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Sample Size Determination in Medical Education Research

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Background

The quality of a study is based on the appropriateness of its method and tools and may be influenced by the suitability of the adopted sampling strategy. Researchers have to make sampling decisions at the beginning of the study planning, the most important of which is whether a sample would represent the total population. Experienced researchers begin with the total population and work until achieving an appropriate sample size. In contrast, less experienced researchers often work bottom-up; they determine the least number of respondents required to conduct research (1). However, unless they pre-identify the total population, it is not possible for them to evaluate how the sample they selected represents the total population. The other important factor is the sample size. In other words, how many participants should be considered? This article discusses on, how the sample should be representative of the population? It also aims to provide strategies for sample size determination for researchers in medical education research in simple language.

Sample Size and Representation of the Intended Population

In addition to the necessity of a minimum number of cases to assess the relationships between subgroups, researchers must achieve a minimum sample size that exactly represents the intended population. According to size, does a large sample guarantee representation? In the first example, the researcher was able to interview a total sample of 450 female students without considering the male student population. Does a small size guarantee representation? The second falls into the trap of saying

that 50% of those who expressed their ideas said that "medical students be active in outpatient clinics for two hours every weekday," while 50% were only uni-gender students. A too-large sample may be inefficient, and a too-small sample may be unrepresentative (e.g., in the first example, the researcher may be going to interview 450 students, but this is impractical in action, or they may have interviewed only 10 students); this may be performed, but it may most likely not be the representative of the total population of 900 students.

Where simple random sampling is used, the sample size necessary to reflect the population value of a specific variable depends on both the population size and the level of heterogeneity within the population (1). For populations with equal heterogeneity or variance, the larger the population, the larger the sample. For populations with equal size, the higher the heterogeneity in a specific variable, the larger the sample required. In the case of a heterogeneous population, a large sample is preferred. In the case of a homogeneous population, a smaller sample is possible. As long as a sample cannot represent the engaged population exactly, it creates a sampling error (2).

Sample Size Calculation

In addition to choosing the sampling method, calculating the sample size also plays a decisive role in research quality regarding publishing research findings or drawing conclusions. Suppose a young assistant professor in a medical sciences university has one month to evaluate and compare medical students' viewpoints, encompassing 900 people in total, on establishing an effective doctor-patient relationship in several

universities using a semi-structured interview. Given the time available, interviewing all the students will be impossible, so he must choose among the students. How will he do that?

If he is going to interview 200 students, is not this number too many? If he is going to interview 20 students, is not this number too few? If he is going to interview only men or women, can he provide an equitable image of this research? How can he express the percentage of students who lack the required skills? There are such decisions and problems in research that depend on several factors, including sampling.

In such situations, decisions will influence the sampling strategy used. According to the above example, consider the assumption that several students are required as a research sample. An issue that should be taken into account is the sample size. A question that amateur researchers often ask is how many people should be in their sample in a study. Although the question is pretty simple, there is no obvious or simple answer because the sample size depends on factors such as research objectives, questions, and design, the size, nature, and heterogeneity of the population from which the sample has been extracted, the required level of trust and confidence interval, the required level of accuracy (the least sampling error that must be tolerated), the statistical power, the representation of the intended population in the sample, the number of categories in the sample, the variability of the investigated factor, the number of variables under investigation in the research, the statistical tests that should be used, and the research nature (for example, quantitative, qualitative, and mixed-method) (2). We will discuss these factors in the following.

Sample Size Based on Research Approach

It is generally better to have a large sample in quantitative research because it provides higher reliability and uses more complicated statistics. Hence, if researchers use some statistical data analyses, Martin (2018) suggests a thirty-people sample size for each variable for quantitative research as the minimum. However, this number is very few, and we recommend significantly more numbers. The suggestion is that before any data collection, researchers should consider the types of relationships they intend to discover in their final sample subgroups. The number of variables the researchers determine to control in their analysis and the types of statistical tests they intend to carry out should specify their decisions about sample size before conducting the research. A predicted minimum number of 30 cases for each variable should be usually used as a "rule of thumb"; it means that an individual should be

assured of having at least 30 cases for each variable. However, it is again emphasized that this estimate is very low (2).

In qualitative research, there is no formula to define the intended number for each larger or smaller unit of data collection (3). The sample size in qualitative research is typically small and non-random, aiming at achieving a detailed description of the intended phenomenon. For instance, a phenomenological study may use a sample of 1 to 10 participants, or a grounded theory study may use 10 to 60 participants (4). Qualitative researchers collect data to describe the phenomena under investigation based on the participants' perspectives. The sample size in qualitative research is influenced by various factors, including the study scope, subject nature, data quality, study design, etc. (5). The principal factor in sample size estimation in qualitative research is the principle of data saturation (6).

Sample Size Based on Required Statistical Power

The sample size also depends on the type of data analysis. In some statistical tests, larger samples are generally required. For example, if the chi-square statistic is going to be calculated, the requirement of this test is the aligned data; for example, consider two subgroups of stakeholders in a university of medical sciences, including 80 fifth-year medical students and 20 professors, and their answers to a question on a five-point scale (Table 1):

In this example, the total sample size is 80 people, considered a sample with an apparently reasonable size. However, six out of 10 answer cells (60%) consist of fewer than five cases. The chi-square statistic requires five or more cases in 80% of the cells (i.e., eight out of 10 cells). In this example, only 40% of the cells consist of more than five cases; therefore, even with a relatively large sample, the statistical requirements for reliable data still need to be met by simple statistics such as chi-square. Obviously, as far as we can, we should predict possible data distributions and see whether they impede appropriate statistical analysis. If the distributions make it impossible to calculate reliable statistics, the sample size should be increased, or the data should be interpreted cautiously due to reliability-related problems.

The point here is that a relatively large sample size may be required for each variable. In fact, Gorard (2003) proposes that we can start from the minimum sample size needed for each cell, multiply it by the number of cells, and then double the total number. In the example mentioned above, the minimum sample size includes six cases in each cell; we multiply it by the table's number of cells and then double it: $120 = 2 \times 10 \times 6$.

Table 1. Example: The fifth-year medical students should be active in outpatient clinics for two hours every weekday

Variables	Completely Disagree	Disagree	No Idea	Agree	Completely Agree
The fifth-year medical students	25	20	3	8	4
Professors	6	4	2	4	4

However, to ensure, we suggest 10 in each cell, and we will have at least a sample of $200 = 2 \times 10 \times 10$. However, there is even no guarantee that the distributions are correct (7).

Sample Size Based on Research Method

The sample size is also determined somehow according to the study design. For example, in a survey study, a large sample is typically required, particularly if inferential statistics are going to be calculated. In ethnographic or qualitative research, it is more likely that the sample size is small. Borg and Gall (1979) propose that a correlational study needs a sample size of fewer than 30 cases; in causal-comparative and experimental methods, the sample size should not be fewer than 15 cases, and survey research should not have less than 100 cases in each major subgroup and 20 to 50 cases in each minor subgroup. They suggest that sample size calculation should begin by estimating the smallest cases in the smallest subgroup of the sample and vice versa (8). Thus, for the aforementioned example (900 medical students), if 5% of the sample should be male students, and this subsample should include 30 cases (e.g., for correlational research), then the total sample would be $600 = 0.05 \div 30$. If 15% of the medical student sample should be women and the subsample should be 45 cases, the total sample should be $300 = 0.15 \div 45$.

Sample Size Proportional to the Investigated Population

The size of a probability sample (e.g., random sample) can be determined by two methods: By the researcher being cautious and confident that the sample represents the population's more extensive features with a minimum number of cases or by using a table that shows the proper size represents a random sample for a given number of the larger population through a mathematical formula. One of these examples has been provided by Krejcie and Morgan (1970), indicating that if a researcher extracts a sample from a population of 30 people or fewer, he is recommended to select the total population as a sample. Krejcie and Morgan show that the fewer the number of cases in the population, the higher the proportion of that population in the sample and vice versa. They remind that with increasing the population, the proportion of the required population in the sample reduces and indeed remains stable at about 384 cases (9).

Sample Size Using Confidence Interval

In determining the sample size for a probability sample, not only the population size but also the

margins of error it is going to tolerate should be taken into consideration. These are expressed based on confidence level and confidence interval. The confidence level, normally expressed as a percentage (usually 95% or 99%), is an index of how confident we can be (e.g., 95% or 99% of the time) that the responses are placed at a given time. The variation range of a confidence interval is the degree of variation or range of variation (e.g., $\pm 1\%$, $\pm 2\%$, or $\pm 3\%$) that a person is intended to be confident about. For instance, the confidence interval is $\pm 3\%$ in many surveys, meaning that if a poll indicates that a political party has 52% of the votes, it can reach 49% ($52 - 3\%$) or 55% ($52 + 3\%$). The confidence interval is influenced by the sample size, the population size, and the percentage of the sample that gives the "correct" answer. Here, the 95% confidence level indicates that we can be 95% confident that this result will be in the 46% to 55% range, i.e., ± 3 per cent. The confidence level is calculated statistically based on the sample size, the confidence level, and the percentages of a level under the normal distribution curve; for example, a 95% confidence level covers 95% of the distribution curve. Here, the sample size is rapidly reduced by increasing the population size. In general (but not always), the larger the population, the smaller the probability sample proportion. Moreover, the higher the confidence level, the larger the sample, and the lower the confidence interval, the higher the sample. In a usual sampling strategy, a 95% confidence level and a 3% confidence interval are used (2).

Sample Size Based on Variable Type

Bartlett et al. (2001) suggest that sample size is different for categorical variables (e.g., gender, education level) than for continuous data (e.g., scores in a test). In categorical data, we usually need larger samples than in continuous data. Regarding categorical and continuous variables, Bartlett et al. (2001) suggest that for categorical data, a margin of error of 5% is considered, while a margin of error of 3% is taken into consideration for continuous data. Here, for both categorical and continuous data, the population proportion is reduced with increasing the sample, and for continuous data, no difference exists in sample size for populations of 2,000 or larger. If categorical and continuous data are used, the researcher should usually choose the largest one (i.e., the sample size required for categorical data) (10).

Sample Size Based on Statistical Analysis

Bartlett et al. (2001) indicate that sample size should be different based on the statistics used and recommend that if multiple regressions are going to be calculated, "the proportion of observations [cases] to independent variables should not be lower than five." However, some statisticians suggest a 1:10 ratio, especially for continuous data, as the sample size should not be smaller for continuous data than for categorical data. They also suggest that in multiple regression: (a) For continuous data, if the number of independent variables is in the 5:1 ratio, the sample size should not be less than 111, and the number of regressors (independent variables) should not be higher than 22; (b) for continuous data, if the number of independent variables is 1:10, the sample size should not be less than 111, and the number of regressors (independent variables) should not be more than 11; c) for categorical data, if the number of independent variables is 1:5, the sample size should not be less than 313, and the number of regressors (independent variables) should not be higher than 62; (d) for categorical data, if the number of independent variables is 1:10, the sample size should not be less than 313 and the number of regressors (independent variables) should not be higher than 31. Bartlett et al. (2001) suggest that for factor analysis, a sample size of fewer than 100 observations (cases) should be considered the general rule. However, the size can reduce by up to 30 cases, and the ratio of a sample size to the number of variables ranges from 1:5 to 1:30 (10, 11).

In addition, Borg and Gall (1979) provided a formula-based approach or sample size determination, i.e., looking at the significance levels of correlation coefficients and then reading the sample sizes is usually required to show the level. For example, if the correlation significance level is 0.01, our required sample size is 10, or if the required correlation coefficient is 0.20, the sample size is 100. Still, an inverse ratio can be observed-the larger the sample population is, the smaller the required correlation coefficient can be considered significant (8).

Conclusion

With quantitative and qualitative data, the substantial requirement is that the sample represents a population from which it has been extracted. In a thesis concerning the life history of one expert in medical education, the sample population is one ($n = 1$). In a qualitative study of 30 faculty members of the surgical ward to investigate their teaching experiences with a virtual reality method, a sample size of 5 or 6 may be enough. In general, in qualitative research, some factors,

including the scope of the research question, influence the sample size; the more general and extensive the research question is, the slower it is to achieve data saturation. Another factor is the collected data quality, which in the way toward attaining high-quality data, may lead the researcher later to data saturation. In addition, the study design can also have a decisive role in sample size in qualitative research. However, in quantitative research or study of a heterogeneous population, e.g., for investigating several variables among medical students of universities, a larger sample should be selected to respect that heterogeneity. In fact, factors such as appropriateness to the research aim, suitability to the research question(s), and compatibility to the research focus determine how many individuals, groups, populations, etc., are needed. Sampling decisions may determine the nature, reliability, validity, trustworthiness, usefulness, and generalizability of the collected data and, indeed, the way of data collection.

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A Practical Guide for Conducting Scholarship of Teaching and Learning (SoTL): An Approach to Developing the Innovative Educational Process

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Abstract

Background: Planning and conducting successful scholarship of teaching and learning or educational scholarship in medical education is essential. The guidelines for faculty members can be significant.

Objectives: This study aimed to develop a practical guide for teaching and learning scholarship activities.

Methods: The present study was a research synthesis conducted in six steps, including formulation of problem or question, literature search, data extraction and analysis, interpretation of results, and public presentation. The extracted publications were independently analyzed, and a consensus was reached on each paper's stated definitions of the educational scholarship steps.

Results: The results were classified into 12 steps, including recognizing an educational problem, reviewing the literature, analyzing the context, creating a goal-oriented team of stakeholders, determining objectives and planning the SoTL project, finding supportive resources, considering ethical issues, implementing the scholar activities and analyzing evidence, critical appraisal of the SoTL project, reflecting on the SoTL project, documenting the details of the SoTL project, and going public and disseminating the experiences.

Conclusion: Scholars must be able to provide a clear, complete explanation of the innovativeness of their scholarly ideas and the need for this kind of content for their audiences. However, studying and reviewing relevant journals, reflecting on the issues or questions posed, and exchanging ideas with your colleagues are recommended for reviewing and refining scholarly and idea-generation questions.

Keywords: Scholarship, Teaching, Learning, Education, Scholarship of Teaching and Learning, Educational Scholarship

Background

Reviewing the subject of scholarship in higher education in the world is a matter that has been discussed seriously since the publication of the Carnegie Foundation's research results, Ernest Boyer and Rice's work in 1990. At the same time, people were hired at universities with the purpose of education, but the only basis for their assessment was their ability and performance in the field of research (1, 2). In a report published by Boyer and Glasick (1990) (1), a new approach to research was suggested in the field of education. Scholarship can be divided into four areas: First, scholarship of discovery: This kind of scholarship is the same as original research that is interpreted as the discovery of new knowledge to achieve a better understanding of the world as an essential component of academic environments (1, 3, 4). Second, scholarship of integration: In this form of scholarship, the faculty member surpasses limited research and seeks to find a link between research within a discipline or even among different disciplines. (1, 5).

Third, scholarship of service: this form is based on using the generated knowledge and the general utility that knowledge can possess. The scholarship answers how the acquired knowledge can be used in practical fields (1, 4, 6). Finally, scholarship of teaching and learning: "a systematic study of teaching and learning and the public sharing and review of such work through presentations, publications or performances" (7). The main activities of the scholarship of teaching included the engagement with the existing knowledge on teaching and learning, self-reflection on teaching and learning in one's discipline, and public sharing of ideas about teaching and learning within the discipline (7).

Educational activities can fit into five areas "Teaching, curriculum development, study guidance, education leadership and management, evaluation and assessment of learners." Educational scholarship activities can take place in each of these domains, and faculty members may work in one or more domains (8). It can be argued that, firstly, the level of interest of

faculty members and researchers in this area has increased, and more opportunities have been gained for experimentation over time. Secondly, most scholars and researchers in this field often start with their background and prior knowledge of this field or scientific discipline and are unaware of the scientific steps. Therefore, it is essential to provide a systematic guideline for scholarship activities for faculty members to achieve their goals (8).

Since the direction of faculty members is essential for reflecting on the teaching and learning process and implementing scholarly projects to answer their teaching questions and considering that scholarship is a time-consuming process in the field of teaching and learning, it is possible to guide the implementation of this critical task by proper planning, implementation, and evaluation of the faculty members and helping them to disseminate their experiences. Therefore, this study aimed to develop a practical guide for a teaching and learning scholarship project by reviewing and synthesizing literature.

Objectives

This study aimed to develop a practical guide for teaching and learning scholarship activities.

Methods

The present study is a research synthesis. A research synthesis aims to combine the literature results with building a new concept and explaining its components. Research synthesis aims to generate new knowledge or concepts by clarifying the relationships, commonalities, and discrepancies among different reports (9). The research synthesis does not merely gather previous knowledge but combines various findings to explore new concepts and their relationships within a meaningful framework (10). In the present study, we have conducted a research synthesis approach introduced by Hedges and Cooper (11). We explained the steps below:

Formulation of question: In the first step, we formulated a question; "What are the practical steps for conducting an educational scholarship?"

Literature search: We searched PubMed*, Science Direct*, CINAHL*, and Embase*. Search terms included a combination of (a) scholarship, scholar, scholarly, (b) teaching, (c) learning, and (d) education. Database searches were conducted in December 2020 without any limitations related to the authors' country of origin, the authors' affiliation, or the place of publication of the research. Eligibility criteria were defined in articles that 1) included the practice of SoTL or teaching and learning research in the educational system; 2) focused on the definition of the concept of educational

scholarship; 3) described the process of SoTL; 4) described the practical recommendations for conducting an educational scholarship. Articles that focused specifically on 1) educators' or students' attitudes and perceptions toward teaching and learning activities; 2) educational intervention of faculty development or residency program related to SoTL; 3) the dissemination of SoTL through journals or other platforms were excluded. In addition, Publications were excluded if they were non-English and were not published in a scholarly journal (PRISMA flow diagram in [figure 1](#)). Two researchers (F.K, M.M) performed the identification and screening review process.

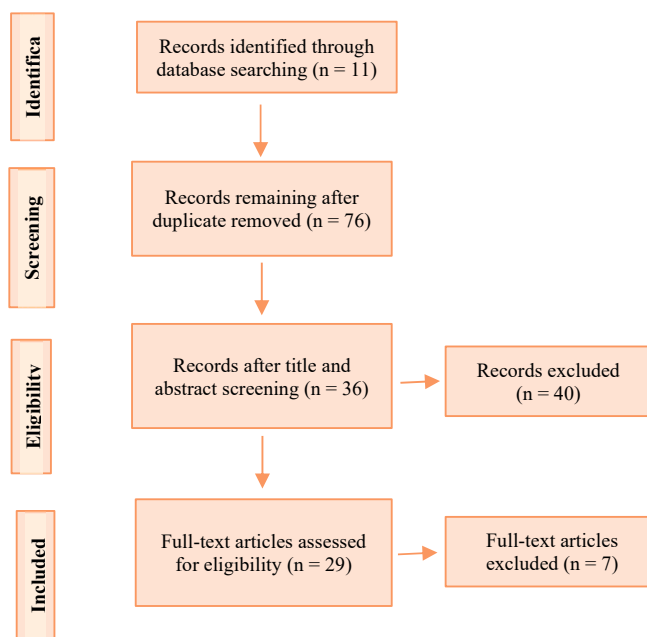


Figure 1. PRISMA flow diagram

Search strategy

- (Scholarship of teaching and learning" OR SoTL OR "educational scholarship" OR "teaching and learning scholarship")
- (Scholarship OR scholar OR scholarly OR inquiry)
- (Scholarly teaching OR excellence teaching OR education research OR teaching and learning research OR research on teaching and learning)
- Teaching and learning" OR education OR "Learning and scholarship")
- (Teaching OR learning OR education)

Data extraction and analysis: In the next step, these extracted articles were screened by scanning the titles and abstracts to identify relevant studies based on the inclusion and exclusion criteria and to remove any duplicates. Title, abstract, and methods screened the

remaining publications, research question, and whether the method or results usefully contributed toward answering the synthesis question. In the data extraction step, to identify the publications eligible for inclusion, researchers (H.A., M.M., F.K.) categorized the following data from each publication: definition of educational scholarship steps and an educational scholarship process.

