clinical environment is considered ideal for obtaining and teaching clinical communication skills. The findings of the mentioned studies are consistent with the present study's results. Soltani Arabshahi conducted a study entitled "Physician-Patient Communication Skills." It was stated that serious problems exist in physician-patient communication, which may be solved differently; skills that should be learned while teaching them are also quite possible. Teaching communication skills to medical

students lets them communicate with patients more effectively to maintain or improve their skills. Thus, more professors must support using "effective" communication skills with the patient and act as good role models for the medical students.

Communication between physicians and patients is beneficial and lets physicians remember many facts and realize that they work together to solve problems, accept the disease's natural consequences, and, on the other hand, improve the satisfaction of the patients and the physician and the mistakes that are found (15). Their studies' findings align with the present study's results.

Bakker et al.'s study showed that a considerable part of patients' complaints to the physician and the treatment instructions misuse occurred due to communication problems rather than physician inadequacy issues (16). Their studies' findings align with the present study's results.

In another study, patients' satisfaction regarding their relationship with physicians was investigated; accordingly, although the overall patient satisfaction was relatively high (62%), major dissatisfaction was found in some components, including the allocation of sufficient and appropriate time for communication with the patients, physicians treatment planning skills, considering the feelings of the patients and their participation, and feeling of insecurity of the confidentiality with the simultaneous visit of several patients (17). Their studies' findings align with the present study's results. Shakerinia conducted a study entitled Physician-Patient Relationship and its Role in Patient Satisfaction with the Treatment Process, in which it was concluded that most physicians have a positive attitude toward communication with patients. However, they don't have the appropriate communication skills. Communication is one of the human skills and is an integral part of the clinical skills of physicians; thus, communication skills courses should be included in educational courses, or communication skills workshops should be held for health care professionals, especially physicians, and nurses, to assist rapid and successful treatment of patients (18). The findings of these studies are consistent with the results of this study. Attari Moghadam et al. (19) conducted a study entitled Teaching Physician-Patient Communication Skills to Medical Students: Evaluation of Students' Awareness and Satisfaction, in which they concluded that 85% of participants were satisfied with the workshop. The difference in the mean

test scores before and after the intervention was statistically significant. Also, after training, the test subscales' scores significantly differed from those before training. Physician-patient communication skills workshops for medical students effectively improve their communication skills awareness (20). Their studies' findings align with the present study's results. Emadzadeh et al. conducted a study entitled Communication Skills of Dentistry Residents and its Effect on Patient Satisfaction at Mashhad University of Medical Sciences (21). Their studies' findings align with the present study's results.

In Yakhforosh et al.'s study, the Communication Skills Attitude Scale (CSAS) psychometric properties were measured in a sample of Iranian medical students. Communication skills (CS) are critical for medical students and other healthcare professionals. CS is an important feature of health care providers, leading to improved patient care and health outcomes. Therefore, CS is one of the essential factors in providing high-quality medical services. The Communication Skills Attitude Scale (CSAS) is the most authoritative and widely used assessment tool for measuring physicians' attitudes toward learning CS (22). Regarding the effectiveness of the training intervention, it is reported that CS training focuses on cognitive, behavioral, and emotional features, which likely have stronger effects on developing and transmitting the mentioned skills. The study confirmed the reliability and validity of CSAS to investigate the attitudes toward communication skills in an Iranian context. Their studies' findings align with the present study's results.

To explain these findings, it can be stated that the training method using podcasts reduces not only the transportation costs of learners but also that they do not need to leave their workplace, and it is more compatible with the ever-changing training needs of health centers (23-28). The learners' satisfaction in this group was higher than the participants in the conventional courses. Considering medical students' occupational and personal activities and the interference of face-to-face training courses with their working or free hours, using the e-learning method as an alternative or complement to the conventional courses can be an appropriate alternative for retraining health care professionals. In general, studies show that establishing an appropriate relationship between physician and patient is vital in the patient and (even physician) satisfaction and attracting patient cooperation to adhere to the treatment

instructions and patient's participation in the treatment process and treatment plans. Establishing a dynamic and mutual relationship between physician and patient leads to accurate information collection, diagnosis, treatment, and treatment adherence. Patient communication skills should be trained, though teaching this skill at the bedside of the patients is challenging. Crowded hospitals, insufficient time, patient conditions, and lack of knowledge of clinical professors avoid the golden opportunity for students' education (29-33). As inferred, the basis of all these capabilities is proper communication with the patient. Professional relationship training with the patient should be conducted in a hidden curriculum, and students learn from the faculty's daily communications with patients, it is a misconception and will not lead to useful results. Training in physician-patient communication should be integrated into the educational curriculum of medical students.

Limitations: Students' non-cooperation and the involvement of disturbing variables beyond the researcher's control during the study, such as students' mental-psychological conditions; the outbreak of coronavirus disease reduced communication between students in clinical departments.

Conclusion

According to the Calgary-Cambridge model, the study showed that physician-patient communication skills training via virtual education significantly affects the attitude and practice of medical students at the Iran University of Medical Sciences. The student's need to learn medical ethics and communication skills and communicate with patients is not fulfilled by only the theoretical medical ethics course. Practical training is vital for medical students, interns, and residents in the presence of professors and in an atmosphere where ethics is institutionalized. Moreover, skill workshops and simulated training sessions may be used for communication skills training. Before giving a working certificate, these training and skills training strategies can be practiced with a union system for physicians, dentists, nurses, and other medical personnel.

Acknowledgements: The present article is derived from the master's medical education thesis at the Iran University of Medical Sciences. I would like to thank the esteemed professors and 4th-year medical students of Iran University of Medical Sciences and the dear colleagues who cooperated in this study.

Conflict of interests: The authors declare that they have no competing interests.

Ethical approval: Ethics approval and consent to participate in the present study was approved by the Ethical approval of the Ethics Committee of Iran University of Medical Sciences (IR.IUMS.FMD.REC.1399.529).

Funding/Support: Not applicable.

References

1. Soltani Arabshahi K, Bahador H. Doctor-patient communication skills. Tehran: Payame Edalat, Iran University of Medical Sciences; 2006. [In Persian]
2. Moin A, Anbari Akmal K. The Patient-Physician Communication. *Daneshvar Medicine*. 2010; 17(85): 71-80. [In Persian]
3. Zamani A, Shahsanai A, Mohseni M. Design, implementation and evaluation a tool to strengthen physician- patient communication skills of medical students. *Iran J Med Educ*. 2011; 10(5):578-85. [In Persian]
4. Managheb SE, Jaafarian J, firouzi H. The effect of communication skills training based on Calgary-Cambridge guideline on knowledge, attitude and practice of family physician of Jahrom University of medical sciences 2007. *Pars Journal of Medical Sciences*. 2022; 6(3): 74-84. doi: [10.29252/jmj.6.3.4.74](https://doi.org/10.29252/jmj.6.3.4.74). [In Persian]
5. Tavakoly Sany SB, Behzhad F, Ferns G, Peyman N. Communication skills training for physicians improves health literacy and medical outcomes among patients with hypertension: a randomized controlled trial. *BMC Health Serv Res*. 2020 Jan 23;20(1):60. doi: [10.1186/s12913-020-4901-8](https://doi.org/10.1186/s12913-020-4901-8). [PMID: 31973765] [PMCID: [PMC6979365](https://pubmed.ncbi.nlm.nih.gov/PMC6979365/)]
6. Manzoor F, Wei L, Hussain A, Asif M, Shah SI. Patient satisfaction with health care services; an application of physician's behavior as a moderator. *Int J Environ Res Public Health*. 2019 Sep 9;16(18):3318. doi: [10.3390/ijerph16183318](https://doi.org/10.3390/ijerph16183318). [PMID: 31505840] [PMCID: [PMC6765938](https://pubmed.ncbi.nlm.nih.gov/PMC6765938/)]
7. Mirhaghjou SN, Nayebi N, Majd Teymouri R, Kazemnejad leily E. Communication skills and related factors within patient by nursing student. *Journal of Holistic Nursing and Midwifery*. 2015;25(2):93-101. [In Persian]
8. Pour Asghar M, Najafi K, Tirgari A, Yazdani J, Falaki M, Salehi F. Investigating Employees' and Health Care Practitioners' Communication Skills. *Iranian Journal of Psychiatry and Clinical Psychology*. 2017;23(2):208-17. doi: [10.29252/nirp.ijpcp.23.2.208](https://doi.org/10.29252/nirp.ijpcp.23.2.208).
9. Baharudin N, Yassin MSM, Sham SFB, Yusof ZYM, Ramli AS. Validation of the communication skills attitude scale (CSAS) questionnaire in a cohort of Malaysian medical students. *Journal of Clinical and Health Sciences*. 2017;(2)2: 46-53. doi: [10.24191/jchs.v2i2.5886](https://doi.org/10.24191/jchs.v2i2.5886).
10. Soltani Arabshahi K, Kouhpayezade J, Sobuti B. The Educational Environment of Main Clinical Wards in Educational Hospitals Affiliated to Iran University of Medical Sciences: Learners' Viewpoints Based on DREEM Model. *Iran J Med Educ*. 2008; 8(1):43-50. [In Persian]
11. Karimi-Moonagi H, Montazeri R, Amini M, Shakeri M-T, Yavari M, Khajehdaluee M, et al. The Concurrent Validity of Using Simulated Patient and Real Patient in Communication Skills Assessment of Medical Students. *Strides Dev Med Educ*. 2014;11(1):65-74. [In Persian]