Synthesis and interpretation of results: In this step, the researchers (H.A., M.M., F.K.) independently analyzed the publications to extract the practical steps of educational scholarship and then reached a consensus on each paper's stated definitions of the educational scholarship steps using a thematic synthesis approach (12). The three-step approach included the free line-by-line coding of the results of studies, the organization of these 'free codes' into related categories to construct 'descriptive' themes, and the development of 'analytical' themes (12). The extracted codes were classified into three categories (a) planning, (b) implementation, and (c) dissemination of findings. A consensus-based approach resolved disagreements in coding.

Public presentation: Finally, a twelve-step practical guide was developed by synthesizing and interpreting the information obtained from the studies. Each step

synthesized the extracted codes to clarify the process of conducting the educational scholarship. The steps are explained in figure 1.

Results

In this study, the following twelve-step guide in the three areas of planning, implementation, evaluation, and publication is offered in the field of the scholarship of teaching to direct academic faculty members in the process of conducting a scholarship program (Table 1). The steps are organized into three phases:

-Planning phase includes recognizing an educational problem, reviewing the literature, analyzing your context, creating a goal-oriented team of stakeholders, determining objectives and planning the SoTL project, finding supportive resources, and considering ethical issues.

-Implementation phase consists of implementing the scholarly activities and analyzing evidence, critical appraisal of the SoTL project, reflecting on your SoTL project, and documenting the details of the SoTL project.

-Dissemination of the finding phase includes going public and disseminating the experiences.

Table 1. The extracted steps of SoTL

Phase	Extracted steps of SoTL	Articles
First phase: Planning	Step 1: Getting started with recognizing an educational problem and/or a new idea	(Cranton, 2011) (13)
		(De Courcy et al., 2017) (14)
		(Rowland and Myatt, 2014) (15)
		(McKinney, 2010, Kenny et al., 2017, Van Melle et al., 2012) (7, 16, 17)
		(Murnaghan et al., 2017) (18)
		(Cranton, 2011) (13)
	Step 2: Reviewing Literature and Finding Evidence	(Potter and Kustra, 2011) (19)
		(Kanuka, 2011) (20)
		(McKinney, 2010) (7)
	Step 3: Analyzing your context	(Rowland and Myatt, 2014) (15)
		(Rowland and Myatt, 2014) (15)
	Step 4: Creating a goal-oriented team of stakeholders	(Chan et al., 2017) (21)
		(McGaghie, 2009) (22)
		(De Courcy et al., 2017) (14)
		Webb 2019, McGaghie 2009 (22, 23)
Second phase: Implementation	Step 5: Determining Objectives and Planning SoTL project	(Murnaghan et al., 2017) (18)
		(McKinney, 2010, McGaghie, 2009, Crites et al., 2014, Alison Stull MSN and Cheryl Lantz MSN, 2005) (7, 22, 24, 25)
		(Rimal, 2017, Rowland and Myatt, 2014) (15, 26)
		(Musolino and Mostrom, 2005) (27)
	Step 6: Finding supportive resources and infrastructure	(Simpson et al., 2007) (28)
		(Haigh et al., 2020) (29)
	Step 7: Considering ethical issues	(Rowland and Myatt, 2014) (15)
	Step 8: Implementing the scholarly activities and analyzing evidence	(Rowland and Myatt, 2014) (15)

	Step 9: Critical appraisal of the SoTL project	(Glassick, 2000) (30)
	(Rowland and Myatt, 2014) (15)	Step 10: Reflecting on your SoTL project
	(Aronson, 2011) (31)	
	(Mezirow, 1990) (32)	
	(Rowland and Myatt, 2014) (15)	Step 11: Documenting the details of the SoTL project
	(Aronson, 2011) (31)	
Third Phase: Dissemination of findings	Step 11: Documenting the details of the SoTL project	(Simpson et al., 2007) (28)
	(Glassick, 2000) (30)	Step 12: Going public and disseminating the experiences
	(O'Loughlin, 2006) (33)	
	(Hall et al., 2018) (34)	
	(McGaghie, 2009, Chan et al., 2018, Cook, 2010) (22, 35, 36)	

Discussion

In this study, the following twelve-step of conducting a SoTL project was organized in the four areas of planning, implementation, evaluation, and publication.

The first phase: planning

Getting started with recognizing an educational problem and/or a new idea: SoTL projects are started by identifying a problem or area of interest in context and developing a research question from that problem.

Faculty usually become interested in a SoTL project by reflecting on the teaching-learning process, something in their own classroom experience as an instructor, and its determinants. It is helpful to start by thinking broadly about a teaching or learning issue, an assignment, a pedagogical strategy, or something of that nature (14). Holding brainstorming sessions between scholars and educational stakeholders to provide opportunities to talk honestly about the issues and problems in their field of study through group discussions was suggested to achieve a new idea for a scholarship. They can also express their views and experiences and get to valuable topics and ideas (19).

The next step would be to put the problem into a question form. These questions can be developed based on teaching-learning background, process, or consequence questions. At the stage of idea generation and design of the question, ask yourself: "What is already known?", "What information is needed?", "What are some possible data collection strategies?", "What resources are needed, and what would the timeframe be?". Three categories of scholarship questions can be formulated as follows:

A. Questions taken from the nature of the problem or topic: An attempt to answer such questions leads to a more precise picture of the nature of the problem, subject, or phenomenon in question. For example, How and to what extent is students' level of understanding

and cognition about theoretical concepts in a scientific major or area? (14).

B. Questions based on the magnitude of the effectiveness, usefulness, or efficiency of strategies, approaches, or interventions: In these types of questions, the effectiveness and efficiency of different methods are questioned. For example, "To what extent can a new practice, method or assignment be effective in learning the educational skills?" (15).

C. The questions are based on a hypothesis, which includes possible scenarios that may result if a specific context is provided. These questions have a preliminary assumption and a result based on the initial conditions in the assumption premise. Mostly, these questions have the conditional format "If ... Then," which measures the hypothesis. For example, "What results will be achieved if a specified approach is used to develop students' thinking and creativity skills during the course?". Table 2 shows the resources for creating a question and idea for scholarship activities.

Scholars must be able to provide a clear, complete explanation of the innovativeness of their scholarly ideas and the need for this kind of content for their audiences. However, studying and reviewing relevant journals, reflecting on the issues or questions posed, and exchanging ideas with your colleagues are recommended for reviewing and refining scholarly and idea-generation questions.

Reviewing Literature and Finding Evidence: After explaining the problem, it is necessary to seek a solution using the informed decision-making approach. Reviewing literature and collecting expert opinions and experiences were recommended in the informed decision-making process (19, 20). Reviewing the literature is vital in each scholarship project (20). It is recommended to find more studies/articles related to your research problem in similar studies or settings and consider them in finding a solution to that problem.

Table 2. The resources for creating a question and idea for SoTL activities (7, 13, 14, 16, 17)

1- Thinking about the teaching-learning process in a classroom or learning environment.
2- Thinking about how to transfer the theory to the teaching-learning function.
3- Attention to the influence of the role of the teacher in the process of the teaching-learning process.
4- Reflecting on new, beneficial, and innovative techniques for teaching a lesson to eliminate past constraints.
5- Using the knowledge gaps in existing evidence, taking into account the limitations in the literature.
6- A critical perception concerning the usefulness and effectiveness of teaching methods.
7- Reflecting on individual performance in the teaching-learning process and exploring possible ways to improve it.
8- Attention to the broad concept of learning (beyond knowledge and skill development) and critical search concerning different aspects of learning (such as the development and reproduction of attitudes or learning-related habits).
9- Review valid evidence regarding evaluation tools and methods for a deeper understanding of the reasons for the effectiveness of educational interventions.
10- Reflecting during and after professional activity, emphasizing critical questions about individual performance.
11- Thoughtful, informed, and systematic research on the teaching and learning of learners.
12- Reviewing available courses and curriculum.
13- Reflection on innovative, evidence-based strategies.
14- Thinking about the teaching-learning process in a classroom or learning environment.

In general, articles, books, and peer-reviewed journals may offer valuable information to find the proper solution. It is also suggested to search the resources in different databases, such as PubMed, Google Scholar, ERIC, Web of Science, and JSTOR (7). Using existing bibliographies and experienced colleagues can be helpful (15).

Analyzing your context: "Identifying context" is obvious and very important for project implementation. In this step, finding the appropriate context for carrying out the activities of the science-research project is considered an influential factor in the planning stage (15). Notably, if the instructor implements the scholar project in owner educational activities, it is more successful because she/he can manage the planning and guidance of training activities. Working in courses responsible for other faculty members can create challenges in implementing and evaluating the scholar process details. An unpleasant feeling in the poor implementation of an innovative project, especially when faculty members are forced to cooperate, has adverse effects on colleagues and students. Therefore, implementing the scholarship project must be carried out more cautiously in courses where you are not responsible.

Create a goal-oriented team of stakeholders: Consultation and collaboration with various stakeholders in implementing any scholarship project is a critical activity. In scholarly projects, forming a team of members, peers, and collaborators, creating a cooperative atmosphere, and expanding scholarship culture in the system play a significant role (21).

The following principles can be effective in creating a successful team:

- Developing common goals and missions.
- Determining the team leader.

- Recognizing team members' roles, expectations, and responsibilities and division of responsibilities.
- Determining standards for achieving expected goals.
- Minimizing the difference between team members.
- Building trust and friendly relationships between team members.
- Promoting joint activities.

Moreover, the establishment of collaboration among team members makes it essential to create mentoring relationships with persons who can lead the design and implementation of a scholarly project. Establishing a mentorship relationship, consultation, cooperation, and communication with the mentor, peers, and colleagues and leadership skills are recommended (22, 23). Furthermore, it is recommended for learners to participate in the scholarly work not only as a subject or examinee but also to conduct research methods (e.g., focus group technique) and analyzing method (e.g., content analysis approach) (14).

Determining objectives and planning the SoTL project: After finding a solution, you must consider the project's purpose, how to achieve it, and how to evaluate it. Questions, objectives, and context are three essential subjects that should be considered in designing a scholarship project.

Proper planning is one of the essential activities of scholarship (18). The following activities are proposed at this stage:

- ✓ Determining the objectives and population of the SoTL project.
- ✓ Identifying ways to attract stakeholder participation, especially learners in the scholarship process.
- ✓ Using conceptual theories and conceptual frameworks in the SoTL project.
- ✓ Using literature to integrate with scholarship programs.

- ✓ Developing innovative and evidence-based teaching strategies.
- ✓ Considering the appropriate methodology for designing scholarship, collecting and analyzing evidence and data.
- ✓ Attention to the proportion between the research method, goals, and objectives of the scholarship project.
- ✓ Flexibility in changing the methods used in scholarship design in the event of a change of position.
- ✓ Locate the research site, for example, a course, a class, a cohort, homework, or a database.
- ✓ Considering time management skills.
- ✓ Taking into account project registration for ethics review and approval of organizational ethics.
- ✓ Finding the project budget and attracting sufficient resources to carry out the project (such as internal and external funds) (7, 22, 24, 25).

The desirable function of the project requires a powerful application of research methodologies to create a link between scholarly questions and learners' learning at the heart of the project (15, 26). The principles of methodologies in designing, specifying the target population, determining the criteria for inclusion/exclusion of the participant and sampling, collecting data, analyzing the data, and the publication process must be considered in this step. In scholarly projects, quantitative or qualitative methods can be used proportionally. It is recommended to use the mixed method in scholarship projects so that qualitative methods (such as grounded theory, ethnography, narrative analysis, phenomenography, and classroom observations) are combined with quantitative methods (quasi-experimental and descriptive) to generate richer data.

You should note that you encounter a set of limitations, such as ethical constraints in conducting any research, which should be considered when choosing the appropriate method for your project. Scholars must consider flexibility in scholarship design even if it may be necessary to redesign the project, and you must be prepared to do this.

Finding supportive resources and infrastructure: Different supportive sources such as resources and organizational support are needed to design and implement scholarly activities. It should be noted that the planning for allocating human resources, developing political support, and carrying out symbolic activities (including awards for educational activities to create a supportive environment for the development of

scholarship activities) should be considered (27). Furthermore, establishing forums as a supportive source can provide opportunities for sharing scholars' experiences with colleagues; consultation with their peers can be considered faculty development situations (27). The organizational infrastructure can be incorporated to support the development, critical appraisal, and publication of scholarly activities (28, 29).

Considering ethical issues: It is advisable to think about ethical considerations when designing a scholarship project. The three categories of ethical issues are:

- a) Ethical issues about using the students' research results. For instance, applying the results of a scholarship or research without permission from participants or students may cause inconsistency with ethical research principles.
 - b) The ethical aspects of choosing the methods or strategies for conducting a scholarship project, such as what methods or tools have to be used to collect, extract or analyze data.
 - c) Ethical aspects of disclosure of the results of a scholarship project and general report as the importance of adherence to the ethical principles of respecting the privacy of individuals in a report (15).
- In general, it is vital to consider three ethical criteria for evaluating the ethical aspects of a scholarship project.
- a) Obtaining informed consent from participants in the SoTL project: All subjects or participants in the SoTL project have the right to be aware of the title, subject, and purpose of the project, as well as the tools or methods of research and how to disseminate the results of the work, and where and for which purpose the research findings will be used.
 - b) The right of all participants in the research concerned to have their privacy and/or personal information protected. Participants in a scholarship project expect their privacy and personal information or demographic information or data to be respected anonymously. Data should be used in the analysis process or the assessment of research hypotheses.
 - c) Protecting participants against physical, emotional, and social harms or defects (15).

The second phase: implementation

Implementing the scholarly activities and analyzing evidence: It is crucial to adhere to the principles of methodology associated with each method. The implementation of procedures and tools must be accurate in each method and data analysis and interpretation at this stage.

In addition, no matter which method is supposed to be used, you must comply with ethical principles such as

obtaining informed consent in various steps from implementation to interpretation of data (15). A good scholar requires different stakeholders' involvement in the educational project process. Therefore, it is essential to engage stakeholders in the process of implementation. It is recommended that the learners participate in different project stages (15).

Critical appraisal of the SoTL project: It is necessary to carry out a systematic evaluation. In order to evaluate systemically, Glassick et al. defined the six criteria for evaluating a scholarly project (30). Based on these criteria, scholarship is an innovative activity in solving a problem, extending the boundaries of knowledge, and entering new areas that have clear objectives, sufficient preparation, using appropriate methodology, significant outcomes, the appropriate presentation of the program, and critical appraisal toward it (30).

According to Glassick's study (30), scholarship activities should:

1. Have clear, meaningful, and realistic objectives.
2. Be prepared enough.
3. Have an appropriate methodology for its implementation.
4. Have significant and considerable results.
5. Be publicly available in an appropriate manner.
6. Be appraised critically.

Reflecting on your SoTL project: Reflecting on the process of scholarship, summarizing the personal experiences of scholars concerning the use of specific teaching methods, or the application of a specific learning model, and the expression of its results and outcomes in a practical manner can help document and revise the process of the project (15). Although reflection is not a cure, it helps the scholar assess the different practical and ethical aspects and dimensions of the scholarship activity (31). Scholars have a conscious and integrated understanding of their experience by reflecting on the activities. Hence, the reflection consequence will reach positive and negative points of the selected activity. Reflection will ultimately provide practical recommendations for the continuation and development of selected measures for other scholars (32). Critical appraisal, reflection, and application of their results for designing future scholarship projects are defined as the foremost step in the scholarly field (37).

Documenting the details of the SoTL project: Note that scholarship is an evidence-based activity (28). You must adhere to the principles of reporting each method used in scholarly activities. Table 3 shows the principles of reporting scholar activities.

Table 3. The principles of reporting SoTL activities (7, 18, 28, 34, 35, 38)

1- Emphasizing innovation in your field.
2- Focusing on scholarly activities.
3- Use a conceptual framework and existing theories to guide or introduce your scholarship.
4- Determining your goal(s) or question(s) clearly.
5- Considering the generalization to the existing activities and policies while compiling the research question and the conclusion, as well as suggesting further research to solve the existing questions and challenges.
6- Ensure that goals or questions are timely, relevant, standard, and necessary.
7- Considering that scholarship evidence should be acceptable in support of new policy formulation or policy change.
8- Using common terminology and readable format, as well as tables, shapes, and graphs, if possible, in reporting documents.
9- Provide some indicators of the effectiveness of the implemented innovation or essential points from the class performance in the documentation.
10- Make sure that evidence from scholarship shows a causal relationship between proposed teaching methods, methodologies, students' outcomes, or at least comments related to perceived effectiveness associated with the proposed methodology. The opinions associated with the process and teaching mechanisms, the outputs of students, or their behaviors are considered valuable outcomes.
11- Documenting yourself systematically and consciously through available literature and "best practice."
12- Presenting all documentation related to scholarship effectively and accurately.
13- Assuring that the documentation provides evidence of the quality and quantity of educational activities.
14- Make sure that publications of scholarly activities are retrievable, documented, and archived to allow them to be repeated by other researchers.
15- Emphasizing innovation in your field.

The third phase: dissemination of findings

Going public and disseminating the experiences: According to Glassick's criteria, sharing scholarly results with peers is essential for evaluating scholarship activities (30). Although publishing the achievements of scholarship activities is not the primary goal, most

scholars are interested in publishing their scholarly projects in related journals to present them to other scholars. Peer review and public dissemination defined the common elements of SoTL (39).

Scholarly project journals are good tools to help disseminate educational scholarship processes (33).

Typically, printing scholar activities are time-consuming because the process of reviewing, accepting, and publishing articles is long. Therefore, adhering to the publication rules and familiarity with the selected journal when submitting is crucial. Also, scholars must check the text of the article in literary, grammatical, and lexical terms before publishing the scientific article (34). Scholarly processes can be published in journal articles, presentations at conferences, publications (for example, books, monographs, chapters in books), other written works (for example, financial contributions, educational instructions, assessment reports for foreign institutions/organizations), reporting academic activities related to teaching (for example, new courses, new programs, student/program, textbooks, interdisciplinary program) (22, 35, 36).

Conclusion

SoTL project is one of the critical concepts in the field of education, which can affect the quality of teachers' teaching and learning process. The present study developed a practical guide for conducting a SoTL project. We outline how to conduct the essential components of successful scholarship of teaching and learning. Scholars must be able to provide a clear, complete explanation of the innovativeness of their scholarly ideas and the need for this kind of content for their audiences. Nevertheless, studying and reviewing relevant journals, reflecting on the issues or questions posed, and exchanging ideas with your colleagues are recommended for reviewing and refining scholarly and idea-generation questions.

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Comparison of the Effect of Lecture and Group Discussion on Health Workers' Knowledge and Attitudes about Asthma Based on the IraPEN Program

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Abstract

Background: The group discussion method is one of the student-centered and active teaching methods in which learners actively participate in educational activities using discussion, and they are given the opportunity to share their opinions and experiences with others.

Objectives: The present study was conducted to compare the effects of the group discussion method and the lecture method on health workers' knowledge and attitudes.

Methods: In this quasi-experimental study, 70 health workers working in Baft, Kerman province, were selected by census method and divided into two groups of 35 people. Asthma-related educational content was presented for one group as a lecture and the other as a group discussion. Before and after the intervention, health workers' knowledge and attitudes scores were evaluated and compared using a researcher-made questionnaire.

Results: The mean age of participants was 38 ± 2.7 years. After the intervention, the mean score of attitude was 65.86 ± 6 in the lecture group and 68.66 ± 4.7 in the group discussion group, indicating a significant difference ($p = 0.04$). The mean score of knowledge after the intervention was 11.4 ± 1.66 in the lecture group and 11.28 ± 1.6 in the group discussion group, which was not statistically significant ($p = 0.77$). In both groups, the mean scores of knowledge and attitude increased significantly after the intervention ($p < 0.0001$).

Conclusion: The results showed that education affected the increase of health workers' knowledge and attitudes in both groups. Also, the group discussion method had a greater effect on increasing the attitude of individuals compared to the lecture method; however, this effect was not significant for knowledge. Therefore, it can be concluded that for the training of health workers, it is better to use integrated teaching methods to create deep and efficient learning as well as positive attitude and motivation.

Keywords: Lecture, Group Discussion, Knowledge, Attitude, Asthma

Background

In the last two decades, significant efforts have been made to improve teaching-learning methods in the field of medical sciences. The lecture method has a long history in medical education but has been widely criticized for its inefficiency in achieving educational goals in various fields. In a traditional lecture, learners are passive recipients of information and do not actively participate in the learning process (1). The group discussion method is one of the student-centered and active teaching methods in which learners actively participate in educational activities using discussion, and they are given the opportunity to share their

opinions and experiences with others. The group discussion teaching method increases the power of criticism in learners (2). Many scientific principles of education can be well generalized in the field of medical education. Medical education includes various dimensions, such as characteristics of the subject under study, educational environment, a sense of responsibility, organizational belonging, and relationship with peers, professors, and patients (3).

Based on the results of Azizifar's (2020) study, there is a significant difference between the effectiveness of the group discussion and the lecture teaching methods in teaching curricula on academic performance in

technical school, in such a way that the performance scores of technical school learners taught by the group discussion teaching method increased significantly compared to the lecture teaching method (4).

The results of Zhao and Potter's study (2016) showed that only after one educational session a significant difference was observed between the scores of students in the control group and the intervention group in both groups, but in multiple-choice tests, this difference was not observed in the scores. It seems that discussion-based learning may lead to better practical knowledge and possible retention of long-term knowledge compared to lecture-based learning (5). At present, the common and formal method in medical education is the lecture method, which has advantages such as cost-effectiveness, but there is much dispute about the role that this teaching method should play in modern medical education. Certainly, traditional lectures do not correspond to modern learning theory (6). The group discussion teaching method significantly increases interaction skills and problem tracking. It can be due to the need for learners to interact and cooperate in group discussion and thus strengthen these skills (7).

In order to investigate the role of the group discussion method in increasing learning and learners' sense of participation, Safari et al. (2011) concluded that the scores of a group of students who had learned the materials theoretically and practically along with group discussion were significantly higher than individuals who had learned them in the form of lectures and theoretical and practical topics, and the amount of learning in them was more than the traditional method of teaching anatomy. Probably, the presence of a sense of group participation and more communication between the professor and the student will increase the motivation for further study (8). Due to the increasing developments of knowledge and continuous confrontation with new dimensions of new treatment-care methods, self-direction in learning is considered one of the students' most important professional competencies (9). Encouraging students to study and search for texts and resources to find the latest and most valid evidence and present it in the classroom, the discussion-based learning method, on the one hand, draws students' attention to education and, on the other hand, provides a fun educational environment to ask questions and provide opinions by creating a learning atmosphere from each other (10).

In a study, Raut et al. (2014) used the group discussion method as an innovative teaching method (microbiology) at Chuan Medical School, Nanded College. After holding the group discussion sessions, the

learners' scores increased significantly, and the students agreed that there was no confusion during the group discussion method, and group discussion helped them better understand and recall the subject and develop the basic characteristics of a successful physician (11). Traditional education is not enough to meet the educational needs of employees and manage complex affairs in today's world; therefore, new and appropriate patterns and methods, as well as scientific and systematic methods, should be used, both in determining the needs and in implementing the desired education so that managers and employees are encouraged to shift from a passive and traditional to an active and creative role (12).

In Rieshahri et al.'s (2018) study conducted to compare the effects of lecture, group discussion, and educational package teaching methods on the level of awareness regarding drug abuse in high school male students in Bushehr, the results of statistical analysis showed that group discussion, lecture, and educational package positively and significantly affected the students' awareness. Also, the group discussion teaching method had a greater impact on learners than the lecture and educational package methods; therefore, this study showed that group discussion was the most effective teaching method in increasing the level of awareness regarding drug abuse (13).

In the health system of the country, the first category of human resources at the forefront of providing health care is the health workers in health centers who are responsible for educating and providing health services in the villages and if education is provided for this stratum of society and the educational courses are designed based on the educational needs of health workers, not only health workers but also clients of health centers will benefit from these educations, and the waste of national capitals will be prevented (14). The package of essential noncommunicable (IraPEN) disease program was implemented for the first time in the four cities of Baft, Naqadeh, Shahreza, and Maragheh in 2015. In this program, in health centers and health bases, the 10-year risk of fatal and non-fatal heart and brain attacks and strokes and the target population of the program are identified, even when they are not symptomatic or ill, and in proportion to the obtained probability, measures are taken to prevent the disease or its complications. In addition, in the field of cancer diseases (colon, breast, cervix) and asthma, measures are taken for early diagnosis and interventions (15).

So far, no codified study has been conducted to examine health workers' knowledge and attitudes about

IraPEN in the country. The results of the health workers' awareness test on IraPEN and asthma are not desirable. On the one hand, the usual teaching method for teaching health content to employees has always been lecture, but this teaching method seemingly is not able to create deep, effective, and efficient learning. The present study compared a teacher-centered teaching method (lecture) and a learner-centered method (group discussion). Also, the studies have found that the effects of group discussion and lecture on medical and paramedical students and even students are compared, and no study was found to examine the effects of these two methods on health workers, who are at the forefront of health education. On the other hand, in the studied texts, contradictory results were obtained from the effect of group discussion compared to the lecture method.

Objectives

The present study was conducted to compare the effects of the group discussion method and the lecture method on health workers' knowledge and attitudes.

Methods

The present study is a quasi-experimental intervention to compare the effectiveness of the group discussion and lecture teaching methods on health workers' knowledge and attitudes about asthma. Due to the limited statistical population, all health workers ($n = 70$) were included in the study by census method. Then, the individuals were divided into two groups of 35 people. The individuals' placement in lecture and group discussion groups was performed using the block randomization method in R software version 4.1.0. The education sessions of the two lecture and group discussion groups were held on different days so that the way of holding sessions of the two groups did not affect each other. The instructor was the same for both groups. The content of the asthma educational package was presented for one group as a lecture and for the other group as a group discussion in 4 sessions of 60 minutes. The rules for holding sessions were reminded to the participants in the group discussion method. Individuals were assigned into groups of five, and no framework was considered in terms of gender segregation so that individuals could better communicate with group members. The composition of the groups was constant until the end of the sessions. One person was elected as the leader of each group, and the seats were arranged in a circle.

The topics discussed in each session were identified for each group, the content raised in each session was

also divided into several sections, and they were asked to study the same section for 5 minutes. Then, all group members discussed the matter and, while discussing, asked each other questions and answered. The instructor did not have an active role in the teaching process and only tried to direct the discussion, prevent the discussion from deviation, and answer the questions and problems of the group members by moving between different groups. After the groups finished reading the material, each group raised five questions for the next group; therefore, aiming at raising a question, the contents were reminded once again for each group. The questions of each group were given to the next group to answer in consultation with each other, and the final answer was provided conclusively. After collecting the answers, all groups were gathered in one place and discussed the questions and answers, and the instructor was only the discussion leader.

Session 1: At first, the participants in the group discussion group were pretested. Then, an educational video on asthma was first shown to the participants to arouse their interest in the discussion subject. Individuals were placed in their own groupings, and the discussion began according to the rules of group discussion classes. The raised material in this session included asthma-related introductory topics, disease definition, causes of asthma, disease course, and asthma symptoms.

Session 2: In this session, topics related to an asthma attack, disease diagnosis methods, how to use a breath meter, asthma control, and treatment, and patient education were discussed. Sometimes the group members deviated from the discussion, which was one of the instructor's problems in returning the individuals' focus to the subject. Since individuals had not been educated in this way previously, they expected the instructor to play a greater role, but the instructor's role was only to facilitate the discussion and try to have the least involvement in the individuals' discussion in each group.

Session 3: The raised topics included therapeutic assistive devices and inhalation techniques, asthma pharmacotherapy, determining a treatment plan for asthma attacks, and asthma control in specific conditions. During the group discussion, disagreements occurred between the group members, and it was difficult for them to accept opposing views; the group leader was asked to help solve this problem. Someone took notes of what the group members were saying to present at the end.

Session 4: The duties of the health worker and the health caregiver regarding the asthma prevention and control program, identification of suspicious individuals, referral of suspicious individuals, and patients' follow-up and care were discussed. In this session, a general practitioner was also invited as an informed guest member so that the members of each group could ask their questions and the problems would be resolved.

For the participants in the lecture group, the research objectives and expectations were clearly explained in the introductory session. In order to increase the interaction between the learner and the teacher, feedback was regularly received from the learners during the lecture session, and their opinions on the raised issues were asked; sometimes, the question design method was also used to create the concentration in learners; they were asked to bring paper and pen to take notes for deeper learning, and a summary was made at the end of each session.

Session 1: At the beginning of the session, the research objectives were shared with the participants. Of the estimated 60 minutes, 50 minutes was devoted to teaching asthma-related introductory topics, disease definition, causes of asthma, disease course, and asthma symptoms, and at the end, 10 minutes was devoted to asking and answering questions.

Session 2: At the beginning of the second session, the participants' level of awareness regarding the previous topics was assessed using oral questions, a summary of the content was provided as a reminder, and topics related to an asthma attack, disease diagnosis methods, how to use a breath meter, asthma control, and treatment, and patient education were taught by lecture method. For practical work, learners were asked to measure their normal lung function with the device.

Session 3: With the coordination made, the learners attended the class, and the problems of the previous sessions were resolved. The topics related to therapeutic assistive devices and inhalation techniques, asthma pharmacotherapy, determining a treatment plan for asthma attacks, and asthma control in specific conditions were then taught completely. Learners were

also asked to write their questions on small pieces of paper. Finally, the papers were collected, the questions were answered, and the last 10 minutes were devoted to asking and answering questions.

Session 4: Materials related to the duties of the health worker and health caregivers in the asthma prevention and control program, identification of suspicious individuals, referral of suspicious individuals, and patients' follow-up and care were taught. All materials stated from the first to the last session were summarized in the final session. One month later, the post-test questionnaire was distributed among the participants of the two groups, and they completed the questionnaire.

The data collection tool was a researcher-made questionnaire with a content validity index (CVI) of 0.80 [CVI = 0.80] and a content validity ratio of 0.99 [CVR = 0.99] of the questionnaire calculated by Cronbach's alpha method, which the reliability of the attitude questionnaire, knowledge questionnaire, and total reliability were obtained 0.76, 0.72, and 0.72, respectively. The research findings were analyzed using SPSS21 software. The paired t-test was used to compare the scores before and after the health workers' knowledge and attitudes with the lecture teaching method, as well as the attitudes before and after the group discussion method, and the Wilcoxon test was used to compare the knowledge before and after the group discussion method. In order to compare the health workers' attitude scores in group discussion and lecture after the intervention, the independent t-test was used, and for their knowledge score, the Mann-Whitney test was used.

Results

The mean age and standard deviation of the study samples (70 health workers working in Baft health center) were 38 ± 2.7 . Also, 68.6% of participants were female, and 31.4% were male. Other demographic information is provided in [Table 1](#).

[Table 1](#) shows the health workers' demographic characteristics in the two lecture and group discussion groups. According to this table, the participants' demographic characteristics were not statistically significant in the two groups.

Table 1. Comparison of health workers' demographic characteristics in the two lecture and group discussion groups

Variable		Group		p-value
		Group Discussion (Percentage) Frequency	Lecture (Percentage) Frequency	
Gender	Female	24 (68.6)	24 (68.6)	1
	Male	11 (31.4)	11 (31.4)	
Level of education	Elementary school	2 (5.7)	1 (2.9)	0.37
	Middle school	5 (14.3)	8 (22.9)	
	Diploma	19 (54.3)	22 (62.9)	
	Associate	6 (17.1)	4 (11.4)	
	Bachelor	3 (8.6)	0 (0)	
Work experience	0-10 years	10 (28.6)	13 (37.1)	0.18
	11-20 years	14 (40)	7 (20.0)	
	21-30 years	11 (31.4)	15 (42.9)	
Age	22-34 years old	10 (28.6)	13 (37.1)	0.74
	35-47 years old	16 (45.7)	14 (40.0)	
	48-60 years old	9 (25.7)	8 (22.9)	

Table 2 shows the comparison of the mean scores of health workers' knowledge and attitudes in the two lecture and group discussion groups before and after the intervention. Before the intervention, no significant difference was observed between the lecture and group discussion groups in terms of knowledge and attitude mean scores ($p > 0.05$). After the intervention, there was

no statistically significant difference in the mean scores of knowledge in the two lecture and group discussion groups, but the mean score of attitude in group discussion was significantly higher than that in the lecture group ($P = 0.04$).

Table 2. Comparison of the mean scores of health workers' knowledge and attitudes in the two lecture and group discussion groups

Variable		Group Mean (SD)		p-value
		Group Discussion	Lecture	
Before	Knowledge	2.17 (7.25)	2.45 (7.8)	0.33
	Attitude	8.29 (61.5)	7.44 (63.14)	0.27
After	Knowledge	1.63 (11.28)	1.66 (11.4)	0.77
	Attitude	4.78 (68.66)	6 (65.86)	0.04

Table 3 shows the comparison of the mean scores of knowledge and attitudes of each group before and after the intervention. According to this table, after the intervention, the mean score of health workers'

knowledge and attitudes in the lecture group increased significantly ($P < 0.0001$).

Table 3. Comparison of the mean scores of knowledge and attitudes of each group before and after the intervention

Variable	Group	Before the Intervention Mean (SD)	After the Intervention Mean (SD)	p-value
Knowledge	Lecture	2.45 (7.8)	1.66 (11.4)	< 0.0001
	Group discussion	2.17 (7.25)	1.63 (11.28)	
Attitude	Lecture	7.44 (63.14)	6 (65.86)	
	Group discussion	8.29 (61.05)	4.7 (68.66) 8	

Also, after the intervention, the mean score of health workers' knowledge and attitudes in the group discussion group increased significantly ($P < 0.0001$). (Table 3)

Discussion

Based on the obtained results, education, both in lecture and in group discussion teaching methods, positively affected health workers' knowledge and attitudes, and the scores of both groups increased significantly after education. Also, the attitude scores of health workers who were taught by group discussion were significantly higher than those in the lecture group, indicating the greater impact of the group discussion method on the attitude of participants in this study. The present research showed that the mean scores of health workers' knowledge about asthma in the two lecture and group discussion groups were not statistically significant at the end of the intervention. In the explanation of the above findings, it can be said that the lack of significant difference in subjects' knowledge scores between the two lecture and group discussion teaching methods in this study may be due to the evaluation of the effectiveness of these two methods in inappropriate time intervals with education sessions. On the other hand, health workers who have always been taught by the lecture method are more familiar with traditional teaching-learning systems and feel more comfortable with these methods, which may be due to their previous level of education and experience as well. Also, due to the unfamiliarity of health workers with the way of implementing group discussion and this teaching-learning method, it seems that there is less flexibility for accepting new teaching methods among health workers, and the lack of significant difference between the two methods does not reject the superiority of group discussion, and the participants were implicitly satisfied with the group discussion method, too. The difference between the statistical population of this study and other studies can also be the reason for the discrepancy in the results.

The results of Sohrabi et al.'s (2021) study conducted to compare the effect of education through lecture and group discussion on nursing students' learning and satisfaction showed that the difference between the final scores and satisfaction in the two groups was significant. This difference was quite evident regarding satisfaction with the teaching method, ease of receiving answers to questions, spending participants' energy, and creating motivation in the two groups. However, in this study, the group discussion method did not improve students' scores (6). Also, in our study, no statistically significant

difference was observed in the knowledge scores of the participants in the group taught by lecture and group discussion teaching methods.

In Isfahan Kalati's (2014) study conducted to compare the two lecture and group discussion methods on pregnant women's level of nutritional awareness, the results of awareness assessment in the final test showed no significant difference between the two methods, but in both groups, after the intervention, the pregnant women's level of knowledge increased compared to before (16), which is consistent with the results of this study on the learners' level of knowledge.

The results of Motrofin et al.'s (2017) study conducted to investigate the difference in the effects of the lecture versus group discussion teaching methods on the learning outcomes of trainee students showed that the learning outcomes of students who were taught by the lecture method were different from those taught by the group discussion method and it was proved that the group discussion method was more effective in improving students' learning outcomes than the lecture method (17).

The results of Arias' study conducted to compare small group discussion with a traditional lecture showed that the educational consequences of small group discussion were more effective in dentistry students' learning and students' practical skill acquisition than the traditional lecture. The learners of discussion groups had a higher score than the learners in lecture groups when testing the skill performance, but no significant difference was observed in the score of knowledge acquired between the two groups in the written test. The format of the education session did not seem to have a direct effect on the acquired knowledge, but in terms of performance, group discussion learners scored better (18). The results of this study are in line with our study regarding knowledge, and there is no difference in both groups.

The results of Karimi et al.'s (2006) study conducted to compare the effects of lecture and group discussion on learning and recall in nursing and pediatric diseases in nursing students also indicated that the level of learning in the two lecture and group discussion teaching groups increased significantly and the level of learning in the lecture group was significantly higher than that in the group discussion method, but the persistence of the learned material significantly increased in group discussion teaching method than the lecture method (19), which is consistent with the results of our research as such education in both methods has affected the increase of learners' level of awareness. It is worth noting that in this study, it is not the case that

group discussion always has had a better result than lecture.