12. Yakhforoshha A, Shirazi M, Yousefzadeh N, Ghanbarnejad A, Cheraghi M, Mojtahedzadeh R, et al. Psychometric properties of the communication skills attitude scale (CSAS) measure in a sample of Iranian medical students. *J Adv Med Educ Prof.* 2018; 6(1):14-21. [PMID: 29344525] [PMCID: PMC5757152]
13. Junod Perron N, Sommer J, Louis-Simonet M, Nendaz M. Teaching communication skills: beyond wishful thinking. *Swiss Med Wkly.* 2015 Feb 9;145:w14064. doi: 10.4414/smw.2015.14064. [PMID: 25664624]
14. Aspegren K. BEME Guide No. 2: Teaching and learning communication skills in medicine—a review with quality grading of articles. *Med Teach.* 1999;21(6):563-70. doi: 10.1080/01421599978979. [PMID: 21281175]
15. Kurtz SM, Silverman JD. The Calgary—Cambridge Referenced Observation Guides: an aid to defining the curriculum and organizing the teaching in communication training programmes. *Med Educ.* 1996; 30(2): 83-9. doi: 10.1111/j.1365-2923.1996.tb00724.x. [PMID: 8736242]
16. Attari Moghadam J, Mokhlespour S, Valizadeh M, Momtazi S, Sharifi F, Ghodrati S, et al. Teaching“Doctor-Patient Relationship”to the Medical Student: Assessment of Knowledge and Satisfaction. *J Med Educ Dev.* 2010; 3(4): 26-33. [In Persian]
17. Saeidi M. Physician-Patient Relationships, Methods of Teaching a Clinical Skill. *Medical Education Journal.* 2018; 6(2): 22-31. [In Persian]
18. Khan A, Egbue O, Palkie B, Madden J. Active Learning: Engaging Students to Maximize Learning in an Online Course. *The Electronic Journal of e-Learning.* 2017; 15(2): 107–15.
19. Osman SZM, Jamaludin R, Mokhtar NE. Flipped Classroom and Traditional Classroom: Lecturer and Student Perceptions between Two Learning Cultures, a Case Study at Malaysian Polytechnic. *International Education Research.* 2014;2(4):16-25. doi: 10.12735/ier.v2i4p16.
20. Bakker DA, Fitch MI, Gary R, Reed E, Bennett J. Patient-health care provider communication during chemotherapy treatment: the perspectives of women with breast cancer. *Patient Educ Couns.* 2001;43(1):61-71. doi: 10.1016/s0738-3991(00)00147-6. [PMID: 11311840]
21. Ammentorp J, Bigi S, Silverman J, Sator M, Gillen P, Ryan W, et al. Upscaling communication skills training—lessons learned from international initiatives. *Patient Educ Couns.* 2021;104(2): 352-9. doi: 10.1016/j.pec.2020.08.028. [PMID: 32888756]
22. Shiraly R, Mahdaviazad H, Pakdin A. Doctor-patient communication skills: a survey on knowledge and practice of Iranian family physicians. *BMC Fam Pract.* 2021 Jun 24;22(1):130. doi: 10.1186/s12875-021-01491-z. [PMID: 34167464] [PMCID: PMC8229738]
23. Emadzadeh A, Yavari M, Ebrahimzadeh S, Ahmadian N. The effects of dental graduate students’ communication skills on patients’ satisfaction in Mashhad University of Medical Sciences in 1383. *Journal of Mashhad Dental School.* 2004; 28(1,2): 69-76. doi: 10.22038/jmds.2004.1594. [In Persian]
24. Eskandari M, Hosseini F, Razjouyan K, Abadi A. Calgary Cambridge Observer Guide indigenization for measuring physician-patient communication skills Based on the Cross-Cultural Adaptation Standard in Iran. *Journal of Medicine and Spiritual Cultivation.* 2019; 28(3): 59-70. [In Persian]
25. Askari R, Akbarzadeh Moghadam A, Kargar M, Tayefi E. Patterns of Physician-Patient Relationship: A Case Study in Shahid Sadoughi Hospital. *Manage Strat Health Syst* 2017; 1(2): 103-10. doi: 20.1001.1.24766879.1395.1.2.3.8. [In Persian]
26. Gerber B. Should we use philosophy to teach clinical communication skills? *Afr J Prim Health Care Fam Med.* 2016 Nov 16;8(1):e1-e4. doi: 10.4102/phcfm.v8i1.1292. [PMID: 28155325] [PMCID: PMC5125257]
27. Soltani Arabshahi S, Ajami A, Siabani S. Investigation of Doctor-Patient Communication Skills Teaching: Medical Learners’ Perception(Stager-Intern) and Staffs of Iran University of Medical Sciences & Kermanshah University of Medical Sciences. *Razi Journal of Medical Sciences.* 2004; 11(41): 423-31. [In Persian]
28. Labaf A, Sabet S, Sasanpour P, Basiri K, Karimi Alavijeh E. Determining the contradictions of components of Calgary-Cambridge physician-patient communication skills with the attitude of Iranian patients. *J Police Med.* 2020; 10(1): 39-46. doi: 10.30505/10.1.39.
29. Attari Moghadam J, Mokhlespour S, Valizadeh M, Momtazi S, Sharifi F, Ghodrati S, et al. Teaching“Doctor-Patient Relationship”to the Medical Student: Assessment of Knowledge and Satisfaction. *J Med Educ Dev.* 2010; 3(4): 26-33. [In Persian]
30. MacLean S, Kelly M, Geddes F, Della P. Use of simulated patients to develop communication skills in nursing education: An integrative review. *Nurse Educ Today.* 2017 Jan;48:90-98. doi: 10.1016/j.nedt.2016.09.018. [PMID: 27741440]
31. Biglu M-H, Nateq F, Ghojzadeh M, Asgharzadeh A. Communication Skills of Physicians and Patients’ Satisfaction. *Mater Sociomed.* 2017 Sep;29(3):192-5. doi: 10.5455/msm.2017.29.192-195. [PMID: 29109665] [PMCID: PMC5644191]
32. Gilligan C, Powell M, Lynagh MC, Ward BM, Lonsdale C, Harvey P, et al. Interventions for improving medical students’ interpersonal communication in medical consultations. *Cochrane Database Syst Rev.* 2021 Feb 8; 2(2): CD012418. doi: 10.1002/14651858.CD012418.pub2. [PMID: 33559127] [PMCID: PMC8094582]
33. Iversen ED, Wolderslund MO, Kofoed PE, Gulbrandsen P, Poulsen H, Cold S, et al. Codebook for rating clinical communication skills based on the Calgary-Cambridge Guide. *BMC Med Educ.* 2020 May 6;20(1):140. doi: 10.1186/s12909-020-02050-3. [PMID: 32375756] [PMCID: PMC7201796]