In Johnson et al.'s (2009) study, the students who had been taught by the conventional method showed an improvement in attitude, knowledge, and performance scores, but this improvement was not evident in the problem-based learning (PBL) method (20).

The results obtained from Hekmatpo et al.'s (2013) study regarding the subjects' knowledge and awareness and also the students' views and attitudes on the way of living lesson showed that group discussion led to increasing the learners' awareness of this lesson than the lecture method, but there was no significant difference between the two methods in their view of the lesson content (21), which was exactly the opposite of the results of our research because there was no difference between the learners' knowledge scores between the two methods, but individuals' attitudes regarding asthma had improved in the group discussion teaching method than lecture.

Rawas et al. (2020) conducted a study in Saudi Arabia to compare the effect of traditional education and individual activities versus small group discussion on the students' test performance. In this study, students were assigned to two groups. The educational content was presented to one group as an activity in small groups and to the other group as individual activities and traditional education. At the end of the sessions, the test was performed. The results showed a significant difference in the scores of the two groups, and students taught in the small group discussion method obtained a higher mean score (22).

The results of Aghapour et al.'s (2015) study conducted to compare the effects of the two lecture and group discussion teaching methods on the subject of clinical theory of pregnancy showed that teaching through the student-centered group discussion method with observing relevant standards was more effective on the learning level of midwifery students than lecture; on the other hand, the information retention was also higher. The results of this study showed that the desire and interest of learners in the group discussion teaching method was stronger and the time spent studying these courses was much less than in the classes taught by the lecture method. Comparing the results of the end-of-class test to each session shows the students' learning and perception in the group discussion method compared to the lecture method classes, showing a significant difference (7).

In Raut et al.'s (2014) study, which used the group discussion method as an innovative method for teaching microbiology at Chuan Medical School, Nanded College, the data analysis showed that after group

discussion sessions, learners' scores increased significantly, and the students agreed that there was no confusion during the group discussion and that the group discussion not only helps better understand and recall the topic but also develops the basic characteristics of a successful physician (11). In Raut, Rawas, Johnson, and Aghapour's studies, the group discussion method was more effective than the lecture method.

In a study entitled "Changing Internships from Traditional Lectures to Small Groups" on medical students to teach general surgery, Cendan et al. (2011) showed that the mean scores of students educated in small groups versus only-lecture groups significantly improved. The time spent preparing the group was longer, but the satisfaction with the educational environment was also higher than the lecture group (22), which is not consistent with the results of this study.

In this study, the level of attitudes of the participants in the group educated by the group discussion method compared to lecture increased significantly, which can be due to the fact that in the group discussion method, the learner's power of expression is strengthened, and finally, his/her tolerance in hearing different opinions promotes and acquires the skills of interacting and exchanging ideas with others through cooperation. On the other hand, this method increases self-confidence and reduces shyness in learners, and makes them practice things such as listening correctly, paying attention, respecting the rights of others, respecting the opinions of others, and accepting the opinions of others. The lack of a significant difference between the knowledge scores in these two teaching methods is not a reason for the inefficiency of the group discussion method. Therefore, it can be concluded that for health workers' training, a combination of teaching methods can be used to create deep and efficient learning and positive motivation and attitude because it seems that in the case of asthma, if health workers have enough motivation to screen, educate, and care for patients, they can take an effective step to reduce the incidence and better quality of life of patients.

Conclusion

The health workers' attitude score increased during the group discussion method. Increased learners' participation is recommended by applying active teaching methods that can provide more learning opportunities and motivation.

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

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Factors Affecting Academic Failure from Students' Perspectives

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Abstract

Background: Students' academic failure is one of the educational problems causing the loss of allocated resources.

Objectives: This study aimed to assess the factors affecting the academic failure of students and their viewpoints regarding the factors affecting educational achievement at Guilan University of Medical Sciences, Guilan, Iran.

Methods: The present cross-sectional analytical study was conducted on 375 students in medical, nursing, and other related fields. A valid and reliable multipart questionnaire was used as a data collection tool. Based on the obtained results, the criteria for academic failure were extracted. Then, due to abnormal data distribution, Spearman nonparametric statistical test was used to analyze the data using both SPSS software (version 23) and GraphPad Prism software (version 7).

Results: According to the obtained results, the frequency of academic failure in the study population was 25.6%. Moreover, 28.46% of the students were satisfied with their field of study. Academic failure showed the strongest relationships with gender, regularity, and precision in the study. Furthermore, the most effective factors in educational achievement from the students' viewpoints were student motivation, professor's mastery over the subject, and student occupational future.

Conclusion: It is necessary to create a system to precisely investigate students' academic failure and counseling needs to help them if necessary.

Keywords: Educational Achievement, Academic Failure, Satisfaction, Students, Iran

Background

Every year, numerous young individuals complete school days and step toward the future with entrance to the university (1). Entry into the university is an important event and critical cross-section because it affects the student's social, familial, and personal life and causes an individual to face new challenges (2). Currently, universities are of great importance in all countries of the world. The university is considered a community in which students and professors are two pillars, and its quantitative and qualitative growth and promotion are at the core of the careful attention of officials (3, 4). In this regard, student academic failure is one of the most important problems in educational systems in all countries (3, 5).

According to the United Nations Educational, Scientific, and Cultural Organization, academic failure is defined as course repetition, early school leaving, and

a decline in the learners' educational quality. Studies have provided a variety of definitions of academic failure (6-8); however, their common point is failure in education. Based on the aforementioned studies, various criteria, such as decreased scores, undesirable averages of scores, repetition of a lesson or educational course, prolongation of the study period, conditionality, expulsion, leaving education prior to the due date, and change in the field of study are symptoms of student academic failure (4). Learning and academic achievements are realized when the physical, mental, and social characteristics of students are considered (9). Academic failure is the cause of psychological, emotional, familial, and social problems for students (5, 10). Frustration and loss of self-esteem, lack of prosperity of talents and abilities, the risk of committing a crime, physical and sexual abuse, drug and alcohol

abuse, and even suicide can be the consequences of academic failure (3, 11, 12).

Academic failure is not only an individual problem but also has effects on the whole society, including the loss of human resources, time, and educational costs (10, 11, 13-15). Meanwhile, students who graduate from various fields of medical sciences and therapeutic services are custodians of individuals living in society (7). If these students complete their education with academic failure, they will not be empowered enough scientifically and practically, and their poor performance can lead to human casualties and financial losses with irreparable consequences (13, 16, 17). Each year, about 10% of students entering different fields of medical sciences experience academic failure in some stages (18). In addition, about half of the students experience failure in at least one course (16). The average rate of academic failure among medical students in Iran is high, compared to those of developed countries, such as England (17). Meanwhile, medical students are facing more academic failure than others (5, 19, 20), most of whom are in the first years of study in the course of basic sciences (20).

To date, various studies have been conducted to investigate and identify the causes of academic failure. The results showed the fundamental and important role of academic interest and satisfaction in the rate of academic failure (11, 21, 22). Studies conducted in Iran on educational satisfaction have shown that most students have a small degree of satisfaction with their field of study (19, 23). Other factors affecting this phenomenon include gender, age, marital status, the field of study, living in a dormitory, being non-native, high Internet usage, lack of scientific and research activities, employment during education, absence from classes, the time interval between the diploma and the university entry, the average of diploma scores, the type of diploma, the occupation and the level of parents' literacy, the number of family members, physical and mental problems, personal characteristics, learning style, self-esteem, and test anxiety (6, 8, 24).

Other studies have shown that academic failure is affected by the number of accepted students (17). And the educational variables and criteria for entering the university, such as the different quotas for entering the university, which are provided by the country's government system for certain groups of people, such as people who live in deprived socio-economic areas, are the main effective factors (10, 17, 20). The disparity between the current capacity of universities and the future needs of the labor market, the occupational future of the course of study and lack of hope for occupational future

(4), and educational factors related to resources and equipment, such as the availability and usefulness of educational assignments, the usefulness of the resources provided by the professors, educational planning, the content of the courses, the teaching methods of the lecturers and their experience in teaching, and educational stressors (e.g., educational conditions and educational and dormitory environments), can also affect academic failure (11, 14, 25, 26).

Objectives

Considering the importance of academic failure, especially in students of different fields of medical sciences, the researchers of the present study considered it necessary to assess the students' viewpoints regarding the factors affecting educational achievement and preventing the occurrence of academic failure and offer a solution to solve this problem based on the obtained data.

Methods

This cross-sectional analytical study was conducted to investigate the factors affecting students' academic failure and their viewpoints regarding the factors affecting educational achievement at Guilan University of Medical Sciences, Guilan, Iran, within 2017-2018. The convenience sampling method was used to select the population under study, and the Cochran formula was employed to calculate the required sample size. Accordingly, the minimum sample size was 370 students who completed at least one semester.

$$n = \frac{\frac{z^2 pq}{d^2}}{1 + \frac{1}{N} \left(\frac{z^2 pq}{d^2} - 1 \right)}$$

$$Z = 1.96, p=q=0.5, d=0.05$$

$$322.4 + 15\% \text{ (Percentage of possible sample attrition)} \\ = 370.76 \cong 370$$

It was also tried to achieve a good proportion of medical students to students in other fields (i.e., nursing, midwifery, laboratory sciences, radiology, operating room, and anesthesiology). The students were given the right to participate or refuse to participate in the study. If they were not willing to participate, they were excluded from the study. After obtaining the necessary permissions, the researchers referred to the hospital and university and first explained the purpose of the study to the selected students. After obtaining verbal consent, the information of the participants in this study was collected anonymously and without the possibility of

returning to the individuals in order to comply with the ethical points.

The data were collected using a 5-part questionnaire. Part A includes a demographic data checklist, including age, gender, marital status, height, weight, ABO and Rh blood group, order of the child in the family, field of study, year of university entry, term of education, grade point average (GPA) of high school (diploma) and university, educational level, number of passed courses, number of not passed courses, conditionality, father's occupation, mother's occupation, parental educational level, economic status, home-to-university distance, employment, and tobacco use. Part B includes the student satisfaction dimensions questionnaire (27,28), including 20 items on a 5-point Likert scale. Part C includes a questionnaire on the factors affecting academic failure (28), including 15 items on a 2–5-point Likert scale. Part D includes a questionnaire on preventing academic failure from students' viewpoint (28), including 13 items on a 2-point Likert scale. Part E includes a questionnaire on the factors affecting academic achievement from the students' viewpoint (14), including 5 domains comprising learner with 5 items, educator with 8 items, educational facilities with 5 items, familial with 3 items, and socioeconomic with 4 items. This researcher-made questionnaire was developed by Ashtiani et al. The validity and reliability of this questionnaire have been calculated by Ashtiani et al. Ashtiani et al. used the content validity method to determine the validity of the questionnaire. In this way, the questionnaire was prepared using the opinions of several faculty members. After applying some suggestions and resolving some problems, its validity was determined. The content validity and reliability of all used questionnaires were evaluated for questionnaires B, C, and D, with Cronbach's alpha coefficient reported as 0.8. The Cronbach's alpha coefficient for questionnaire E was 0.84 (14, 28).

In addition, to define academic failure, based on Changizi Ashtiani et al., the researchers of the present study, and other researchers, students with a GPA of less than 15 or at least one conditional semester were considered cases of educational underachievement (28). After data collection, descriptive and analytic statistics were used to analyze the data using SPSS software (version 23) and GraphPad Prism software (version 7). The D'Agostino-Pearson omnibus test showed that the distribution of the data was not normal; therefore, a nonparametric test was employed for variance analysis, and the Spearman test was used to investigate relationships. In this study, the significance level was considered 0.05. The academic motivation was assessed

through a three-choice question, including low, moderate, and high motivation.

Results

A total of 375 students participated in the current study, 64% of whom were female. The mean age of the subjects was 22.83 ± 4.8 years. Additionally, 11.20% of the total study population were married. Moreover, 16.17% of the participants were smokers, and mostly they were the first child of the family. Furthermore, 9.36% of the students had a history of referring to the university counseling center mostly for educational counseling. The GPA range of 18-20 was the most frequent in the high school period, which changed to the range of 13-18 in the university period. Most students had parents with university education, entered university immediately after pre-university, and were native to Guilan province (Table 1).

In studying students' satisfaction with the field of study, 28.46% were satisfied with their field; the most direct relationship was observed between satisfaction and interest in the field of study and parent's education. Moreover, there was an inverse relationship between interest in the field of study in non-medical students and employment in education. The total score of satisfaction was 26.41 ± 3.94 . Furthermore, 5 (1.36%), 71 (19.24%), 188 (50.95%), 98 (26.56%), and 7 (1.90%) students were very dissatisfied (score: 8-15), dissatisfied (score: 16-21), relatively satisfied (score: 22-27), satisfied (score: 28-33), and very satisfied (score: 33-40), respectively. In most students, precision and focus in the study were moderate, and the study method was not restricted and was flexible. In addition, the students reported the study duration on average as less than an hour a day. The students spent more than 6 hours a day on the Internet; however, 70.54% of them spent less than 2 hours a day on the Internet for educational purposes.

Most students were living with their families, and 5.29% used quotas other than the quota of the area. In addition, 7.67% of the students were always or often present in the classroom; however, the interest in the field of study in 9.03% of them was low, and educational motivation was reported to be low in 7.78% of students who had chosen their field of study with personal interest. Moreover, 49.44% of the students reported difficulty in access to the supervisor, and 48.30% described access to the counseling unit as difficult. Additionally, 40.44% of the students assessed the usefulness of their specialized courses at a weak and moderate level. At the same time, they reported the quality of education as good and excellent (Table 2).

In terms of the factors preventing academic failure from students' viewpoints, three factors of the educational quality of the college, the use of experienced professors, and improvement of amenities in dormitory and university had the most significant effects, respectively (Table 3). The results of this study showed that 25.6% of the students had academic failure, and 17.70% became conditional. Students' academic failure showed a direct relationship with gender ($r=-0.197$), focus on the study ($r=-0.175$), irregularities in the study ($r=0.190$), study hours in 24 hours ($r=-0.118$), Internet

usage rate for educational purposes ($r=-0.146$), professor's educational level ($r=-0.107$), the existence of a warm and intimate relationship in the family ($r=-0.148$), and the occupational future of the field of study ($r=-0.186$) (Table 4).

In addition, by examining the factors affecting academic achievement from the students' point of view, the most significant effects were related to student motivation, the professor's mastery over the subject, and the occupational future of the student's field of study, respectively.

Table 1. Demographic Data

Variable (responsiveness %)	Grouping	n (%)	Variable (responsiveness %)	Grouping	n (%)
Gender (100)	Male	135 (36)	Educational degree (99.73)	Bachelor	155 (41.44)
	Female	240 (64)		MD	219 (58.55)
Age group (100)	18-22	166 (44.24)	University average score (97.06)	>18	39 (10.71)
	23-26	169 (45.07)		15-18	56 (15.22)
	27-30	22 (5.87)		13-15	3 (0.82)
	30	16 (4.27)		<13	2 (0.55)
Marital Status (100)	Single	333 (88.8)	Student employment (99.2)	Yes	54 (14.52)
	Married	42 (11.2)		No	318 (85.48)
Height (93.86)	150-159	29 (8.24)	Time interval between pre-university and university entrance (98.66)	Immediately	190 (51.35)
	160-169	161 (42.74)		1 year	149 (40.27)
	170-179	108 (30.68)		2 years	20 (5.41)
	180-189	47 (13.35)		More than 3 years	11 (2.97)
	190-199	7 (1.99)			
Weight (94.13)	40-59	133 (37.68)	Father's occupation (40.8)	Governmental	97 (63.04)
	60-79	170 (48.46)		Non-governmental	1 (0.65)
	80-99	44 (12.46)		Unemployed	55 (35.95)
	100	6 (1.7)			
Blood group (92.8)	A+	89 (25.57)	Distance from home to university in km (97.06)	<50	173 (47.53)
	A-	14 (4.02)		50-100	91 (25.00)
	B+	66 (18.97)		100-200	38 (10.44)
	B-	8 (2.3)		200-400	29 (7.97)
	O+	119 (34.2)		400-600	15 (4.12)
	O-	25 (7.18)		>600	18 (4.94)
	AB+	24 (6.9)		Yes	27 (7.24)
	AB-	3 (0.86)		No	346 (92.76)
Referring to the university consulting center (99.73)	Yes	35 (9.36)	Mother's occupation (41.33)	Housewife	137 (88.38)
	No	339 (90.64)		Employed	18 (11.61)
Order of child in the family (98.93)	First	184 (49.6)	Father's literacy (98.4)	Illiterate	6 (1.63)
	Second	115 (31)		Elementary	18 (4.88)
	Third	38 (10.24)		Middle school	20 (5.42)
	Fourth	17 (4.58)		High school	96 (26.20)
	Fifth or more	17 (4.58)		University	229 (62.06)
Field of study (100)	Medical	220 (58.67)	Number of conditional courses (100)	1	25 (6.67)
	Paramedical	84 (22.4)		2	3 (0.80)
	Nursing	71 (18.93)		3	2 (0.53)
University entrance year (100)	2009 and earlier	17 (4.53)		0	345 (92.00)
	2010	21 (5.6)	Number of failed courses (100)	0	345 (92.00)
	2011	40 (10.67)		0.5-1.5	16 (4.27)
	2012	53 (14.13)		2-3	8 (2.13)
	2013	55 (14.67)		>3	6 (1.6)
	2014	75 (20)	Average diploma score (98.13)	>18	13-15
	2015	112 (29.87)		15-18	56 (15.22)
	2016	2 (0.53)		13-15	4 (1.09)
				<13	3 (0.82)

The mean scores of the factors related to the learner, educator, environmental educational facilities, family, and socioeconomic dimensions were 21.31 ± 3.07 (out of 25), 31.75 ± 5.55 (out of 40), 19.88 ± 3.68 (out of 25), 10.63 ± 2.59 (out of 15), and 15.96 ± 2.95 (out of 20), respectively (Table 5).

Discussion

In the current study, 64% of the participants were female, and the mean age of the subjects was 22.83 ± 4.8 years. In a study conducted by Loloie et al. on medical students in Kerman, Iran, the mean age of the

participants was 22.2 years, and 73.5% of the participants were female (27).

The results of this study showed that 25.6% of students had academic failure, and 17.70% became conditional. In a study conducted by Esmaeilpour-Bandboni et al. n students of Guilan University of Medical Sciences to assess academic failure in medical students, They had reported that 28.1% of students had academic failure (28).

In a study conducted by Ghasemi et al. (2014) to examine the academic failure of nursing and midwifery students, they stated that 36.5% of the surveyed students had academic failure (26).