The Applicability of Interactive Educational Applications Tailored to the Type, Nature, and Characteristics of Continuing Education Courses for General Practitioners

Mehrnoosh Khoshnoodifar¹, Navaz Emadi², Azam Noori³, Hosnieh Raoufian^{4,5*}

¹Ph.D. of E-Learning Assistant Professor, E-Learning Department, Faculty of Medical Education and Learning Technologies, Shahid Beheshti University of Medical Sciences, Tehran, Iran

²Ph.D. Student in E-Learning in Medical Sciences, E-Learning Center in Medical Education, Faculty of Medicine, Tehran University of Medical Sciences, Tehran, Iran

³Master's Student in E-Learning in Medical Sciences, Faculty of Medical Education and Learning Technologies, Shahid Beheshti University of Medical Sciences, Tehran, Iran

⁴Ph.D. Student in E-Learning in Medical Sciences, Department of E-Learning in Medical Sciences, Faculty of Medical Education and Learning Technologies, Shahid Beheshti University of Medical Sciences, Tehran, Iran

⁵Master of the Operating Room, Department of Operating Room, Faculty of Nursing and Midwifery, Torbat Heydariyeh University of Medical Sciences, Torbat Heydariyeh, Iran

Received: 2023 June 17

Revised: 2023 October 07

Accepted: 2023 November 25

Published online: 2023 November 30

***Corresponding author:**

Department of E-Learning in Medical Sciences, Faculty of Medical Education and Learning Technologies, Shahid Beheshti University of Medical Sciences, Tehran, Iran.

Email: raoufianh1@sbm.ac.ir

Citation:

Khoshnoodifar M, Emadi N, Noori A, Raoufian H. The Applicability of Interactive Educational Applications Tailored to the Type, Nature, and Characteristics of Continuing Education Courses for General Practitioners. *Strides Dev Med Educ.* 2023 November; 20(1):204-213.

doi:10.22062/sdme.2023.198733.1237

Abstract

Background: Continuous education is essential for medical professionals to stay up to date. In this regard, new technologies such as appropriately designed applications tailored to the needs of the audience allow independent and high-quality learning beyond time and place restrictions for the employees. Therefore, the current study's aim was to investigate the appropriateness of interactive educational applications with the type, nature, and thematic features of the continuous education courses provided to physicians.

Objectives: The present research aimed to scrutinize the virtual CME courses held by the Shahid Beheshti University of Medical Sciences in 2018-2020. We categorized the topics of the courses based on their educational goals, content, and methods, as well as evaluation methods, and determined the applicability of using interactive educational applications for the subjects taught.

Methods: In this qualitative study, virtual continuous education courses held by the Shahid Beheshti University of Medical Sciences in 2018-2020 were examined. The data were collected by reviewing the statistics documented, scrutinizing the educational content and the characteristics of the platforms used during courses, conducting individual interviews, and holding focus group discussions with lecturers and physicians participating in these courses. Data coding, extraction, categorization, and analysis were held concomitant with each step.

Results: The educational courses were flexible in terms of accessibility and schedules. The most common subjects were related to clinical and non-specialized topics. The educational goals were mostly at low-cognitive and non-transparent levels, and the content was presented mostly in the form of audio non-interactive slides. The teaching method was mostly through lecturing, and evaluations were objective and summative. Low graphical attractiveness, poor toolbox, and poor user interactive interface were among the drawbacks of the education courses.

Conclusion: The use of interactive, appropriately designed applications tailored to the needs of the audience can resolve some of the shortcomings of conventional continuous educational courses and fulfill educational objectives at different levels. These applications provide the possibility of skillful and motivational training, as well as more proficiency, deeper learning, and higher satisfaction by creating a more attractive learning environment.

Keywords: Continuing Medical Education Courses, Educational Application, Thematic Features

Background

Regarding physicians' need for uninterrupted updating of their medical knowledge to provide better

services to patients and guarantee professional achievements, it is highly important to pay attention to continuing professional education of doctors (1, 2).

According to the law of continuing education, all the members of the Iran Medical Council need to participate in continuing medical education (CME) programs since 1996 (3). However, the limitations of face-to-face training, such as physical space restrictions, shortcomings in infrastructure, transportation problems, and limitations in providing vacancies for large groups of participants, have led many doctors to decline participation in CME courses (4). The results of studies have shown that the quality and proficiency of the educational systems are among the most important developmental concerns of governments and decision-makers in every country. It is worth mentioning that holding educational courses alone cannot help organizations achieve their goals. In fact, CME can lead to the improvement of the quality of clinical care services only if appropriate teaching methods are used (5-7). A solution for this issue is to use novel technologies. The use of smart technology-based instruments and applications can facilitate doctors' access to CME courses. In this regard, interactive applications based on various educational media can perform better than text-based methods for delivering educational content (8-10). Studies have noted many advantages of e-learning educational methods, such as better access of the audience to the educational content, convenience, flexibility, reduced travel costs, saving time, adaptability to different learning styles, and the possibilities of using multimedia tools, reviewing the content, providing supplementary materials, dynamic updating of scientific content, and designing interactive case presentation scenarios (9-12).

Considering the aforementioned explanations, it is necessary to apply new and user-friendly technologies with wider accessibility to deliver educational courses, including CME programs. In order to develop interactive educational applications for delivering CME courses to doctors, we first need to identify and classify the topics for which appropriate interactive applications can be designed. For this purpose, the present research aimed to scrutinize the virtual CME courses held by the Shahid Beheshti University of Medical Sciences in 1397-1399. We categorized the topics of the courses based on their educational goals, content, and methods, as well as evaluation methods, and determined the applicability of using interactive educational applications for the subjects taught.

Objectives

The present research aimed to scrutinize the virtual CME courses held by the Shahid Beheshti University of Medical Sciences in 2018-2020. We categorized the topics of the courses based on their educational goals, content, and methods, as well as evaluation methods, and determined the applicability of using interactive educational applications for the subjects taught.

Methods

This qualitative study was conducted using a directed content analysis approach (13, 14) in 2021 at the CME site of Shahid Beheshti University of Medical Sciences. In order to design and develop interactive educational applications for the CME courses of doctors, we conducted a 3-step experiment to identify topics for which appropriate interactive applications could be designed.

As required by directional content analysis, we initially performed a review of overseas and domestic literature using the keywords and phrases of continuing education courses, educational applications, continuing education topics, etc. Relevant articles authored by Iranian or foreign researchers were extracted from validated databases, according to which a number of questions were raised to be asked during semi-structured interviews. These questions covered areas such as educational goals, educational content, teaching and learning methods, evaluation methods, and type of interaction, as well as the strengths and weaknesses of the virtual CME courses (Appendix 1) (5, 15-23).

In the second step, information such as the frequency and area of the CME topics provided to general practitioners between 2018 and 2020 were extracted from the university's CME website, and relevant educational documents and media were categorized. Then, the necessity and appropriateness of the subjects in terms of educational goals, educational content, teaching methods, and user environment were analyzed. For this purpose, 42 courses out of a total of 420 courses were chosen using the 10% sampling strategy. The researcher registered for these courses and completed them in order to be able to fill out the checklist of the research objectives. According to the study's objectives, this checklist included the type of disease, course name, educational goals, educational content, teaching-learning methods, evaluation methods, and the user environment (interactive tools) of the applications designed.

In the third step, individual interviews were conducted with CME specialists. In addition, two focused group discussion sessions were held with the participation of ten physicians selected by purposeful and snowball sampling methods. The interviews continued until they reached data saturation. The duration of individual interviews ranged between 40 and 50 minutes, and the focus group sessions lasted 90 minutes. The criteria for selecting an interviewee included having at least two years of experience in managing or preparing and teaching a training course.

For conducting the individual interviews, the time and place were arranged with the interviewee. Written informed consent was obtained to audio-record the interview, and after each interview, the recorded file was transcribed verbatim. Next, the recorded file was matched with the transcribed text. Every interview (either individual or focus group) was then summarized, coded, and finally categorized with regard to the objectives of the interview. Duplicated categories were identified in subsequent interviews. Finally, themes,

categories, and their frequencies of mentioning were extracted and organized in seven dimensions (Table 1).

The data gathered during the literature review, reviewing documents and checklists related to courses, individual interviews, and focus group sessions were analyzed using MAXQDA software version 2010 (VERBI Software GmbH, Germany).

In order to ensure the reliability and accuracy of the qualitative data, the criteria of Lincoln and Guba, including reliability, verifiability, and transferability (15), were utilized. Credibility was achieved by long-term communication with the participants and prolonged engagement with the data through conducting in-depth interviews, as well as by reviewing the interview texts by the participants. Reliability was achieved via peer-reviewing by external reviewers. For this purpose, the texts of some of the interviews, along with the codes, categories, and themes extracted, were provided to three experts in the field of qualitative research (who were not members of this study’s research team) to be verified.

Table 1. Themes Derived from Individual Interviews and Focus-group Sessions

Categories	Themes	Number of mentioning
Educational goals	Cognitive, such as education of diseases, therapeutic courses, patient care, pharmaceutical treatment, prescription writing	6
	Attitudinal, such as education on ethics and professionalism	4
	High-level cognitive goals (creative thinking and problem-solving), differential diagnoses of diseases, and clinical reasoning	4
Educational content	Educational videos are so attractive that they can establish an interaction between the content and learners.	3
	The platform allows the easy access of the content to learners.	5
	At the present time, most of the educational content is in the form of PowerPoint slides and podcasts.	6
	Educational content that consists of textbooks or long texts is inappropriate.	4
	Textual content and articles are better to be derived from reliable databases so that learners can be assured of their reliability.	3
	Educational games can be more attractive to learners.	1
	The educational content should be diverse to support different learning styles of learners.	1
The educational content should provide feedback to learners so that an effective interaction can be established between the content and the learners.	2	
Teaching-learning methods	Flipped classroom + online session is an excellent choice.	5
	Question and answer + online session is a key choice.	4
	Gamification should be used as an educational method.	1
	The educational content should initially be presented to the learners in the platform’s environment, followed by concomitant webinar meetings and questions and answers to monitor the learning process.	4
Evaluation	The entrance exam and pre-exam should be considered.	3
	The discussion and case analysis methods should be used for evaluation.	3
	Attention should be paid to formative evaluation during the course based on measurable educational activities, such as doing homework and participating in non-simultaneous scientific discussions in the platform’s environment.	4
	Online exams should be held to grant the certificate.	2
	In-person exams should be held to grant the certificate.	2

Type of interaction	Effective interactions should be established between learners and professors.	3
	Effective interactions should be established between the content and learners.	1
	Effective learner-learner interactions should be established.	2
	Constructive, immediate, and effective feedback should be provided by the instructor to learners' learning activities	2
Strengths	Flexibility of the courses, allowing the participation of a wide range of professionals	2
	The possibility of free access to educational content and self-regulated studying	5
	The possibility of asking questions at any time and receiving immediate feedback.	2
Weakness	The lack of effective professor-learner and learner-learner interactions during the course	4

For transferability, a complete description was provided for the background of the research, the process of participant selection, and the procedures used for data collection and analysis. Verifiability was confirmed through an audit trail for the research process and decisions.

Results

Four professors in the field of medical education participated in individual interviews, two of whom (50%) were full professors; one was an associate professor (25%), and the other was an assistant professor (25%). Two of the professors were male (50%), and the mean age of the participants was 49 ± 8 years.

In focus group sessions, 20 general practitioners participated, 55% (n=11) of whom were male and 45% (n=9) were female, and the means of age and work experience were (mean \pm SD) 38 ± 5 and (mean \pm SD) 7 ± 2 years, respectively.

The analysis and recapitulation of nine domestic articles and eight foreign articles revealed that online CME programs delivered via e-learning platforms were largely effective. The topics chosen for the courses were largely suited to the interests of the audience. The physicians preferred the afternoon and before dinner as the best time for participation in these courses, and most of them used mobile phones, and fewer used iPads to participate in the courses. Most of the doctors had a sincere commitment to accomplish the courses. Also, the quality of voice and the style of presentation were directly associated with the enthusiasm of doctors to attend the courses.

The review of the documents showed that a total of 546 face-to-face and virtual CME courses, some of which are still ongoing, were held by the Shahid Beheshti University of Medical Sciences over the two years under investigation. Out of these, 420 courses were completely virtual; 362 courses were held by clinical departments, and 58 courses were held by basic science departments (Tables 2 and 3).

In this study, 42 courses were selected by statistical sampling to investigate the trends and goals of the virtual CME courses held at the Shahid Beheshti University of Medical Sciences. Among the 420 virtual courses, according to statistical calculations, we projected three scenarios of 10% sampling for different situations, which led to the suggestion of sample sizes of 42, 80, and 59. According to our analyses, we selected the first scenario (i.e., the 10% sampling method that required a sample size of 42) (Appendix 2).

The reviewing of the documents showed that the educational goals of the courses had been defined at lower Bloom cognitive levels (i.e., knowledge, perception, and application). Only a few courses defined educational goals at the analytic level, and there were no courses focusing on higher-level objectives such as evaluation and synthesis. Objectives either were not mentioned or were verbally explained for some courses, indicating a low focus on educational goals (Table 4).

Reviewing the educational content of the CME courses revealed that most of them employed non-interactive lecture-based teaching using slides, and in most of them, the images and diagrams were fixed and inactive. Some of the courses included videos, but interactive tools such as Storyline had been employed uncommonly (Table 4).

Investigating the teaching and learning methods demonstrated that they were not diverse, and the most common methods included non-interactive lecturing, case studies, and questioning without the instructor's feedback. Some of the courses used problem-oriented methods by presenting a scenario, and at the end of some courses, a summary or conclusion was provided. In addition, some courses employed samples, key concepts, and content organization methods (Table 4).

Regarding the type of evaluation in the CME courses examined, all courses used the same evaluation method, which was based on the final exam.

Table 2. The Titles and Frequencies of Virtual Learning Courses Held in the Context of the Continuing Clinical Medical Education Program for General Practitioners at Shahid Beheshti University of Medical Sciences from 2018 to 2020

Department	The course's title	Frequency	Fields
Clinical departments (362 courses)	Internal	171	Internal (47), gastroenterology and endocrinology (17), rheumatology (7), neurology (14), lung (6), infectious diseases (33), allergy-immunology (6), pediatrics (33), pediatric infectious diseases (10), dermatology (5), psychiatry (11), psychology (7)
	Surgery	23	Surgery (8), orthopedics (7), neurology (8)
	Internal surgery	90	Nephrology (5), urology (7), otolaryngology (6), ophthalmology (5), obstetrics and gynecology (15), dentistry (4), cardiology (5), emergency medicine (43)
	Other	66	Radiology (4), anesthesiology (17), forensic medicine (35), sports medicine (3), physical medicine and rehabilitation (7)

Table 3. The Titles and Frequencies of Virtual Learning Courses Held in the Context of the Continuing Non-clinical Medical Education Program for General Practitioners at Shahid Beheshti University of Medical Sciences from 2018 to 2020

	The course's title	Frequency
Non-clinical departments (basic sciences, 58 courses)	Pharmacy	13
	Nutritional sciences	12
	Medical education	1
	Community health	12
	Health service management	5
	Occupational Medicine	5
	Health and disasters	5
	Medical ethics	5

The questions were answered on multiple random choice scales, requiring a minimum score of 70 out of 100 to pass the exam. The duration of the test was 30 minutes, and the maximum number of retesting was three times for each participant (Table 4).