Table 2. Investigation of the Relationship between Different Factors and Students' Satisfaction with the Field of Study

Inverse relationship with	Correlation (r)	P-value	Direct relationship with	Correlation (r)	P-value
Field of study	-0.564	<0.001	Interest in the field of study	0.506	<0.001
Student employment	-0.260	<0.001	Father's education	0.362	<0.001
Time interval between pre-university and university entrance	-0.200	<0.001	Mother's education	0.350	<0.001
Difficult access to the supervisor	-0.164	<0.001	Motivation to continue education	0.285	<0.001
Selecting a field of study affected based on others' opinions	-0.158	<0.001	score University average	0.208	<0.001
Having problems with access to the counseling unit	-0.150	<0.001	Economic status	0.172	<0.001
Lack of acceptance through average diploma score	-0.147	<0.001	Residence with family	0.158	<0.001
Average diploma score	-0.143	<0.001	Study in 24 hours	0.122	<0.001
Distance between student residence place and university	-0.122	<0.001	Quality of educational planning	0.122	<0.001
Student entrance quota at the entrance exam to university	-0.121	<0.001	Satisfaction of physical space of education	0.109	<0.001
Number of failed courses	-0.108	<0.001			

In a study conducted by Habibzadeh et al to assess academic failure among students at Ardabil University of Medical Sciences, Iran, they reported that 4.05% of the surveyed students had academic failure (38 out of 938 students) (29). The results of the aforementioned studies are consistent with the results of the present

study, indicating the importance of academic failure among medical students.

The findings of this study suggest an inverse relationship between gender and academic failure. This result means that the female students experienced academic failure less than male students.

Table 3. Other Effective Factors in Academic Failure

Variable	Grouping	n (%)	Variable	Grouping	n (%)
Precision and focus in the study	Low	64 (49.17)	Motivation to continue education	Low	28 (7.67)
	Moderate	233 (66.63)		Moderate	122 (33.42)
	High	69 (85.18)		High	215 (58.9)
Study hours in 24 hours	Less than 1 hour	175 (47.95)	Hours of Internet usage in 24 hours	Less than 1 hour	22 (6.06)
	2 hours	119 (32.6)		1-2 hours	27 (7.44)
	4 hours	59 (16.16)		2-4 hours	49 (13.5)
	6 hours	12 (3.29)		4-6 hours	46 (12.67)
	More than 6 hours	0 (0.00)		More than 6 hours	219 (60.33)
Residence place	Student dormitory	91 (24.86)	Educational quota	Area 1	37 (10.31)
	With family	209 (57.1)		Area 2	233 (64.9)
	Self-governing dormitory	18 (4.92)		Area 3	70 (16.5)
	Rental homes	48 (13.11)		Have a quota	19 (5.29)

Interest in the field of study	Moderate	141 (38.52)	How to choose the field of study	Personal interest	259 (71.55)
	High	192 (52.46)		Effects of family and individuals around	103 (28.45)
Educational quality of college	Excellent	144 (39.56)	Usefulness of specialized courses	Excellent	76 (21.05)
	Good	143 (39.29)		Good	139 (38.5)
	Medium	67 (18.41)		Medium	129 (35.73)
	Weak	10 (2.57)		Weak	17 (4.71)
Method of study	Precise and planned	47 (12.95)	Attendance in the classroom	Always	10 (2.74)
	Non-restricted and flexible	226 (92.61)		Often	18 (4.93)
	Without planning	92 (21.25)		Low	145 (39.73)
				Rarely	192 (52.6)
Having access to the supervisor	Easy	182 (50.56)	Having access to the counseling unit	Easy	182 (70.51)
	Difficult	178 (49.44)		Difficult	170 (48.3)
Hours of Internet usage in 24 hours for educational purposes	Less than 1 hour	127 (34.99)			
	1-2 hours	129 (35.54)			
	2-4 hours	52 (14.33)			
	4-6 hours	28 (4.71)			
	More than 6 hours	219 (60.33)			

Table 4. Factors Preventing Students' Academic Failure (Responsiveness Rate: 98.4% [n=369])

Factors	n (%)
Improving educational quality of college or university	306 (82.93)
Use of experienced professors	286 (77.51)
Improving amenities in dormitories and universities	253 (68.56)
Giving university grants	224 (60.70)
Encouraging students by professors	224 (60.70)
Use of well-trained educational counselors at universities	214 (57.99)
Ability and interest of professors in teaching and internship	214 (57.99)
Existence of appropriate study halls in dormitories and universities	197 (53.39)
Holding workshops to learn correct planning for studying and the correct way of studying and learning in the presence of successful students in this field	194 (52.54)
Paying attention to individual differences of students by professors during teaching and internship	188 (50.95)
Having access to supervisors and their assistance	170 (46.07)
Collecting and compiling the experiences of successful students and sharing periodically among other students	153 (41.46)
Student admission based on average diploma score (instead of national entrance exam)	70 (18.97)

The aforementioned findings are consistent with the findings of studies by Changizi, Khadiv, and Fallah (21). In addition, in previous studies, the relationship between marriage and academic failure was proven; however, such a relationship was not observed in this study. The present study showed that in high school, most of the average scores were within the range of 18-20; nevertheless. However, despite the results of previous studies, there was no relationship between

academic failure and high school scores. Most of those who had academic failure were MD students, and this relationship was statistically significant.

It is noteworthy that only 12.5% of the students referred to the university counseling center, and two-thirds of the counseling sessions were educational. With this low percentage of counseling, giving importance to this issue requires designing a mechanism for managing and increasing counseling for students.

Table 5. Factors Affecting Students' Educational Achievement (Responsiveness Rate: 94.93%)

Dimension	Factors (of 5 scores)	Mean (standard deviation)
Educator dimension	Professor's level of education	4.28 (0.88)
	Professor's teaching experience	4.10 (0.99)
	Professor's mastery over the course scope	4.49 (0.76)
	Respectful relationship between professor and student	4.20 (0.97)
	Continuous evaluation of the student (through oral questioning or taking quizzes) during the semester	3.49 (1.15)
	Using different methods of teaching by the professor, such as group discussion and teaching by students	3.75 (1.08)

	Professor use of learning assistance tools during teaching	3.47 (1.06)
	Timeliness and timely presence of professor in class	3.73 (1.09)
Learner dimension	Student motivation	4.68 (0.61)
	Student self-confidence	4.45 (0.75)
	Student interest in the field of study	4.51 (0.69)
	Regular attendance of the student in class	3.65 (1.11)
	Attention and focus of students in class	4.03 (0.9)
Familial dimension	Sensitivity and insistence of parents on children's education	3.12 (1.21)
	Guiding children in education by family	3.45 (1.11)
	Warm and intimate relationship with the family	4.06 (0.92)
Socioeconomic dimension	Giving grants (student loans) to students	3.95 (1.05)
	Income and economic status of family	3.90 (0.98)
	Parental educational level	3.63 (1.14)
	Occupational future of the field of study	4.48 (0.87)
Dimension of environmental educational facilities	Number of faculty members	3.35 (1.16)
	Suitability of the student dormitory environment in terms of population and facilities	4.06 (1.00)
	Students' access to books and national and international publications in the library	4.07 (0.93)
	Suitability of the physical environment of class in terms of light, heat, space, table and chair arrangement, and the number of class members	4.06 (0.98)
	Facilities of clinical teaching environment	4.33 (0.86)

It should be noted that contrary to the results of the study by Changizi et al., in the present study, the ratio of successful students' referrals to the university counseling center was higher than students facing academic failure (21). In the present study, similar to the study by Changizi et al., there was no relationship between the family's economic status and a student's academic failure; however, some studies considered the aforementioned relationship effective and direct. Contrary to the findings of Changizi et al.'s study, in the present study, there was no relationship between academic failure and parents' occupations. In the present study, there was no relationship between academic failure and the distance between student home and university; nevertheless, this relationship was significant in previous studies (21).

In addition, in this study, the time interval between the completion of high school and entry to university had no relationship with academic failure. The total satisfaction score among students experiencing academic failure was higher than the total average score of students, which did not match the results of other studies (21). In a study by Moslemizadeh and Ahmadipour, they concluded that medical students with a problem with cell phone use and a history of mental disorders were more likely to drop out. It was noted that since academic failure is not uncommon, the factors associated with it should be appropriately identified in order to act in a timely manner (30). In the present study, there was a relationship between academic failure and precision in the study, meaning that students with more precision had less academic failure. In addition, the aforementioned subject was related to regularity in the study. In other words, the regular and planned study was related to the prevention of academic failure, and

this problem was not observed in students who spent more time studying and more hours of Internet usage for educational purposes. This issue suggests that appropriate counseling can be highly effective in solving such students' problems.

Among the limitations of this study were the lack of cooperation of the whole students in participating in the study, the lack of consideration of factors related to mental health, the impact level of mental health on academic failure, and methods for the prevention of academic failure. Therefore, it is suggested to carry out studies on the prevalence of mental health problems and their relationship with academic failure.

Conclusion

In the present study, the relationship between academic failure and the three factors affecting academic achievement, including the professor's educational level, the warm and intimate relationship in the family, and the occupational future of the field of study, was reversed, meaning that students facing academic failure did not believe in the effect of these three factors. This issue is important because it shows the low importance of these components among students with academic failure; in other words, the professor's level of education and literacy was not important to them, and they did not consider their families as the basis for academic achievement. Additionally, they did not imagine an appropriate occupational future.

According to the results of this study, the most effective factor in the success or prevention of academic failure is discipline and precision in the study, and the most effective factors in academic achievement are student motivation, the mastery of the professor over the subject, and the occupational future of the student.

Furthermore, psychological counseling is essential in solving the educational problems of students. Therefore, the present study suggests creating a student monitoring system and preventing academic failure to solve problems and provide services at the time required to help prevent potential damages and loss of capital.

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Conflict of interests: We, the authors of this study, hereby declare that there is no conflict of interest with any organization or person.

Ethical approval

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Explaining Faculty Members' Perceptions of Virtual Learning Based on Various Types of Educational Interactions During the Coronavirus Disease 2019 Outbreak: A Qualitative Content Analysis

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Abstract

Background: Given that interaction is a vital element in virtual learning, using the professors' experiences and perceptions during the coronavirus disease 2019 (COVID-19) outbreak can provide useful information about the quality of educational interactions in virtual learning courses in order to improve virtual learning.

Objectives: This study aims to explain the perceptions of faculty members of Kerman universities regarding virtual learning based on educational interactions during the COVID-19 outbreak.

Methods: This study was conducted with a qualitative content analysis approach in the academic year of 2021 in Kerman University of Medical Sciences and Shahid Bahonar University of Kerman. The data collection method was semi-structured interviews with 13 professors of these universities who were included in the study using purposive sampling. Data analysis was performed using the qualitative content analysis method according to the steps introduced by Graneheim and Lundman.

Results: The results of this study were presented in the form of 4 main themes: 1) Teacher-learner interactions, including the tools used, how they interact, and their barriers; 2) Learner-learner interaction, learner-content interaction, and teacher-content interaction, including the professors' actions to create and increase them; 3) Teacher-teacher interactions, including professors' instructional and research interactions and their barriers; 4) Content-content interaction, which the findings indicated that professors did not pay much attention to this type of interaction.

Conclusion: Virtual learning is not limited to the COVID-19 outbreak period but can be used as a supplement to face-to-face learning, even when the universities reopen; therefore, valuable experiences of professors of virtual learning can be used to strengthen various types of educational interactions and develop virtual learning in the studied universities and other universities.

Keywords: Perception, Virtual learning, Educational interaction, Qualitative approach, COVID-19

Background

The coronavirus disease 2019 (COVID-19) pandemic, as a severe acute respiratory syndrome, which began in mid-December 2019 in Wuhan, China, has gradually spread to all countries of the world. On January 30, 2020, the World Health Organization (WHO) declared the COVID-19 outbreak a public health emergency (1). According to the WHO report, 229,858,719 people have been infected with the disease in the world so far (September 23, 2021) due to the COVID-19 crisis, of which 4,713,543 have died. In Iran, 5,477,229 people have been infected with this disease so far (September 23, 2021) and of these, 118,191 have died (2).

The COVID-19 pandemic has caused damages to various economic, social, and cultural sectors. Education, as one of the most important national functions, has been severely affected by the current crisis (3). Due to the high population of students, the density of classrooms, the use of public and common spaces, and the high probability of the virus transmission through

this group to the community, care and control of educational spaces have been among the first measures of countries with this disease (4). Following the outbreak of this virus in Iran, schools and universities were closed from the first week of March 2019, and this closure has continued until now, September, 2021. However, the government's policy during the holiday period has been that "schools and universities are closed, but teaching and learning are not closed." Accordingly, one of the most important and serious programs proposed by the education department and also higher education department is the issue of virtual learning. Virtual learning has profoundly affected teaching-learning methods because it has provided a large number of learning resources in the form of video, text, audio and video, etc. through the Internet (5). Virtual learning provides the use of new multimedia technologies and the Internet to enhance the quality of learning through access to resources and services, as well as distance exchange and collaboration (6). This electronic

technology can include a course, a program, or even an online lesson (7), which is led by an instructor, has a specific program, and is performed in a learning management system (8). Virtual learning environments are web-based software systems that enable learners to interact with their instructors and classmates, access learning resources without time and space constraints, and use advanced communication and information technologies (9-10). Therefore, it can be said that flexibility is the most important advantage of virtual learning (11). Learning in a virtual space, due to its special features, can help reduce many current teaching-learning problems, including time management, cost reduction, greater efficiency, increased motivation, increased contact with the learner, teamwork opportunities in multimedia environments and electronic conferences, unlimited access, and sufficient space and time resources to interact with a large number of learning applicants (12).

Interaction and its tools have been mentioned as one of the ten main requirements for the development of virtual learning (13). Interaction is recognized as a core theory in distance learning research (14-15) and is the core of the learning experience (16). Regarding interaction in virtual learning environment, interaction has been defined as a two-way process of active and engaging communication between participants with the possibility of manipulating, reflecting, exchanging, and sharing content through various facilities and tools simultaneously and asynchronously to achieve the desired goal (17). According to Moore (1989), learning is based on three types of interaction: Learner-learner interaction, learner-content interaction, and teacher-learner interaction. According to Anderson (2004), in order to create interaction, three elements of student, professor, and content are needed. These three elements can create six types of interactions in relation to each other: 1- Learner-learner interaction, 2- learner-content interaction, 3- teacher-learner interaction, 4- teacher-teacher interaction, 5- teacher-content interaction, and 6- content-content interaction (18). Learner-learner interaction is a type of communication that is defined as "the interaction between a learner and other learners, alone or in a group environment, with or without the presence of a coach in real time" (19). Learner-content interaction is the time the learner spends with the content of a course or topic being studied, such as reading books or textbooks, browsing PowerPoints and web pages, or watching movies (20).

Teacher-learner interaction refers to the relationships and interactions between professor and student and to actions such as referring to the professor

during office (and non-office) hours and asking him/her for help (21). It also includes how to motivate learners, providing information, providing feedback, and support and encouragement to learners (8). In explaining the teacher-teacher interaction, Anderson refers to the mutual communication and cooperation of professors to expand and update their knowledge, especially in complex areas. Teacher-content interaction refers to the production and use of content by the professor. Garrison and Anderson (2003) have mentioned content preparation as one of the main roles of the professor in distance learning. Content-content interaction is the newest, most abstract, and most subtle type of interaction, in which, by using information and communication technology and artificial intelligence, content is able to automatically interact with other computer information sources, find and update new scientific content related to itself, and inform the professors and students of the updated content after its changes have reached an acceptable level (22).

Given the importance of interaction in learning and its role in virtual learning environments, numerous studies have been conducted in this field so far (8, 19, 23-28). Since professors and instructors in virtual learning, like other types of learning, have a very special place, they can provide the audience with useful information regarding the quality and efficiency of the educational course; however, in reviewing the conducted studies, there was no research that comprehensively examines and analyzes the experiences and perceptions of faculty members of virtual learning based on various types of educational interactions. Therefore, using a qualitative approach, this study deals with identifying faculty members' experiences and perceptions of virtual learning based on various educational interactions during the COVID-19 outbreak and while recognizing existing and potential limitations and harms, proposes solutions to help its trustees amend the current situation and move in the direction of a possible and desirable situation.

Objectives

Considering that virtual learning is currently provided in Kerman universities due to the COVID-19 outbreak and faculty members are experienced in using it, better results can be achieved based on their views. This research is an applied study conducted to identify the experiences and perceptions of faculty members of Kerman universities of virtual learning based on various educational interactions during the COVID-19 pandemic period.

Methods

This qualitative study was conducted using the content analysis approach in 2021. Data collection was performed in Kerman universities (Kerman University of Medical Sciences and Shahid Bahonar University of Kerman) and the data collection method was semi-structured interviews with faculty members of the mentioned universities. Interview questions and interview guides were developed by reviewing the theoretical literature. The interview was conducted using the interview guide, i.e., a list of written questions and topics that should be followed in a specific sequence, but if interesting topics are raised during the interview, the researcher is free to ask unpredicted questions. Purposive sampling was used to select participants in order to use the experiences of key and effective individuals who had the most information about the method of educational interactions in the virtual learning environment. In this regard, knowledgeable and experienced individuals in virtual learning, who were willing to express their perceptions and experiences in the field of educational interactions in the virtual learning environment, were asked for help. Having an executive background or related articles in the field of education was the criterion for selecting participants. At the end of the interview, they were also asked who they knew that could help the researchers in this regard. Sampling was performed gradually until the data saturation. Prior to the interview, due to the existing conditions (the COVID-19 pandemic), participants were contacted by phone and the study objectives were explained to them. In order to comply with ethical considerations, principles such as obtaining permission, observing the principles of confidentiality, maintaining anonymity, and the participants' right to leave the study were observed. After agreeing to the face-to-face interview (in accordance with health procedures), necessary arrangements were made for the time and place of the interview, and the interviews took place in any place suggested by the participants, including their office at the university. Participants' consent was recorded orally at the beginning of the interview. Also, with their permission, the transcripts of the interviews were recorded for more detailed analysis, and the manuscripts were then approved by the participants. Interviews ranged from 40 to 50 minutes. After 13 interviews, data saturation was obtained. Data analysis was performed using the qualitative content analysis method according to the steps introduced by Graneheim and Lundman (29) in such a way that after the interview, the conversation text was implemented from the recorded file and reviewed several times, and

each interview was coded. The texts of the interviews were analyzed after several careful readings as an open coding system to produce the first categories. For this purpose, the text of each interview was initially divided into semantic units and in the next step it was summarized and converted into codes. Different codes were compared based on their differences and similarities and classified into categories. MAXQDA software was used for this purpose. In order to strengthen the analysis validity, the researchers discussed and revised the primary categories to arrive at the themes. There was a process of feedback and discussion among researchers on how to categorize and organize the codes. Important concepts were categorized by examining through repeated reading and abstracting of meanings to ensure that information about the categories was not omitted. Simultaneous data analysis, key participant selection, the use of time integration, continuous monitoring and observation, and accurate and in-depth description and review of observers were used to increase the data validity and acceptability. For the data acceptability, Guba and Lincoln's (1994) four criteria, including credibility, confirmability, dependability, and transferability (30), have been constantly considered by researchers. Despite devoting enough time to collecting data, communicating well with participants, conducting interviews at participants' chosen locations, reviewing the extracted codes by the participants (codes extracted from participants' conversations were given to them and they were checked for the correct interpretation of their sentences), re-reading the extracted codes by other colleagues and concluding and summarizing with the agreement of the researchers and the approval of a supervisor outside the research, an attempt has been made to achieve them. In order to transmit the findings, participants' quotes were presented as stated. This research was reviewed in the ethics committee of Shahid Bahonar University of Kerman and has been accepted with the ethics code of ID IR.UK.REC.1400.025.

Results

The participants of the present study were 13 faculty members of Shahid Bahonar University of Kerman and Kerman University of Medical Sciences. In terms of gender, the faculty members of Kerman University of Medical Sciences were 1 woman and 6 men, and the faculty members of Shahid Bahonar University were 4 women and 2 men, all with at least 5 years of teaching experience. The participants of Kerman University of Medical Sciences were from the departments of statistics and epidemiology, health education, health information (virtual learning), and medical education. Also, the

participants of Shahid Bahonar University of Kerman were from the departments of educational sciences, computer, agriculture, mathematics, and law. The analysis of data obtained from the interviews with participants led to the extraction of 6 components, 26 categories, and 95 subcategories.

Question 1: What are the faculty members' experiences and perceptions of learner-learner interactions in virtual learning during the COVID-19 outbreak period?

In general, in-depth analysis of faculty members' perspectives led to the identification and classification of faculty members' actions to create and increase interactions between students in order of the frequency of the obtained responses. These actions include 9 categories, which are classified in Table 1. Excerpts from the transcripts of the interviews are presented in the following as evidence.

The participants' statements in the research regarding learner-learner interactions are as follows:

Interviewee Code 1: "I usually perform grouping in all my classes and give projects to the students and I am aware of their interactions; for example, for one of my master's degree lessons, considering the system capabilities, I designed four rooms in the system and divided the students into four groups. In these rooms, the students of each group interacted with each other, and it was possible for me to move between the rooms and monitor the students' activities."

Interviewees Code 2, 5, 10, 13: "I use the group discussion method and students consult with each other

in groups, but due to the low speed of the Internet and the weakness of the systems, it was not face-to-face."

Interviewees Code 3, 4, 13: "Sometimes, I give homework individually and ask students to score each other's work."

Interviewees Code 3, 8, 13: "Using the forum, I encourage students to stay in touch."

Interviewee Code 1: "I am sure that among my students there are individuals who know other students in our field of study at other universities. I can encourage my students to coordinate with those students and give them the class link so that they can come to our class for one session and explain to us what resources they have for a particular course at their own university and how the professor teaches; this is called the same 'network interactions' that students create in a network."

Question 2: What are the faculty members' experiences and perceptions of learner-content interactions in virtual learning during the COVID-19 outbreak period?

After analyzing the data obtained from the interviews, in order of the frequency of the obtained responses, it was found that in faculty members' perspectives, professors and students should take some actions to increase the learner-content interaction. The actions of faculty members to create and increase learner-content interactions include 2 categories and 11 subcategories, which are classified in Table 2. Excerpts from the transcripts of the interviews are presented in the following as evidence.

Table 1. Faculty members' experiences and perceptions of learner-learner interactions in virtual learning during the COVID-19 outbreak period

Component	Category
Faculty members' actions to create and increase learner-learner interactions	Considering a group project for students
	Using participatory teaching methods such as group discussion
	Evaluating each student's individual work by his/her classmates
	Raising questions in the virtual classroom system discussion forum
	Raising questions by students in the WhatsApp group
	Encouraging students to critique each other's opinions
	Asking and answering questions by the student from his/her classmates in the online class
	Encouraging students to engage in network interactions
	Involving students as a group in the production of electronic content

Table 2. Faculty members' experiences and perceptions of learner-content interactions in the virtual learning environment

Component	Category	Subcategory
Faculty members' actions to create and increase learner-content interactions	Actions that should be taken by the professor	Holding the final exam in the virtual classroom system
		Holding midterm exams in the virtual classroom system
		Putting an exercise or question in the system
		Holding an oral exam along with activating the webcam during the course
		Introducing practical resources to students
		Uploading course materials on the system or the WhatsApp group before holding an online class

	Actions that should be taken by the student	Engaging students individually or in groups in preparing electronic content and presenting lessons in the online classroom
		Performing a project or research or practical work individually or in a group
		Doing homework
		Analyzing a movie or a book
		Using the recorded files of each session in the system by the students

The participants' statements in the research regarding learner-content interactions are as follows:

Actions that should be taken by the professor

Interviewees Code 3, 12: "For some theory courses, I consider the midterm exam in the form of open book, allowing the student to interact with the content."

Interviewees Code 1, 2, 6, 8, 9: "I define exercises in the system. This connection is established by giving the exercise, and because the exercise is basic, the student has to read the previous 5 or 6 sessions to be able to answer that task."

Actions that should be taken by the student

Interviewees Code 1, 3, 4, 5, 6, 9: "I ask the students to use up-to-date articles and present them in the class."

Interviewees Code 1, 2, 3, 11, 12: "For some lessons, there is practical work that the student has to do individually or in groups, all of which requires the student to read a lot to be able to answer."

Interviewees Code 6, 10: "Since class sessions are recorded in the system, students can use this capability of the system and listen to the course content of each session whenever they want."

Question 3: What are the faculty members' experiences and perceptions of teacher-learner interactions in virtual learning during the COVID-19 outbreak period?

In general, in-depth analysis of faculty members' perspectives, in order of the frequency of the obtained responses, led to the identification and classification of the tools used by the faculty members to interact with students, which include 3 categories and 11 subcategories. Faculty members also consider how to interact with students, including 2 categories of academic and extracurricular interactions. These items are classified in Table 3. Excerpts from the transcripts of the interviews are presented in the following as evidence.

The participants' statements in the research regarding teacher-learner interactions are as follows:

Tools used by professors to interact with students

Interviewee Code 11: "I use Skyroom for online education and Navid for offline education to upload content and exams."

Interviewees Code 1, 2, 3, 4, 5, 7, 8, 9, 12, 13: "The main backup alongside the Ims system is the groups we have created in WhatsApp."

The way of teacher-learner interactions

Academic Interactions

Interviewees Code 2, 5, 9: "I use reverse learning, i.e., I identify a topic and the students study at home and then we do our homework and troubleshoot the problems the next session in the class."

Interviewee Code 10: "Interaction is audio and through a microphone or written via Google forums."

Table 3. Faculty members' experiences and perceptions of teacher-learner interactions in virtual learning during the COVID-19 outbreak period

Component	Category	Subcategory
Tools used by teachers to interact with students	Academic systems	Ims, Skyroom system, Adobe Connect, Mobin system, Navid system, GoogleMit
	Non-academic tools	Email, phone call and Skype
	Social networks	WhatsApp and Telegram and creating groups and channels in them
How to do teacher-learner interactions	Academic interactions	Answering students' emails and phone calls, answering students' messages on social media, sending assignments by students to WhatsApp groups and giving positive and encouraging or corrective feedback to students as soon as possible, asking and answering questions in the system and calling students' names to answer the questions, using the reverse learning method and troubleshooting in each session, raising the hand by the student in the system to answer the questions, presenting some of the class topics by the students in the system, asking for students' views orally through a microphone or text in the chat room of the system about lesson topics, using Google forums for textual interactions, changing the role of the student to the role of professor and managing the class by him/her at the professor's request
	Extracurricular interactions	Activating students' microphones and talking to them, greeting and roll calling in the system and communicating face-to-face with students if possible, asking students' views for expressing their suggestions and criticisms to increase the quality of classes, expressing humor issues and joking with students during their rest time in the system

Extracurricular Interactions

Interviewees Code 1, 3, 10, 13: “The first session is face-to-face and in most sessions I greet students for a quarter of the time.”

Also, after analyzing the data obtained from the interviews, it was found that in faculty members’ perspectives, the most important factors that prevent good and complete interaction with students include four categories: Issues related to 1- learner, 2- teacher, 3- infrastructures, and 4- university planning. These categories have 20 subcategories classified in Table 4. Excerpts from the transcripts of the interviews are presented in the following as evidence.

The participants’ statements in the research regarding the barriers to teacher-learner interactions are as follows:

Learner-Related Issues

Interviewees Code 2, 5, 8, 9: “Students’ lack of interest and motivation, which causes them not to communicate and not to comment.”

Interviewees Code 2, 3, 8, 11: “I did not interact with some students because they say ‘we do not have a system’ perhaps because they cannot afford the purchase.”

Interviewees Code 1, 13: “Student’s refusal to turn on the webcam, so it must be culturalized.”

Teacher-Related Issues

Interviewees Code 7, 8, 10: “In the field of human resources, our experience as professors is very low in virtual learning.”

Interviewee Code 3, 8, 9: “Sometimes, feedback is delayed due to busy schedule and makes students reluctant to interact.”

Interviewee Code 8: “Sudden shifting from face-to-face learning to virtual learning has made it difficult for professors to adapt, especially to older professors.”

Interviewee Code 10: “In simultaneous classes, the interaction problem is that the instructor is still the only speaker; so if the instructor is not trained to conduct online classes, he/she will have trouble interacting with the student.”

Infrastructure-Related Issues

Interviewees Code 1, 2, 3, 4, 5, 6, 7, 9, 11, 12, 13: “University and country infrastructures and low-speed Internet are not adequate for the virtual learning system.”

Interviewees Code 1, 2, 3, 6, 8, 9, 11, 12, 13: “When all the webcams are on, it indicates that we have simulated a face-to-face class in a virtual learning environment. I have tried several times to have a video class, but as soon as the camera is activated, the internet speed drops sharply and we log out.”

University Planning-Related Issues

Interviewees Code 2, 3, 6: “I think the virtual learning process should be in such a way that there are fewer students in the class, but it is not.”

Interviewee Code 3: “The large number of courses available to students leaves no time for them to interact. Class time is also important. Experience shows that early morning classes are not very well attended by students.”

Question 4: What are the faculty members’ experiences and perceptions of teacher-teacher interactions in virtual learning during the COVID-19 outbreak period?

In general, after in-depth analysis of faculty members’ perspectives, it was found that professors interact with colleagues inside or outside the university or abroad in relation to three categories of academic issues, research issues, and various issues that the amount of these interactions differ in professors’ views. Also, after analyzing the data obtained from the interviews, it was found that there were factors that prevented good and complete interaction of faculty members with their colleagues, involving 12 subcategories. These items are classified in Table 5.

Excerpts from the transcripts of the interviews are presented in the following as evidence.

The participants’ statements in the research regarding teacher-teacher interactions are as follows:

Interaction with colleagues inside the university

Interviewee Code 3: “I have good relationships with colleagues inside the university. For example, when a colleague is more experienced in a particular field, I try to invite him/her to a meeting to discuss that issue in my class.”

Interviewees Code 3, 11, 12: “We have research relationships with colleagues inside the university.”

Interviewee Code 10: “I hold educational technology web conferences at the university, and my colleagues use these courses.”

Table 4. Faculty members' experiences and perceptions of the barriers to teacher-learner interactions in virtual learning during the COVID-19 outbreak period

Component	Category	Subcategory
Barriers to teacher-learner interactions	Learner-related issues	Low student motivation
		Students' economic problems
		Low student experience
		Lack of proper culture building for establishing visual communication by the student
		Students' feeling alienated from systems
		Low student self-esteem
		Social isolation
		The problem of learners' adapting to technology
		Ignoring the professor's privacy by the student
	Teacher-related issues	Low professor experience
		Professors' busy schedule and lack of timely feedback to the student
		Professors' feeling alienated from systems
		The problem of professors' adapting to technology
		Lack of necessary training for professors in the field of holding virtual classes
	Infrastructure-related issues	Disruption of technology
		Weakness of university systems
		Compatibility issue
	University planning-related issues	Large number of students in the class
		Many student courses
		Class time

Table 5. Faculty members' experiences and perceptions of teacher-teacher interactions in virtual learning during the COVID-19 outbreak period

Component	Category	Subcategory
Faculty members' experiences and perceptions of the teacher-teacher interactions	Interaction with colleagues inside the university	Academic interaction
		Research interaction
		Interaction regarding various issues
	Interaction with colleagues outside the university	Academic interaction
		Research interaction
		Interaction regarding various issues
	Interaction with colleagues abroad	Academic interaction
		Research interaction
		Interaction regarding various issues
	Barriers to teacher-teacher interaction	Professors' busy schedule
		Lack of recognition and access to colleagues in other universities
		Lack of proper culture building to interact with colleagues
		Lack of regular attendance of professors at the university or virtual meetings
		Lack of professors' awareness of the need to interact with colleagues
		Rejection of interaction by colleagues
		Weakness in doing teamwork
		Difference in interests
		Low colleagues' self-esteem
		Newness of virtual learning
		Feeling uncomfortable when asking questions from colleagues
		University atmosphere

Interaction with colleagues outside the university

Interviewee Code 1: "I think virtual learning is the best opportunity to invite not only academic colleagues but also colleagues from other universities to come to our virtual classroom for half an hour and give explanations on a topic they specialize in."

Interviewees Code 3, 12: "We have mostly research interactions with colleagues outside the university."

Interviewee Code 6: "Tarbiat Modares University has set up a panel in our field and they give very good lectures twice a month. There are also other panels at Lorestan

University, Sari University, Ahvaz University, and Tabriz University, and the members are indeed formed together."

Interaction with colleagues abroad

Interviewee Code 8: "I use the experiences of professors abroad. For example, I got all resources of one of my lessons that a friend of mine was teaching abroad."

Interviewees Code 3, 11, 12: "Most interactions with colleagues abroad is in research fields."

Interviewee Code 13: "Now that learning has become virtual, the conferences and webinars are not dedicated to

a specific university and all can attend the webinars all over the country or abroad.”

Barriers to teacher-teacher interaction

Interviewees Code 1, 2, 3, 9, 13: “Too much busyness prevents us from interacting with colleagues.”

Interviewees Code 2, 5, 11, 12: “Lack of recognition and access to colleagues who teach the same courses as I am teaching and who serve at other universities in different cities are among barriers.”

Interviewees Code 1, 11, 13: “Interaction with colleagues should be culturalized. It would be great if, for example, I could invite four of my colleagues from different universities in different cities to my class.”

Interviewees Code 7, 8, 11: “Lack of regular attendance of professors is a barrier.”

Interviewees Code 2, 7: “Maybe we were not looking for it ourselves and do not know the need for it.”

Interviewees Code 7, 8: “Some people think that we should not interfere with the work of faculty members unless that person is a flexible one.”

Interviewee Code 10: “One of the reasons is the special atmosphere that exists in our educational environments; the lack of security and the fear that exists, makes most professors reluctant to cooperate with each other on educational issues.”

Question 5: What are faculty members’ experiences and perceptions of content-content interactions in virtual learning during the COVID-19 outbreak period?

After analyzing the data obtained from the interviews, it was found that faculty members did not pay much attention to the content-content interaction. Most participants acknowledged that it was the first time that they had been exposed to this type of interaction.

The participants’ statements in the research regarding content-content interactions are as follows:

Interviewee Code 2: “We need to be more up-to-date about virtual learning. If there are certain ways which we can learn to have all types of interaction, especially content-content interactions, I think we do not have it at all.”

Interviewee Code 3: “Sometimes, I give a link to a movie while presenting the content so that the students can fully understand the story.”

Question 6: What are faculty members’ experiences and perceptions of teacher-content interactions in virtual learning during the COVID-19 outbreak period?

In general, in-depth analysis of faculty members’ perspectives, in order of the frequency of the obtained responses, led to the identification and classification of two categories, including faculty members’ actions to select content and preparing electronic content, consisting of 17 subcategories. These are classified in Table 6.

Excerpts from the transcripts of the interviews are presented in the following as evidence.

The participants’ statements in the research regarding teacher-teacher interactions are as follows:

Table 6. Faculty Members’ experiences and perceptions of teacher-content interactions in virtual learning during the COVID-19 outbreak period

Component	Category	Subcategory
Faculty members’ actions for teacher-content interactions	Professors’ actions to select the course content	Identifying books
		Referring to the course title
		Reviewing up-to-date and practical articles and resources
		Checking sites and forums
		Surveying students to select content
		Content selection based on the student level
		Referring to study resources abroad
		Using other professors’ pamphlet
		Consulting with colleagues
	Professors’ actions to prepare electronic content	Using PowerPoint software to prepare electronic content
		Preparing electronic content in the form of videos or photos
		Using pdf files
		Preparing electronic content by students
		Using electronic content prepared by colleagues
		Using Storyline software to prepare electronic content
		Using SCORM software to prepare electronic content
		Participating in educational courses abroad and using their content

Professors’ actions to select the course content

Interviewee Code 4: “We have a topic, but virtual learning tells us to change some parts of the topic, especially the practical parts.”

Interviewees Code 3, 6, 10, 11, 13: “I will mostly use newer and more practical articles to select the course content.”

Interviewee Code 3: “One semester, the first session, I asked the students if I introduce a book or specify titles that each session one person presents as conference.”

Interviewee Code 8: “I assess the students’ level at the first session with questions and answers and then, accordingly, I select the introductory or advanced content.”

Interviewee Code 9: “I refer to course resources abroad.”

Interviewee Code 9: “I use other professors’ pamphlets.”

Interviewee Code 11: “I talk mostly with colleagues.”

Professors’ actions to prepare electronic content

Interviewees Code 2, 3, 4: “I entrust the preparation of electronic content to students (individual or group) so that each session one person or one group presents it.”

Interviewee Code 10: “When the content is designed as software and as SCORM (multimedia content), this type of content is completely interactive and it is as if the instructor is teaching in the classroom. In addition, the instructor takes an exam from the student and shows the results to the student, gives feedback, and as a result, like a software instructor, can do all the work of an instructor in a real environment.”

Interviewee Code 8: “I have added educational courses abroad to my curriculum.”

Discussion

After analyzing the data obtained from the interviews, it was found that the faculty members of Kerman paid attention to various educational interactions, including teacher-learner interaction, learner-learner interaction, learner-content interaction, learner-content interaction, and teacher-teacher interaction. Also, they have taken steps to improve and increase various types of educational interactions but the amount of these interactions is different from the perspective of each faculty member. It is worth noting that professors have not paid much attention to content-content interactions.

The findings of the present study on faculty members’ experiences of the learner-learner interaction in a virtual learning environment showed that faculty members took actions to create and enhance interactions between students, the most important of which are: Considering a group project for students, group discussion, and evaluating each student’s individual work by his/her classmates. These findings are consistent with the results of studies by Kuo et al. (2014) (31), Gasell (2020) (8), Rahmadian et al. (2020) (28), Salmi (2013) (32), Kurucay et al. (2017) (21), and

Mendis et al. (2016) (33). According to this research, group discussions create opportunities for participation, knowledge sharing, and social interaction with peers. Students also love group activities because they can break the whole work into small pieces; therefore, doing homework is more controllable for them. The point to consider in group activities is work division. Although work division is one of the benefits of group activities and creates interaction between students, it does not necessarily help improve students’ learning, so online course instructors should ensure that each group member participates equally in group activities and they are engaged in all stages. Making the reports visible for all students and asking the students to give feedback to the reports of other teams is also a way to get more students involved in work and help each other.

The findings of the present study on faculty members’ experiences of learner-content interactions in a virtual learning environment showed that in order to create and enhance student-content interactions, faculty members took actions such as placing exercises or raising questions in the system, uploading course materials on the system or a WhatsApp group before holding an online class, and introducing applied resources to students. Also, by considering assignments for students such as preparing electronic content and presenting it in the class, performing a project or research or practical work individually or in group, doing homework, analyzing a movie or a book, and using the recorded files of each session, faculty members contribute to greater learner-content interactions. These findings are consistent with the results of Paiva et al. (2016) (34), Ekwunife et al. (2014) (35), Mendis et al. (2016) (33), and Emmah’s (2014) (36) studies.