Regarding the utilization of tools and software in the courses, most of the educational content had been presented in the form of videos and audio slides in the software environment, equipped with adequate and appropriate tools for changing the size of the window, moving forward, and backward, pausing, as well as tools such as eraser, lighter, outline, search, adjusting the volume and timeline, and note-making (Table 4). Table 4 summarizes five examples of the courses, but all 42 courses can be analyzed based on the criteria provided in this table.

The results of the third step of the study (a recapitulation of focus group sessions) showed that 40% of the content was about diseases such as COVID-19, cancers, eye diseases, and diabetes, and 30% of the courses were held virtually, enabling access to the course at any time and in any location. One advantage of virtual courses is their flexibility, allowing the participation of different professional groups, but a noteworthy drawback can be the lack of adequate interaction between the instructor and learners (Appendix 3).

The data from the interviews were organized into seven dimensions, including objectives, content, teaching methods, evaluation, type of interaction, strengths, and weaknesses. The views and concerns of the interviewees about the topics covered in CME courses were also outlined, and the themes intertwined with their needs and concerns were extracted to obtain more comprehensive findings (Appendix 4).

According to the main objective of the study, the CME courses were categorized based on their subjects to assess the applicability of interactive educational applications, the results of which have been shown schematically in Appendix 4.

Table 4. The Results of Analysis of 42 Virtual Clinical/Basic Science Continuing Medical Education Courses Provided to General Practitioners

Group	Title	Educational goals	Educational content	Teaching-learning methods	Evaluation	Tools
Ethics	Research ethics	Cognitive goals/knowledge ranking (verbal expression of goals)	Slide with audio files/non-interactive/no charts or tables/fixed images	Lecture/non-interactive, case presentation, questions and answers	A minimum score of 70/ time of 30 minutes/random and multiple-choice questions/test repetition for 3 times	Full screen/ stop button, forward and backward moving of slides/ marker tools (eraser, lighter, outline, search, volume, and timeline adjustment)
Cardiovascular diseases	Herbal medicines' effectiveness in the treatment of cardiovascular disorders	Cognitive goals/knowledge ranking (verbal expression of goals)	Slide with audio files/non-interactive/no charts or tables/fixed images	Lecture/non-interactive	A minimum score of 70/ time of 30 minutes/random and multiple-choice questions/test repetition for 3 times	Full screen/ stop button, forward and backward moving of slides/ marker tools (eraser, lighter, outline, search, and volume and timeline adjustment)
Urology	Etiology/symptoms and prevention of kidney stones in traditional medicine	Cognitive goals/knowledge ranking (verbal expression of goals)	Slide with audio files/non-interactive/ fixed images	Lecture/non-interactive	A minimum score of 70/ time of 30 minutes/random and multiple-choice questions/test repetition for 3 times	Full screen/ stop button, forward and backward moving of slides/ marker tools (eraser, lighter, outline, search, and volume and timeline adjustment)
Psychology	Active listening and empathy	Cognitive goals/knowledge ranking (verbal expression of goals)	Slide with audio files/non-interactive	Lecture/non-interactive, case presentation, questions and answers	A minimum score of 70/ time of 30 minutes/random and multiple-choice questions/test repetition for 3 times	Full screen/ stop button, forward and backward moving of slides/ marker tools (eraser, lighter, outline, search, and volume and timeline adjustment)
Dermatology	The basics of laser therapy for dermatologic disorders	Cognitive goals/knowledge ranking (verbal expression of goals)	Slide with audio files/non-interactive/ charts /fixed images	Lecture/non-interactive	No testing	Full screen/ stop button, forward and backward moving of slides/ marker tools (eraser, lighter, outline, search, and volume and timeline adjustment)

Discussion

Based on the results of the present study, CME courses had good accessibility, but their educational goals were mostly at low Bloom cognitive levels, and they mostly contained non-interactive content. In most cases, the teaching method chosen was through lecturing, while it was expected to use more interactive methods. Evaluations were objective and summative, while formative evaluation should be considered more frequently. In addition, educational platforms lacked appropriate graphical efficiency and user-friendly tools, which need to be improved.

The results of studies have confirmed that continuing education programs held online and via e-learning instruments are somehow more effective than traditional programs; nevertheless, the transformation of Iran's education system in parallel with technological advances takes place slowly due to the lack of the infrastructure required, as well as due to cultural barriers. The preferences of the audience, including duration, type of presentation, and evaluation methods, are deterministic in choosing the topics and features of CME courses, encouraging participants to favor virtual courses. This finding was in line with the report of Atai and Siamian, who investigated the role of virtual learning in holding CME courses during the COVID-19 pandemic (16). However, our observation was opposed to the results of a study by Wang *et al.*, who investigated the effectiveness of e-learning in CME among healthcare workers in China (17) and asserted that virtual learning was effective among healthcare staff but not for general practitioners, which could be due to the poor quality of educational content or choosing topics unmatched with the needs of the audience.

According to the results obtained, the educational content presented in virtual courses is longer available compared to that presented in face-to-face training courses, so physicians can register and complete these courses when they need to. This flexibility causes doctors to be more enthusiastic about virtual rather than in-person CME courses. This finding was consistent with the results of Sadeghi-Tabar *et al.*, who investigated various dimensions and components of CME based on blended learning (18).

The results of the present research showed that in most CME courses, general topics were offered to medical professionals, while specialized and challenging topics were avoided.

This can be probably due to the lack of appropriate software and hardware infrastructure and the unavailability of a user-friendly management platform allowing for constructive communication with the audience. This finding was in line with the results of Atai *et al.* (19), who studied the effectiveness of conventional CME methods.

In a study by Fani *et al.*, the challenges of virtual medical education were investigated, and the results suggested that virtual training methods might not be applicable to specialized and practical topics (20). This finding opposed the results of the present study, and this difference could be related to the type of educational content. On the other side, simulation and gamification can provide a safe and stress-free environment to facilitate learning and reinforce traditional education (21).

In most CME courses analyzed, there was no clear mention of the objectives, which is an important part of the courses. These courses mostly focus on low-level cognitive objectives. Experts, however, presume such goals to be the best for virtual CME courses if these courses address diseases and their treatments. Consistently, the results of Ammenwerth *et al.* approved this observation (22).

Our analysis showed that the educational content in the CME courses was mostly presented through audio slides and podcasts. This is while educational videos seem to be more effective for learners. In addition, the use of diverse content, such as simulators and educational games, can help exert deeper learning effects. Micro-educational content, despite having narrower objectives, can also help the audience learn more deeply. The results of studies by De Gagne *et al.* (23, 24), Gawlik *et al.* (25), Sozmen *et al.* (26), and Thillainadesan *et al.* (27) were also in line with our findings.

Overall, conventional teaching-learning methods more commonly use non-interactive techniques such as lectures. Although methods such as presenting clinical cases and scenarios and problem-solving techniques are also used, these methods use less interactive content. Experts suggested the use of not only non-simultaneous teaching methods but also simultaneous techniques such as reverse classes, which was consistent with the results of studies by Hradetzky *et al.* (3), Atai *et al.* (19), and Xiberta *et al.* (28).

In terms of interactions, the CME courses analyzed had low levels of interactions. This interaction was more focused on the engagement of the learner with the educational content through the tools offered by the

applications used to present the course. However, less attention was paid to other types of interactions, including the interaction of learners with the professors and their peers, as well as providing constructive feedback. Consistently, Momtazmanesh *et al.* (5), Longhini *et al.* (10), and Yeh *et al.* (29) reported similar findings; however, our observation opposed the results of Tehrani *et al.*, who assessed the perception of university professors from virtual learning and highlighted the low levels of interactions, inadequate motivations, and inefficient support in virtual learning (30), which can be due to the fact that the audience of virtual learning in the recent study were students.

Regarding evaluation, most CME courses were focused on multiple-choice final exams. Experts suggest using formative evaluation methods, such as taking a pre-test and using case-oriented methods, as well as paying attention to cheating prevention strategies. This observation agreed with the results of Cheong and Hsu (31), Ebrahimi *et al.* (32), and Eskanderzadeh *et al.* (33).

The strengths of the CME course held included the diversity of courses and their wide accessibility to learners. The most prominent limitation of these courses included the lack of effective interactions between learners and instructors.

Nowadays, most CME courses are held virtually, and clinical courses generally outnumber courses related to basic sciences. There is a need to revise the design of educational plans and reinforce technical infrastructure. The objectives of the courses were mainly at low and middle cognitive levels, with less attention being paid to higher cognitive levels, such as criticism, evaluation, or synthesis.

The use of e-learning tools can augment the active role of the learner, leading to more comprehensive learning. Therefore, it is suggested to renew technical infrastructure and empower instructors by familiarizing them with the fundamentals of designing virtual courses and technological infrastructures so that they can develop motivational, educational content.

One of the limitations we faced during conducting interviews and focus-group sessions was the poor cooperation of doctors due to their busy schedules. Also, parts of the research coincided with the COVID-19 outbreak that made accessibility to the audience difficult, requiring extensive efforts and prolonged time for making arrangements.

Conclusion

According to the results of the present study, the design and development of interactive applications can help deliver effective CME courses only if these applications are designed based on learners' requirements and possess suitable pedagogical features. These applications can obviate the drawbacks of the conventional methods used to deliver CME courses (e.g., low to medium cognitive levels) and allow for holding higher-level courses. On the other hand, the smart platforms of these applications enable effective education at skill-based and motivational levels. Moreover, because learners are offered numerous complex and multifaceted choices, they are expected to master problem-solving and decision-making skills through receiving feedback. Finally, these applications provide accessibility to educational courses anywhere and anytime, making them applicable for learners who cannot attend them. Moreover, the attractive learning environment encourages learners to actively participate in the course and experience more satisfaction and deeper and more meaningful learning.

Supplementary Material(s): is available here [To read supplementary materials, please refer to the journal website and open [PDF/HTML](#)].

Acknowledgements: This article was extracted from a research project approved by Iran's National Center for Strategic Research in Medical Education (Nasr). We sincerely thank this center for its unwavering support, as well as all those who collaborated in conducting this study.

Conflict of interests: There is no conflict of interest for the authors of the article.

Ethical approval: In order to comply with research ethical standards, we obtained permission from the CME center of the university. Also, written informed consent was obtained from the participants, and they were assured that their data would remain confidential and they were free to exit the study at any time. The study's protocol was approved under the ethics code of 960435 by the National Center for Strategic Research in Medical Education (Nasr).

Funding/Support: National Center for Strategic Research in Medical Education (Nasr).

References

- Zia Ziabari SM, Monsef Kasmaei V, Khoshgozaran L, Shakiba M. Continuous Education of Basic Life Support (BLS) through Social Media; a Quasi-Experimental Study. *Arch Acad Emerg Med.* 2019 Jan 20;7(1):e4. [PMID: 30847439] [PMCID: PMC6377214]
- Mohapatra S, Kapil A, Suri A, Pandia MP, Bhatia R, Borkar S, et al. Impact of Continuous Education and Training in Reduction of Central Line-associated Bloodstream Infection in Neurointensive Care Unit. *Indian J Crit Care Med.* 2020 Jun;24(6):414-417. doi: 10.5005/jp-journals-10071-23455. [PMID: 32863633] [PMCID: PMC7435091]
- Hradetzky D, Etter P, Lucano E. Experience with a Continuous Education Program for Clinical, Regulatory and Quality Affairs in Northwestern Switzerland. *Annu Int Conf IEEE Eng Med Biol Soc.* 2022 Jul; 2022: 3291-3294. doi: 10.1109/EMBC48229.2022.9871082. [PMID: 36085903]
- Ebrahimi H, Mohammadi Hosseini F, Amirnia M, Mehraee A, Jamali V, Hejazi SA. Factors Influencing Nurses' Participation in Continuing Education Programs in Tabriz University of Medical Sciences. *Iran J Med Educ.* 2012; 12(7):518-26. [In Persian]
- Momtazmanesh N. Challenges of community oriented medical education in Iran. *Teb va Tazkiyeh.* 2010;19(2):52-64. [In Persian]
- Mojtahedzadeh R, Ebrahimzadeh I, Zandi B, Sarmadi M, Alipour A. Proper e-content format for internet based continuous medical education in Iran. *Iran J Med Educ.* 2011; 11(4): 382-92. [In Persian]
- Rosiński J, Różańska A, Jarynowski A, Wójkowska-Mach J, Polish Society of Hospital Infections Team. Factors Shaping Attitudes of Medical Staff towards Acceptance of the Standard Precautions. *Int J Environ Res Public Health.* 2019 Mar 23;16(6):1050. doi: 10.3390/ijerph16061050. [PMID: 30909536] [PMCID: PMC6466440]
- Cabrera LF, Ferrada P, Mayol J, Mendoza AC, Herrera G, Pedraza M, et al. Impact of social media on the continuous education of the general surgeon, a new experience, @Cirbosque: A Latin American example. *Surgery.* 2020 Jun;167(6):890-894. doi: 10.1016/j.surg.2020.03.008. [PMID: 32359773]
- Liu X, Cheng J, Huang S. Mobile Phone Training Platform for the Nursing Staff in the Emergency Department. *Telemed J E Health.* 2019 Jan;25(1):66-70. doi: 10.1089/tmj.2017.0317. [PMID: 29742034]
- Longhini J, Rossetini G, Palese A. Massive open online courses for nurses' and healthcare professionals' continuous education: a scoping review. *Int Nurs Rev.* 2021 Mar;68(1):108-121. doi: 10.1111/inr.12649. [PMID: 33855697]
- Kim JT, Park JY, Lee HJ, Cheon YJ. Guidelines for the management of extravasation. *J Educ Eval Health Prof.* 2020;17:21. doi: 10.3352/jeehp.2020.17.21. [PMID: 32668826] [PMCID: PMC7431942]
- Okura M. The Process of Structuring Community Health Needs by Public Health Nurses Through Daily Practice: A Modified Grounded Theory Study. *Asian Nurs Res (Korean Soc Nurs Sci).* 2019 Oct;13(4):229-235. doi: 10.1016/j.anr.2019.08.001. [PMID: 31574308]
- Elo S, Kyngäs H. The qualitative content analysis process. *J Adv Nurs.* 2008 Apr; 62 (1): 107-15. doi: 10.1111/j.1365-2648.2007.04569.x. [PMID: 18352969]
- Momeni Rad A. Qualitative content analysis in research: nature, stages and validity of results. *Educational Measurement Quarterly.* 2014;4(14):187-222. [In Persian]
- Lincoln YS, Guba EG. But is it rigorous? Trustworthiness and authenticity in naturalistic evaluation. *New directions for program evaluation.* 1986;1986(30):73-8. doi: 10.1002/ev.1427.
- Ataei M NS, Siamian H. Changes and Challenges of Continuing Medical Education in the Covid-19: A Narrative Review. *Clin Exc.* 2022;12(2):29-38. [In Persian]
- Wang Z-Y, Zhang L-J, Liu Y-H, Jiang W-X, Jia J-Y, Tang S-L, et al. The effectiveness of E-learning in continuing medical education for tuberculosis health workers: a quasi-experiment from China. *Infect Dis Poverty.* 2021 May 18;10(1):72. doi: 10.1186/s40249-021-00855-y. [PMID: 34006313] [PMCID: PMC8129609]
- Sadeghitabar P, Shariatmadari M. Identification of the Dimensions and Components of Continuing Medical Education Based on Blended Learning with Sustainable Development Approach. *Scientific Quarterly Journal of Environmental Education and Sustainable Development.* 2021;9(2):63-82. doi: 10.1001.1.23223057.1399.9.2.4.9. [In Persian]
- Ataei M, Safaryan Hamadani S, Zamani F. A Review of Current and Effective Educational Methods in Continuing Medical Education. *Clin Exc.* 2020;9(3):12-22. [In Persian]
- Fani K. Problems facing virtual medicine education. *Iran J Med Educ.* 2020; 20:416-7. [In Persian]
- Lee J, Kim H, Kim KH, Jung D, Jowsey T, Webster CS. Effective virtual patient simulators for medical communication training: a systematic review. *Med Educ.* 2020 Sep;54(9): 786-795. doi: 10.1111/medu.14152. [PMID: 32162355]
- Ammenwerth E, Hackl WO. Topics for Continuous Education in Nursing Informatics: Results of a Survey Among 280 Austrian Nurses. *Stud Health Technol Inform.* 2019;260:162-9. [PMID: 31118333]
- De Gagne JC, Park HK, Hall K, Woodward A, Yamane S, Kim SS. Microlearning in Health Professions Education: Scoping Review. *JMIR Med Educ.* 2019 Jul 23;5(2):e13997. doi: 10.2196/13997. [PMID: 31339105] [PMCID: PMC6683654]
- De Gagne JC, Woodward A, Park HK, Sun H, Yamane SS. Microlearning in health professions education: a scoping review protocol. *JBI Database System Rev Implement Rep.* 2019 Jun;17(6):1018-1025. doi: 10.11124/JBISRIR-2017-003884. [PMID: 30489350]
- Gawlik K, Guo J, Tan A, Overcash J. Incorporating a Microlearning Wellness Intervention Into Nursing Student Curricula. *Nurse Educ.* 2021 Jan/Feb;46(1):49-53. doi: 10.1097/NNE.0000000000000842. [PMID: 32433377]
- Sozmen EY. Perspective on pros and cons of microlearning in health education. *Essays Biochem.* 2022 Apr 29;66(1):39-44. doi: 10.1042/EBC20210047. [PMID: 35415758]
- Thillainadesan J, Le Couteur DG, Haq I, Wilkinson TJ. When I say ... microlearning. *Med Educ.* 2022 Aug;56(8):791-792. doi: 10.1111/medu.14848. [PMID: 35654438] [PMCID: PMC9542948]
- Xiberta P, Boada I, Thió-Henestrosa S, Ortuño P, Pedraza S. Introducing Online Continuing Education in Radiology for General Practitioners. *J Med Syst.* 2020 Jan 16;44(3):55. doi: 10.1007/s10916-019-1499-7. [PMID: 31950280]
- Yeh HF. Virtual Reality Skills Training Trends in Nurse Practitioner Education. *Hu Li Za Zhi.* 2021 Oct;68(5):13-17. doi: 10.6224/JN.202110_68(5).03. [PMID: 34549403]
- Tehrani H, Afzal AM, Salehian M, Taghipour A, Latifnejad RR, Karimi FZ. Explaining the perception and experience of faculty members of Mashhad University of Medical Sciences of virtual education during the covid-19 epidemic. *Journal of Torbat Heydariyeh University of Medical Sciences.* 2022;10(1):48-63. [In Persian]