According to these studies, the measurement amount of learner-content interactions is the number of downloaded and seen videos, and the number of problems solved by students. Lecture recording is also an important medium for increasing conversation in distance learning environments. In addition, access to lectures is a form of access to lesson content that highlights the importance of the learner-content interaction in the virtual learning environment. The links available in the virtual learning environments provide students with the opportunity to upload and download files and course materials so that they can download, see, and study the materials and interact with their course content. The results of this study are inconsistent with that of Rossi et al.’s (2013)(37) study. They believe that the design features of virtual learning environments are in favor of content-learner interactions. In other words, it is wrong to overemphasize the content-

learner interaction in these environments, and it is better to allow learners to interact with other learners in these environments.

The findings of the present study on faculty members' experiences of teacher-learner interactions in the virtual learning environment showed that professors used tools such as academic systems, non-academic tools, and social networks to interact with students. Regarding these tools, these findings are in line with the results of studies by Ustati et al. (2013) (38), Gasell (2020) (8), and Yazdani Kashani et al. (2013) (39). Based on these studies, in terms of usability, LMS has been perceived as a good platform for obtaining information about content and receiving feedback from instructors and creating teacher-learner interactions. There are also seven different communication tools that facilitate online interaction between learners and teachers, including email, talk page, bulletin board, blog, audio/video playback, chat, and web-conference. Social networks also provide the necessary contexts for the design and implementation of a virtual university with a focus on an interactive approach. Also, faculty members know how to interact with students, including academic and non-academic interactions.

These findings are consistent with the results of studies by Ustati et al. (2013) (38), Salmi (2013) (32), Kuo et al. (2014) (31), Paiva et al. (2016) (34), and Gasell (2020) (8). According to these studies, in order to increase academic interactions, instructors should try to regularly post questions on discussion pages, answer students' questions as soon as possible, and give immediate feedback to students; also, the measurement criterion of teacher-learner interactions is the number of messages sent and received between professors and students. In addition, the best method for virtual learning is often an introductory discussion aimed at creating a sense of membership in the virtual learning environment, where students and instructor can introduce themselves and get familiar with others in the online class. Also, according to faculty members' statements, low student motivation and large number of students, weakness of university systems and disruption of technology, lack of necessary training for professors regarding holding virtual classes, and the problem of learners and teachers' adaptation to technology are some barriers that cause the interaction between the professor and student not to be done well and completely. These findings are consistent with the results of studies by Pourjamshidi et al. (2013)(40), Sundari (2017)(41), Yengin et al. (2011)(42), Saeedipoor et al. (2015)(43), Gasell (2020)(8), and Kurucay et al. (2017)(21). According to these studies, the attitudes of professors

and students toward virtual learning and their sense of satisfaction increase their interactions with each other. Also, students' skill, trust, and motivation levels are among the elements that can affect how students communicate and interact with others in the classroom. The number of learners of the virtual course affects the teacher-learner interaction, and the higher the number of learners of a course, the less their interaction with the professor. The infrastructures and norms of the virtual learning system are among the factors affecting teacher-learner interactions. The online skill educational program has also been designed to help faculty members develop online courses and improve interactions in these courses, with professors receiving the advice and support of an experienced online instructor. Lack of instructors and students' ability to use technology has been stated as an important barrier to online collaboration; therefore, instructors and students should receive clear guidance on how to use technology to collaborate.

The findings of the present study on faculty members' experiences of teacher-teacher interactions in the virtual learning environment showed that faculty members interacted with colleagues inside or outside the university or abroad, with varying degrees of interaction from professors' perspectives. Regarding this type of interaction, the findings are consistent with the results of studies by Malekipour (2020)(44) and Nouri Motlagh et al. (2012)(45). According to these studies, professors should interact with their colleagues on issues such as how to teach and evaluate students in the classroom, sharing the latest achievements and new scientific methods in the curriculum area, and providing facilities and educational materials needed in the educational space. Also, audio or video conferences and webinars can provide face-to-face interaction and increase the interaction of professors with their colleagues.

According to the participants' statements in this study, the busy schedule of professors, lack of recognition and access to colleagues in other universities, lack of proper culture building to interact with colleagues, and lack of regular attendance of professors in the university or virtual sessions are some of the barriers that cause the teacher-teacher interaction not to be performed well and completely. These findings are consistent with the results of Zarei Zavaraki et al.'s (2013)(46) study. According to this research, the reason for low interaction of professors with other professors can be due to the fact that professors teach in virtual learning courses as online and virtually and rarely attend the educational center as in-person; as a

result, professors do not know each other, leading to reduced interaction between faculty members.

The findings of the present study regarding faculty members' experiences of content-content interactions in the virtual learning environment showed that faculty members did not pay much attention to content-content interactions. Regarding the content-content interaction, the findings are in line with the results of Zarei Zavaraki et al.'s (2013)(46) study. According to this research, the content-content interaction in the electronic curriculum of Khajeh Nasir al-Din Tusi University of Technology is at a lower than average level and not much attention has been paid to this type of interaction in the virtual learning environment. The content-content interaction discussion in virtual learning requires the development of technologies and interactive tools and the availability and adequacy of hardware and software infrastructures. Given the emergence of virtual learning courses in our country, it seems natural for faculty members not to pay attention to this type of interaction but virtual learning planners and administrators must do their best to improve and promote this type of interaction in virtual courses.

Findings of the present study on faculty members' experiences of teacher-content interactions in the virtual learning environment led to the identification and classification of faculty members' actions for selecting content and preparing electronic content. The most important actions include: Identifying books, referring to course titles, reviewing up-to-date and practical articles and resources, using PowerPoint software to prepare electronic content, preparing electronic content in the form of videos or photos, and preparing electronic content by students. Regarding preparing electronic content, these findings are in line with the results of Quadir et al.'s (2019)(19) study. According to this research, to ensure effective learning, instructors are recommended to use coloring, bulletins, links to other content, and multimedia educational materials such as video clips and PowerPoint in the content.

Conclusion

The findings of the present study showed that faculty members more or less pay attention to various types of educational interactions in virtual learning and have taken steps to increase and improve these types of educational interactions, but there are also barriers that prevent interactions from being performed completely and well. In this regard, some of those barriers can be mentioned in the following: Weakness of university systems, disruption of technology, lack of necessary training for professors in the field of holding virtual classes, the problem of teachers and students adapting to technology, students' economic problems, lack of regular

attendance of professors at the university or virtual sessions, and weakness in doing teamwork.

Therefore, suggestions for improving and increasing various types of educational interaction in the virtual learning environment are as follows: Designing an active space by professors during the course, university support for professors, holding workshops for professors and students, upgrading infrastructures, forming specialized groups across the country to prepare electronic content, simulating face-to-face classes in the virtual learning environment, virtual learning alongside face-to-face learning, and benefiting from the experiences of others.

Undoubtedly, the COVID-19 pandemic is not the end of an epidemic, and there is still the risk of the emergence of other diseases and crises. In addition, virtual learning can be used as a supplement to face-to-face learning even when the universities reopen; therefore, it seems that virtual learning will be an important element in future education systems. So, it is appropriate to use faculty members' experiences of virtual learning to strengthen various types of educational interactions and benefit from it to improve and develop virtual learning in the studied universities and other universities.

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

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Relationship Between Sensory Processing Patterns and Critical Thinking in Students

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Abstract

Background: Sensory processing pattern is a unique characteristic in each human. Critical thinking is a well-known skill of successful individuals.

Objectives: This study aimed to investigate the correlation between the critical thinking skills and sensory processing patterns of students of Medical Sciences.

Methods: This cross-sectional study was conducted on 213 students (147 males and 66 females). Brown's Adolescent and Adult Sensory Profile Questionnaire and Ricketts' Critical Thinking Questionnaire were used for data collection. Data analysis was performed using SPSS software (version 24) and appropriate statistical tests (i.e., the Pearson correlation test and independent samples t-test).

Results: Critical thinking had a significant positive relationship with sensory sensitivity ($r=0.229$) and a significant inverse relationship with sensory seeking ($r=-0.249$) and low registration ($r=-0.223$). Critical thinking had a significant positive relationship with students' grade point average ($r=0.875$). Additionally, there was no significant relationship between critical thinking with sensory avoidance ($r=0.099$) and age ($r=0.847$). In the sensory processing patterns, only low registration had a significant relationship with gender ($P<0.05$).

Conclusion: Students whose dominant patterns of sensory processing were sensory sensitivity and sensory seeking had better and worse critical thinking skills than others, respectively. It seems necessary to pay attention to sensory processing patterns in students to develop their mental skills, especially critical thinking.

Keywords: Thinking, Perception, Student, Critical Thinking, Sensory Processing Pattern

Background

Sensory processing patterns are among the most fundamental psychological features that explain how individuals perceive and react to environmental stimuli. The findings in the field of sensory processing confirmed that individuals process sensory information in different ways, which means that some individuals are more or less sensitive to sensory information than others (1-3). In 1997, Aron et al. developed the term "sensory processing sensitivity". According to this definition, individuals with the characteristic of sensory processing sensitivity tend to deep and powerful processing of a large amount of information, including paying close attention to other individuals' moods or artworks, such as analyzing a painting (1).

Despite the findings of Aron et al., Winnie Dunn proved that there are four patterns of sensory processing. Dunn's four-factor sensory processing model is a very popular model among occupational therapists (2). In this model, sensory processing style is in the form of four characteristics, namely low registration, sensory sensitivity, sensory avoidance, and sensory seeking. Dunn stated that sensory processing depends on two main factors, including threshold (high or low) and response strategy (active or inactive). As a result of this theory, the four following concepts are defined:

1) High threshold and passive response are classified as low registration.

2) High threshold and active response are classified as sensory seeking.

3) Low threshold and passive response are classified as sensory sensitivity.

4) Low threshold and active response are classified as sensory avoidance (2).

Sensory processing is an essential factor that is effective in numerous aspects of individuals' lives, especially students (4, 5). Mahmoudi et al. demonstrated that there is a sensory processing disorder in students with poor sleep quality (6). Yano et al. showed that there is a relationship between sensory processing sensitivity and depression (7). Amemiya et al. indicated that emotional control in students with sensory sensitivity was improved through yoga (8). What can be concluded from the aforementioned studies is the effect of sensory processing patterns on individuals' behaviors and reactions (1). Studies also acknowledge that creativity, maturity, and commitment play a special role in the quality of students' education (9). The aforementioned concepts are described as "critical thinking" (10). Critical thinking is defined as the ability to search for an issue, challenge, or situation to synchronize all available information related to the subject under study and arrive at a solution or hypothesis to justify the individual's orientation (11).

Critical thinking is defined in different terms. One of the reasons is that critical thinking is a subjective concept that requires high-level cognitive functions that make it more difficult to define and accurately measure a unit (12). Another reason is that each investigator has defined it according to their perceptions and research findings (13). Numerous studies have been carried out on the relationship between critical thinking with academic achievement and other aspects of students' lives (14). Akpur et al. showed that critical thinking has a positive and significant relationship with academic achievement (15). In a study, Soleimanpouromran et al. emphasized the effect of critical thinking on increasing positive social skills, reducing impulsive and rebellious behaviors, and increasing communication with peers (16).

Although studies have not confirmed the direct effect of critical thinking on physical health, considering that critical thinking is one of the main skills for medical students in clinical decision-making (17). Both categories (i.e., sensory processing and critical thinking) affect different aspects of human life, and critical thinking is one of the main factors in students' academic achievement (18). In addition, no study has examined the relationship between critical thinking and sensory processing pattern. Therefore, the present study was designed to investigate the correlation between critical

thinking and sensory processing in students of Medical Sciences.

Objectives

This study aimed to investigate the correlation between the critical thinking skills and sensory processing patterns of students of Medical Sciences.

Methods

The present cross-sectional study was conducted on 213 students of Hamadan University of Medical Sciences in the academic year 1399-1400 using convenience sampling. The sample size was determined using the PWR software package in R.3.6.1 software. The significance level was considered 0.05, and the test power was 90%. The value of r , which shows the correlation based on previous information, was 0.22. The inclusion criteria were the age of at least 19 years and healthy condition (i.e., no report of an acute or chronic physical or mental disorder that disrupted an individual's life). Before completing the questionnaire, the first author gave the necessary explanations about the project process, and the questions were answered through the internet. The questionnaires were sent to the subjects via email or social media. Internet informed consent was obtained from the participants at the end of the e-questionnaire for their anonymized information to be published in this article. All analyses were carried out using SPSS software (version 24).

Research Tools

1) Demographic questionnaire included information on age, gender, school of study (i.e., medicine, dentistry, pharmacy, paramedical science, nursing, and rehabilitation), academic year (first to the sixth year), grade point average (GPA), and place of residence (dormitory or native city)

2) Brown's Adolescent and Adult Sensory Profile Questionnaire (19) is an adaptation of the Sensory Processing Questionnaire for Children and Colleagues, which was developed in 2001. This questionnaire is a self-report scale with 60 items and sensory processing patterns in four areas of low registration, sensory seeking, sensory avoidance, and sensory sensitivity. Each pattern has 15 items with a score range of 15-75. This questionnaire does not have any cutoff points. The respondent should rate the items using a 5-point Likert scale (never, rarely, sometimes, often, and always) (19). Brown et al. offered the internal consistency of the subscales of this questionnaire within the range of 0.60-0.78 (19). In a study by Gamarisa et al. the Cronbach's alpha coefficient of this test was equal to 0.87 for the whole scale. The Cronbach's alpha coefficients of this

test for the subscales of low registration, sensory sensitivity, sensory seeking, and sensory avoidance were 0.71, 0.72, 0.65, and 0.75, respectively (20). In the present study, internal consistency was obtained through Cronbach's alpha coefficient for the whole test ($\alpha=0.847$).

3) 33-item Ricketts' Critical Thinking Questionnaire (10) was administered to assess critical thinking skills in students. The scale was designed by Facione et al. and received significant differences in relation to the California Critical Thinking Disposition Inventory (CCTDI) (21). Ricketts tried to provide a shorter, more effective, and more reliable scale. The Critical Thinking Tendency Questionnaire was based on Facione's Critical Thinking Scale (22). On this scale, the subject should indicate on a 5-point Likert scale (from strongly disagree equal to 1 and strongly agree equal to 5) the extent to which he/she disagrees or agrees with each of the statements. In items 2, 12, 15, 19, 23, 30, 32, and 33, the scoring is obtained in reverse. This scale has three subscales, namely creativity (the first 11 items), maturity (the next 9 items), and commitment (the last 13 items). The total score on the Critical Thinking Questionnaire for each individual is within a range of 33-165. This questionnaire does not have any cutoff points. Ricketts administered the Critical Thinking Questionnaire to 60 agricultural students to standardize it. The reliability coefficients of the subscales of this test were reported as 75%, 57%, and 86% for creativity, maturity (cognitive maturity), and commitment (mental engagement) (23). In a study by Pakmehr et al. the psychometrics of this questionnaire in the Persian language was obtained, and the reliability coefficient of this questionnaire in Persian was reported to be 91% (24). In the present study, the internal consistency of Ricketts's Critical Thinking Questionnaire was confirmed and calculated by Cronbach's alpha coefficient ($\alpha=0.844$).

Before participating in the study, the students were provided with the necessary explanations about the research process and the two concepts of sensory processing and critical thinking. Students' participation in the research was informed and voluntary. Moreover, in the draft research form, it was possible to communicate with students to answer their questions and possible concerns during the study. Then, the data were analyzed using appropriate statistical tests. The Pearson correlation test was used for three purposes, including exploring the relationship between sensory processing patterns and subscales of critical thinking, investigating the relationship between subscales of critical thinking and GPA, and studying the relationship between age with critical thinking and sensory

processing patterns. The independent t-test was used to investigate the relationship between gender with sensory processing and critical thinking. A p-value less than 0.05 was considered statistically significant.

Results

A total of 213 students of Hamadan University of Medical Sciences, including 147 females (69%) and 66 males (31%), from different fields of medical sciences in 2 months participated in this investigation. The highest and the lowest numbers of participants were related to medical students ($n=40$, 18.77%) and health students ($n=20$, 9.38%), respectively. Table 1 shows further details of demographic variables.

The students obtained the highest score among the four sensory processing patterns in the sensory sensitivity pattern, with a mean score of 48 ± 5 . Moreover, the lowest score was obtained in the low registration pattern with an average score of 34 ± 6 . The average total score of critical thinking for students was 124 ± 5 . The Pearson correlation test was used to investigate the normality of data distribution in the dimensions of sensory processing and critical thinking (using a Q-Q plot test) (Table 2).

Table 1. Demographic Characteristics of Subjects

Variables	n	%
Gender		
Male	66	31
Female	147	69
School		
Medicine	40	18.77
Dentistry	38	17.84
Paramedicine	30	14.08
Nursing	12	5.63
Radiology	18	8.45
Midwifery	28	13.14
Pharmacy	32	15.02
Rehabilitation	25	11.73
Physiotherapy	10	4.69
Occupational therapy	15	7.04
Health	20	9.38
Academic year		
First	38	17.84
Second	96	45.21
Third	29	13.61
Forth	12	5.67
Fifth	18	8.45
Sixth	20	9.22
Residence		
Native city	128	60.09
Dormitory	85	39.9

There was a significant and positive correlation between GPA and critical thinking score ($P<0.05$, $r=0.875$).

Table 2. Mean and Standard Deviation Related to Scores of Sensory Processing Patterns and Subscales of Critical Thinking and Total Score of Critical Thinking

Subscales		Mean	Standard deviation	Minimum	Maximum
Sensory processing patterns	Low registration	34	6	18	58
	Sensory avoidance	38	6	20	64
	Sensory seeking	40	7	22	65
	Sensory sensitivity	48	5	32	63
Subscales of critical thinking	Maturity	33	3	23	43
	Creativity	43	5	30	54
	Commitment	47	4	33	61
Total score of critical thinking		124	5	90	155

Table 3. Correlation Coefficient Values between the Subscales of Critical Thinking and Sensory Processing Patterns

Items	Commitment	Maturity	Creativity	Sensory avoidance	Sensory seeking	Sensory sensitivity
Maturity	0.597**	-	-	-	-	-
Creativity	0.606**	0.632**	-	-	-	-
Sensory avoidance	-0.093	-0.132	-0.046	-	-	-
Sensory seeking	-0.193*	-0.237**	-0.219**	0.690**	-	-
Sensory sensitivity	0.117	0.221**	0.256**	-0.187	-0.028	-
Low registration	-0.197*	-0.186	-0.192*	0.632**	0.702**	0.043

**P<0.01, *P<0.05

The examination and comparison of the relationship between sensory processing patterns and critical thinking subscales showed that the commitment subscale had a significant inverse relationship with seeking ($r=-0.193$) and low registration ($r=-0.197$). The maturity subscale had a significant inverse relationship with sensory seeking ($r=-0.237$), low registration ($r=-0.186$), and sensory avoidance ($r=-0.132$). The maturity subscale had a significant positive relationship with sensory sensitivity ($r=0.221$). The creativity subscale had a significant reverse relationship with sensory seeking ($r=0.219$), sensory avoidance ($r=0.046$), and low registration ($r=0.192$). In addition, creativity had a significant and positive relationship with sensory sensitivity ($r=0.256$) (Table 3).