31. Cheong PL, Hsu N. Developing and Evaluating a Continuous Education Program for Healthcare Assistants in Macao: A Cluster-Randomized Trial. *Int J Environ Res Public Health*. 2021 May 8;18(9):4990. doi: [10.3390/ijerph18094990](https://doi.org/10.3390/ijerph18094990). [PMID: [34066659](https://pubmed.ncbi.nlm.nih.gov/34066659/)] [PMCID: [PMC8125805](https://pubmed.ncbi.nlm.nih.gov/PMC8125805/)]
32. Ebrahimi S. Virtual training and evaluation. Proceedings of the 13th National Education Conference; 2021 Dec 15; Tehran, Iran. 1992. [In Persian]
33. Eskandarzade Asl A, Saghai Legran Z. Evaluation methods in virtual education. Proceedings of the National Conference on Family and School Studies; 2022 Mar 13; Bandar Abbas, Iran. 2022. [In Persian]

Appendix

Appendix 1. Themes Derived from Individual Interviews and Focus-group Sessions

Interview questions	
1	Can you recall the courses you conducted and the topics you covered in the last two years?
2	How many of these courses were conducted face-to-face, and how many were virtual?
3	In your opinion, what were the strengths of conducting virtual courses?
4	In your opinion, what were the weaknesses of conducting virtual courses?
5	Were you satisfied with the platform used for virtual education?
6	What additional features do you think the current virtual education platform needs to enhance the learning experience?
7	What types of educational subjects do you believe can be effectively presented in a virtual format?
8	What educational goals can be achieved in the virtual education space? (Note: Educational goals refer to cognitive, skill, and attitude objectives. For instance, can high-level cognitive goals like diagnosing and examining a specific disease be effectively presented virtually? Provide an example of virtual learning objectives.)
9	What types of content, such as educational videos, animations, podcasts, PowerPoint presentations, etc., did you use in virtual training programs?
10	How was this content delivered to the learners?
11	In your opinion, what other types of content could be employed to make virtual education more engaging for learners and facilitate their learning process?
12	Regarding content organization, do you believe all course material should be made available for learners to study at their own pace after the course starts? Alternatively, should content be arranged from simple to complex? Or, should no content be included, with references provided to encourage independent study?
13	How can the content be designed to enhance interaction between the learners and the course materials, promoting independent learning and communication with the content?
14	What teaching and learning methods did you employ in virtual training courses?
15	In your opinion, what are the most effective educational methods for designing applications? Should we focus on question-and-answer formats, problem-solving, pre-organizers, group discussions, flipped classrooms, presenting educational scenarios, clinical cases, summarization techniques, procedural demonstrations, using object generators, games, augmented and virtual reality, or other approaches?
16	Did the platform you used for virtual education facilitate interaction between students and between students and teachers?
17	What, in your view, are the key characteristics of an interactive application that can accommodate various types of interactions effectively?
18	What evaluation methods did you employ in your virtual continuing education program? Did you include formative evaluations such as self-evaluation, peer evaluation, procedural demonstrations, projects, individual and group assignments, and critiques of media, in addition to final evaluations like tests, with considerations for online formats such as multiple-choice, true/false, diagram completion, activities, projects, etc.?
19	What features should interactive software possess to facilitate effective learner evaluation?
20	In your field of expertise, [insert the field], what subjects do you believe are best presented through virtual training and application?
21	Considering all these factors, can you prioritize the most important topics in your training course based on the needs of the target group, particularly general practitioners?

Appendix 2. The Number of Examples of Specialized Courses in the Continuing Education Program Based on Different Scenarios

Row	Expertise	Program number	Scenario 1	Scenario 2	Scenario 3
			10% sample	10%sample with at least two programs from each specialty	10%sample with at least two programs from each specialty with 10 or more programs and one program from specialties with less than 10 programs
1	Internal	47	5	5	5
2	Emergency Medicine	43	4	4	4
3	Forensic Medicine	35	4	4	4
4	Children	30	3	4	4
5	Internal/Infectious	23	2	2	2
6	Anesthesia	17	2	2	2
7	Internal / Digestion and Glands	17	2	2	2
8	Obstetrics and Gynecology	15	2	2	2
9	Internal / Brain and Nerves	14	1	2	2
10	Medicine	13	1	2	2
11	Nutrition	12	1	2	2
12	Community Health	12	1	2	2
13	Psychiatry	11	1	2	2
14	Pediatric Infectious	10	1	2	2
15	Neurosurgery	8	1	2	1
16	Surgery	8	1	2	1
17	Internal/Rheumatology	7	1	2	1
18	Psychology	7	1	2	1
19	Physical Medicine and Rehabilitation	7	1	2	1
20	Orthopedics	7	1	2	1
21	Urology	7	1	2	1
22	Internal/Lung	6	1	2	1
23	Allergy and Clinical Immunology	6	1	2	1
24	Ear Nose and Throat	6	1	2	1
25	Internal Nephrology	5	1	2	1
26	Eye	5	1	2	1
27	Medical Ethics	5	1	2	1
28	Cardiovascular	5	1	2	1
29	Occupational Medicine	5	1	2	1
30	Skin	5	1	2	1
31	Services Management	5	1	2	1
32	Health in Disasters	5	1	2	1
33	Dental	4	0	2	1
34	Radiology	4	0	2	1
35	Sports Medicine	3	0	2	1
36	Medical Education	1	0	1	1
Total		420	42	80	59

Appendix 3. Summary of Focus Group Meetings

Questions	Summary of group interviews
Topics in the courses held in the last two years	Forty percent of the mentioned titles include diseases such as Covid19, cancer, influenza, eye diseases, diabetes, hypertension. - 10% of the topics on occupational medicine - 20% of the courses on ethics and professionalism training - 30% of the course in the form of practical workshops and skills training
The number of virtual courses	Thirty percent of all courses are virtual and most of the topics include cancer and viral diseases
Strengths of the courses held	Access to the course at any place and time, the flexibility of the course for the participation of a wide range of participants, the possibility of accessing the course content and studying with a self-regulation method (as a prominent feature that 4. people mentioned) depended on it
Weaknesses of virtual courses	The lack of effective interaction between professors and learners and learners with each other during the course, the possibility of holding a meeting at the same time and online interaction was low, and many meetings were satisfied only with content being placed in the system.
The level of satisfaction with the virtual platform	The level of satisfaction with the virtual continuing education system was average and there was a balance between the stated advantages and limitations.
Good features of a virtual platform	Having effective interaction between professors and learners and learners with each other, providing content in different formats, having space for group participation of learners, having homework modules or self-tests for formative evaluation.
Subjects that can be taught virtually	Theoretical topics in practical courses and workshops also include part of the content that can be presented in virtual form.
Objectives that can be taught virtually	Courses that have cognitive and attitudinal goals, for example, teaching diseases and how to treat or diagnose them. For attitudinal purposes, if it is possible to create meetings and discussion rooms, a more effective understanding of the subject will be obtained.
The type of content you use	Thirty percent of the content was PowerPoint with a text file, 20% of the content was a text file with an audio file, 30% of the content was a video file with a text file, 20% of the content was an animation with a text file.
How learners access content	The content was placed in the continuous education system of the university and the learners had access to the content through this way.
What other content can increase the appeal?	The content includes animation or content that has interaction between the learner and the content, for example, a story line file that determines the learning path for learners with different scenarios and feedback questions. Content including educational games can be more attractive for learners.
How is the content organized?	In order to organize more content, according to the goals of the course, the pre-considered content is placed in the system according to the sequence of educational goals, and the learners study it according to a specific schedule.
The feature of interactive content is inclusive content	Providing feedback to the learners, matching the content with the goals of the course, matching the content with the level of the learners, the content should have diverse learning styles.
Your virtual training method	The content should first be presented to the learners in the system environment and then the sessions should be held in the form of a webinar, and in the same way, questions and answers were done after the content was presented to follow up the learning.
What is the optimal virtual training method in an application?	Using the gamification method, using self-centered learning methods such as the flipped class, using the wiki as a collective wisdom.
Types of interaction in the course	The interaction between learners and professors of the course has been done through the system, but there was no effective interaction between learners and learners with the content.
Features of an interactive software	An interactive software should have three types of effective interaction including interaction between professors and learners, interaction between learners and interaction between learners and content.
Evaluation method used	60% face-to-face exam, 20% online exam, 20% formative evaluation
Desirable features of a software to help in evaluation	It has an entrance exam, presentation of goals and outcomes of the course, a clear evaluation path, self-examination during the course, immediate assignments, automatic feedback by the system.
What courses can be made virtual?	Courses that do not have practical goals and consequences, such as familiarity with diseases such as cancer, infectious diseases, etc.

Appendix 4. Thematic Classification and Features of Continuing Medical Education Courses Applicable to Be Presented Using E-Learning Applications

Courses		
Specialized clinical courses	Specialized non-clinical courses (basic sciences)	
Courses' topics		
Theoretical topics: All general and specialized theoretical topics in clinical and non-clinical fields can be presented through e-learning courses.		
Skill-based and process topics: <ul style="list-style-type: none"> - Process and skill-based courses in which the desired processes or skills are not too complicated, and the trainee can learn them through educational games, puzzles, simulators, or augmented virtual reality technologies. - Courses that require multistep and complex procedures or acquisition of more advanced skills require smart and complex technologies, so if these technologies are not available, such courses are not suggested to be held. - Courses that require internships, especially at the patient's bedside, presence in the real environment, and communicating with the patient cannot be presented through virtual learning courses. 		
Courses' objectives		
All-level cognitive goals: <ul style="list-style-type: none"> - Knowledge - Perception - Application - Analysis - Evaluation - Synthesis 	Psychomotor goals: <ul style="list-style-type: none"> • Processes and skills with minimal complexity • Processes and skills with fewer steps and dimensions If advanced instruments and technologies are available, psychomotor goals with moderate complexity can also be considered.	Emotional-motivational goals: Emotional-motivational goals are suitable for e-learning courses only when a variety of interactions and interactive tools are used and timely, constructive, and motivational feedback is provided.
Courses' content features		
<ul style="list-style-type: none"> - Content with small components (i.e., microlearning) can cover a limited number of educational objectives. - Content should be updated and obtained from new and valid sources. - Single or multimedia and mixed content. - Interactive and non-interactive content. - Content obtained from various sources. - Content generated by content management software - Content with appropriate hierarchy and coherence - UI & UX: content with a user-friendly interface, user guide, icons and indicators, adequate blank space, and suitable graphics and colors. - Content with hyper-text and hyper-media - The presence of highlight, note-taking, copy, cut, paste, timeline, etc. tools in the virtual environment is necessary for interactive content. 		
Teaching-learning methods' features in courses		
<ul style="list-style-type: none"> - Active methods that can engage the learner with the teaching-learning process: - Problem-solving - Collaborative - Questions and answers - Using familiar cases and examples - Inductive and deductive methods (considering the audience and the topic) - Explorative methods - Investigational and search-based methods - Discussion and dialogue - Focusing on projects occupying the minds of the learners - Providing timely and constructive feedback - Gamification of the learning process - Guiding enthusiastic learners toward studying more resources through the facilitation process - Team working with rotational leadership - The presence of interactive and discussion tools such as forums, chat rooms, online classes, etc., simultaneously and non-simultaneously, can be largely helpful. 		
Evaluation methods		
<ul style="list-style-type: none"> - Formative evaluation, including: - Self-assessment - Peer-assessment - Assigning individual and group homework and projects - Self-evaluation - Multiple-choice final exam 		
The features of tools and technologies used in courses		
<ul style="list-style-type: none"> - The list of titles 		

- Interactive tools:
- Interaction with the content
- Interaction with peers
- Interaction with the instructor
- Interaction with resources
- Marking and note-making tools
- Tools for controlling the speed, size of the page, marker, eraser/lighter, search box, outline
- Interactive and guiding tabs
- Reminders and alarms for important dates
- Advanced tools allowing performing procedures and skills, such as simulators and augmented virtual reality
- Smart platforms
- Interactive educational applications