Among the four dimensions of sensory processing, critical thinking had a significant and positive relationship with sensory sensitivity ($r=0.229$, $P<0.05$). Critical thinking also had a significant reverse relationship with sensory seeking ($r=-0.249$, $P<0.01$) and low registration ($r=-0.223$, $P<0.01$) (Table 4). The results showed that among the sensory processing patterns, gender was associated only with low registration ($P<0.05$). Female students scored higher in this pattern than male students. Furthermore, the results confirmed that there was no significant correlation between age with sensory processing ($P>0.05$) and critical thinking ($P>0.05$) (Table 5).

Discussion

The present investigation confirmed that for students who participated in the study, sensory sensitivity had the most significant relationship among

the four patterns of sensory processing with critical thinking and its subscales (i.e., creativity and maturity). Sensory seeking and low registration also showed a significant inverse relationship with critical thinking. All patterns of sensory processing had a significant relationship with at least one of the subscales of critical thinking. Extensive investigations have been accomplished on the consequences of sensory processing patterns on behaviors in healthy and disabled individuals (25, 26). For example, Meredith et al. showed that coping approaches could reduce distress in individuals with sensory sensitivity (27).

Another finding of this study is that the patterns of low registration and sensory seeking had a significant inverse relationship with critical thinking. In 2012, Rizzo et al. demonstrated a positive relationship between creativity and sensory sensitivity, which is confirmed by the results of the present study (28). What is important about the aforementioned finding is paying attention to the definitions of each of the sensory processing patterns. In the pattern of sensory sensitivity, the threshold is low and the model of response is inactive (2); therefore, it is expected that individuals who have this pattern are likely to be people with higher critical thinking skills and can more effectively understand the tensions and feedback from the environment, manage them using critical thinking skills, and provide logical and accessible solutions (29).

Regarding the two patterns of sensory seeking and low registration, which showed both a significant inverse relationship with critical thinking, it is noteworthy that in both of these patterns, the response method is active. Regarding the four patterns of sensory

processing, Winnie Dunn said that “individuals whose sensory processing patterns of sensory sensitivity and avoidance are predominant have a more accurate and comprehensive awareness of environmental stimuli, such as sound, smell, and touch”. The difference between sensory sensitivity and sensory avoidance is in the method of response, in which the former is active

response and the latter is passive response (2). Despite the scientific evidence that critical thinking and its subscales are related to the four sensory processing patterns, it cannot be precisely confirmed or rejected that people with a low threshold and passive response (sensory sensitivity) think more critically than others.

Table 4. Relationship between Critical Thinking and Sensory Processing Patterns Using Pearson Correlation Test (n=213)

Variable	Sensitivity	Seeking	Low registration	Avoidance
Critical thinking	0.229**	-0.249**	-0.223**	-0.099

**P<0.01, *P<0.05

Table 5. Relationship between Demographic Variables with Critical Thinking and Sensory Processing Patterns

Variables		Critical thinking				Sensory processing patterns			
		Commitment	Creativity	Maturity	Total	Low registration	Sensory avoidance	Sensory seeking	Sensory sensitivity
Gender	t	-0.9	0.59	0.21	0.07	-1.97	-0.98	0.16	0.36
	%95 confidence interval of difference	-1.60 to 0.59	-1.08 to 2.02	-1.28 to 1.60	-3.40 to 3.65	-3.89 to 0.00	-2.97 to 0.98	-2.02 to 2.38	-1.40 to 2.03
	P-value	0.03	0.03	0.00	0.00	0.59	0.81	0.89	0.21
Age	r	-0.03	-0.03	0.09	0.01	-0.06	-0.08	0.03	0.09
	P-value	0.66	0.63	0.18	0.84	0.32	0.23	0.62	0.14

The findings of the present study also indicated that critical thinking had a positive and significant relationship with GPA, which is the main sign of academic achievement. Some studies confirm the aforementioned finding and some studies violate this finding (30-32). Sireerat et al. examined the relationship between critical thinking and GPA in Thai dental students (using the CCTDI) and showed a positive and significant relationship between GPA and two areas of critical thinking (except for systematicity and confidence in reasoning) (33). Contrary to the results of the present study, Aghaei. et al. who examined the relationship between critical thinking and academic achievement in undergraduate physical education students, concluded that there is no significant relationship between academic achievement and critical thinking skills (31). For the determination of the exact relationship between GPA and critical thinking, it is necessary to perform studies with a larger statistical population among students and other populations.

Conclusion

The results of the present study indicated that the students with high sensory sensitivity patterns have better critical thinking skills than others, and this pattern has the most significant relationship in the four patterns of sensory processing with critical thinking and its subscales (i.e., creativity and maturity). Individuals

with sensory seeking and sensory processing patterns of low registration have less critical thinking skills than others. The results showed that students with a high GPA also have higher critical thinking skills. All patterns of sensory processing had a significant relationship with at least one of the subscales of critical thinking. The results confirmed that the sensory processing factor is important and influential in critical thinking skills. Therefore, it seems necessary to pay attention to the patterns of sensory processing in students and other populations because it can be effective in the development of their mental skills, especially critical thinking.

Limitations: The present study was a cross-sectional study and the results were obtained in a certain period. It is suggested to conduct a more detailed investigation of the relationship between critical thinking skills and sensory processing patterns using longitudinal studies to provide more reliable results. Another limitation of this study was the use of tools (self-report type) that increased the probability of incorrect completion of items by the subjects. The closure of universities made it impossible for Face-to-face communication with students. Furthermore, due to the sampling method, the study sample might not be representative of all the students at Hamadan University of Medical Sciences; therefore, the results should be generalized with caution.

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Students' Academic Lifestyle in COVID-19 Crisis: A Qualitative Study with a Phenomenological Analysis

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Abstract

Background: COVID-19 crisis has created special educational conditions. This challenge has brought about changes in students' academic lifestyles.

Objectives: We aimed to conduct a qualitative study on the students' academic lifestyle and quality during the COVID-19 crisis.

Methods: This is a qualitative method with a phenomenological analysis. The research was conducted within the framework of logic sampling on 50 students with a phenomenological approach to Medical, Health, and Laboratory Sciences students. It was purposeful. Students were asked to describe the style and quality of their academic life in the form of expression of experience during their COVID-19 crisis and quarantine, and then the analysis of the students' written work was performed using Colaizzi's seven-step process. Four-dimension criteria were also considered to assess rigor of qualitative research (credibility, dependability, conformability, and transferability).

Results: Of 64 codes obtained in the research, five themes and 11 sub-themes emerged. Themes included items such as 1) unknown stress and anxiety, vague future and professional problem, 2) cognitive burden (information literacy, bulk contents, need for self-paced, and need for mastery), 3) interests (following interest and compensation process), 4) skills (self-regulation, self-direction, and time management), and 5) security (available content, exercise, and practice).

Conclusion: According to the results, it can be stated that changing the academic lifestyle can provide improved personal skills and information literacy, but changing the academic lifestyle in a negative direction with cognitive burden and fear of the unknown has created many problems in the process of this lifestyle.

Keywords: Academic Lifestyle, COVID-19, Medical Education, Phenomenology Approach, Qualitative Study, Active Learning

Background

As of December 2019, a large number of COVID-19-infected patients were reported in Wuhan, Hubei Province in China. The rapid progress of coronavirus disease has significantly increased mortality and has become a worldwide pandemic, with significant potential for adverse effects on mental health and various aspects of life, including education (1, 2). Today, many educational programs are done in modern scientific ways and with the help of technology development. In this regard, promoting students' scientific literacy and helping them understand science and the nature of science, obtaining basic scientific concepts, and realizing the connections between science and technology, society and environment and, more importantly, the acquisition of scientific values and

attitudes, as well as the continuation of scientific studies, are among the most important goals of educational systems (3). The quality of students' academic life, as an active and prominent part of the society, significantly affects learning and increases scientific awareness and their academic success. In fact, students' quality of life is a clear sign of their satisfaction with their student life (4).

Quality in general and quality of life, in particular, is a complex concept consisting of various objective and subjective dimensions. The most common concept of quality of life is the concept of well-being and the way people look at life (5). The need for research arose since higher education systems in Iran and some countries do not function properly in providing facilities, services and opportunities for students' development. This inefficiency has created problems for students and while

creating dissatisfaction with their academic life, it has disrupted their learning process and socialization (3). The study of quality of life not only in Iran but also in the world is a relatively new topic and the quality of students' academic life also falls into this category (5).

In the model of quality of academic life of South Korean students, the need for health, security, and economic needs in the university environment is examined and the criteria for quality of students' life are presented (4).

Sirgy et al. (2007) have conducted many studies to assess the quality of academic life, among which the first study included 2,812 undergraduate students from 10 universities around the world. Data were conducted among undergraduate students using an online questionnaire. The results of the study approved the hypothetical model as well as the validity of the tool. The second line of the study was conducted to investigate the developed model. In this model, 7. Sirgy et al. (2010) emphasized the satisfaction with university life as one of the multiple dimensions of individual life, which can play an effective role in overall life satisfaction (6, 7). COVID-19 crisis conditions have created special conditions in education. This challenge has brought about changes in students' academic lifestyles.

At this critical educational time and COVID-19 crisis, major changes have taken place in the transmission of the principles of the courses (8, 9) The development of professional activities and learning based on competencies is measured by new indicators. The timing of some curricula in some universities has changed and the delivery of some courses is delayed (10).

In order to prepare students for future professional careers, training students to face sensitive job conditions faces many challenges. COVID-19 crisis has had a significant impact on medical education, and this cannot be ignored. In this situation, many contents and educational items in the virtual form were changed and the evaluation of learning resulting from these changes was very important (11). Change in classroom teaching through technology and social distance in teaching and change in teaching and learning styles from face-to-face teaching to instrumental teaching through technology, such as Zoom, Adobe, and Blue Baath have resulted in changing the style of learning and teaching in universities (12). What needs to be considered is whether this fills the gap between returning to a normal lifestyle for students or causing change and creating tension and stress in users (13). On the other hand, acquiring various capabilities in the field of placing clinical students in a crisis environment shows that this has not been able to change the field for their readiness

and leads them to be more powerful than ever in clinical and professional life (14).

Objectives

Due to COVID-19 crisis and the closure of face-to-face class, the teaching and learning process showed fundamental changes. One of these was the change in students' academic lifestyle. This process with the educational crisis could have major effects on students' educational experience. Students' style in adapting to change and review of this process in experience can help to deepen this issue. The aim of this study was to attend to the academic lifestyle of students during COVID-19 crisis in the form of a qualitative study with a phenomenological approach.

Methods

This research is a qualitative method with a phenomenological analysis that was conducted with the aim of examining students' experiences of the academic lifestyle in times of COVID-19 crisis and its quality. Sampling of the research was conducted within the framework of logic sampling with a phenomenological analysis which was purposeful. In this way, all students in the LMS system in different levels of education from the Department of Medicine, Health, and Laboratory Sciences were investigated. The study was categorized into three educational groups that had different courses and were in different stages of medicine from the freshmen to basic sciences (360 people), freshmen health students (17 people), and sophomore laboratory sciences (25 people) that were available in the LMS system in the first semester of 2021 (between December 2020 to February 2021). All students were users of the LMS system from the start of COVID-19 pandemic. All students were interested in sharing their experiences, and informed consent was obtained from the subjects to participate in the study voluntarily.

Students were asked to describe the style and quality of their academic life in the quarantine and COVID-19 crisis, and then an analysis of the students' writings was performed. One part of the data was also expressed in WhatsApp space and in the form of text and voice communication for the teacher as a focus group. Focus group size and number of students were different in all groups.

Also, participation of the students in the LMS space was completely optional and the students acted with their desire to send their experiences. However, the teacher reminded and requested the expression of experience. A total of 50 students in all groups wrote their experiences and their experiences were analyzed. The data were reviewed with the approval of two experts

in qualitative analysis and their agreement was the criteria of extracted sections in the results. With the aim of maximizing the variance of content validity, a request for cooperation and participation in writing the academic lifestyle was made in different groups and sections as a triangulation (Diversity of students from different groups and different genders) helped increase data validity. Students were assured that their experience in this field would be used only for research.

In data analysis, seven steps in Colaizzi's descriptive phenomenological method were used for data analysis (15). This process concludes: 1. Familiarization: The researchers familiarize him or her with the data, by reading all statement several times 2. The researcher identifies all statements that are of direct relevance to the phenomenon 3. Formulating meanings: The researcher identifies meanings relevant to the phenomenon that arise from a careful consideration of the significant statements. 4. Clustering themes: The researcher clusters the identified meanings into common themes across all accounts 5. Developing an exhaustive description: The researcher writes a full and inclusive description of the phenomenon. 6. Producing the fundamental structure: The researcher condenses the exhaustive description that captures just those aspects to the structure of the phenomenon. 7. Seeking verification of the fundamental structure: The researcher returns the fundamental structure statement to all participants to ask whether it captures their experience (15).

Lincoln and Guba (1994) mentioned four criteria for the validity of articles and qualitative analysis, including credibility, dependability, confirmability and transferability. Also, reflectivity is one of the major criteria in qualitative research (16, 17). Prolonged engagement in the LMS system, appropriate interaction with participants by data review, and member check were considered to increase credibility. Also, the assurance of dependability or the stability of the findings was checked by using the opinions of external checkers and re-reading the data together. Allocating enough

time to analyze the data and not personal interpretation of it and then returning and reviewing the main concepts underlying the scenarios and participant storytelling could help ensure the validity and reliability of the work (transferability and fittingness). To develop reflexivity, researchers continuously tried to match their positions during the interview or observation and react accordingly to what the research had seen and heard.

Results

A total of 50 students in all groups wrote their experiences and their experiences were analyzed. In this study, 56.4% of students were female and the rest were male. All participants in this study included medical (27 subjects), sophomore laboratory sciences (12 subjects) and public health (11 subjects). Of 64 codes obtained in the research, five themes and 11 sub-themes were extracted. Themes included items such as unknown stress and anxiety, vague future, and professional problem, cognitive burden (Information literacy, bulk contents, need for self-paced, need for mastery), interests (following interest, compensation process), skills (self-regulation, self-direction, time management), and security (available content, exercise and practice, healthy environment in family) (Table 1). As a result, five themes and 11 sub-themes were extracted.

The first theme includes the unknown: This theme consists of three subthemes (stress and anxiety, the life's vague future with a virus, and professional problems). In this situation, students experienced symptoms such as anxiety and worry and spoke of a kind of cognitive conflict over the comparison of traditional and virtual education.

Their main concern was how to adapt to the situation. Anxiety and worry about the type of education as well as the time and life with COVID-19. Some also expressed anxiety about the professional future, lack of deep learning in virtual training, and lack of mastery over content.

Table 1. Themes and sub-themes and sample statements in the research

Themes	Sub-themes	Statements sample
Unknown	Stress and anxiety	"Stress and worry ruin my soul. A damn virus has come to bother us"
	Vague future	
	Professional problem	
Cognitive Burden	Information literacy	"The volume of homework they upload is many times greater than the amount of regular homework. I become dizzy"
	Bulk contents	
	Need for self-paced	
	Need for mastery	
More attention to interests	Complexity of contents	"One of the best things I can do is read novels that I liked to read for years and did not have time for".
	Following interest	
	Compensation process	
Skills	Self-regulation	"I think this period is a good opportunity for a person to regulate his/her affairs and thoughts"
	Time management	
	Self-direction	

Safety	Available content,	“One of the good things is that you are in your own home and in your own room and you do not have to put up with others in a small dormitory. Whenever you like, you study even in the middle of the night and no one has anything to do with you”.
	Exercise and practice	
	Healthy environment in family	

A sophomore medical student “Stress, anxiety, and worry kills me that damn virus is to disturb us badly... I went to bed at 12...I checked my phone to read news as my routine.... high rate... mortality.... people with masks and gloves.... their fear...celebrities beg people to stay at home.... medical staff and their hard time....my brother with ruined lungs and my worry for him!!! I stayed up till morning...I woke up having a bad headache.... got my phone to check our class group that was about assignment and content on the site...oh, how can I handle this one?”

The second theme was cognition burden: which was characterized by sub-themes such as (need for mastery, bulk contents, need for self-paced, complexity of content, and students’ information literacy) cited the cognitive burden of presenting and mastering bulk virtual content as a factor in creating cognitive load, and on the other hand, the need for master and self-read courses, the complex content of some courses and individual mastery of it as a cause of stress and pressure on their mental power. Some expressed the lack of information literacy in the search for resources and the use of content and the lack of skills in this field as factors of stress and increased mental load in how to use and apply the content.

“Health student “Hi. I cannot imagine worse. When you log in to the LMS system, you face lots of files sent by professors that are frustrating instead of motivating. For instance, 13 neuroanatomical files are loading on site and it is very stressful, also other courses do the same which disrupts our concentration...if we had online classes, we did not have such problems....I have criticize of this issue. I wish I could follow it up...professors do it for their own convenience, but.....”.

Attention to interests: following them were another theme seen in the academic lifestyle. Pursuing interests with the extra earned time, dealing with personal matters, and abandoning interests were some of the topics that were observed. Studying books at this time had opened its way among the interested students.

Other themes were more interesting: This theme consisted of two subthemes. Following interest and compensation process.

“A junior medical student; “Reading novels, which are on my to-do list for a long time is the work I enjoy doing. Apart from the assignments that professors upload, we are learning that we can study without the concern of tests and passing them. We understand that

if we learn a word today, it can help us tomorrow undoubtedly.” A medical student: “I closed my eyes and prayed...opened my notebook and drew an emoji and started studying...skimmed the content and got help from references to complete my information for writing a good handout. At the end of my handout, I wrote: hey life! You are hard on me but I survive. Maybe I am sadder than before, but I believe in good things of life to live since they are a lot. “

Another theme was skill: These themes consisted of three themes (Self-regulation, self-direction, and time management).

Laboratory Sciences student

“In education, I have tried to stand on my own foot and get help from books, internet, etc.,...to answer my questions that I am so planned in comparison to the first days of quarantine time that I was unplanned. I can handle the volume and time of courses to lessen my worries. I think it is a hard but useful experience for both learners and teachers since it causes better management of virtual studying by getting experience. It can also be a good experience for professors to prepare voices on files and Power Points to give students peace and calm. I wish our professors understood us to reduce our stress, especially concerning that we are freshmen students and we are not familiar with exams. “

Safety was one of the topics: This theme consists of three themes (Available content, exercise and practice, and a healthy environment in a family). The safety of physical environment and healthy family environment without any traffic and illnesses, along with the presence of ready content, the possibility of practice and repetition, access to the content and the teacher in virtual environment were the reason for following safety for students. A medical freshman student: “We cannot attend real classes anymore. It has problems, but it also has positive points. Being at home all the time, being with your family and yourself, planning for life, self-cognition ...are among its blessings. Studying and learning are much easier at home (provided that educational content is complete and is provided on a plan; otherwise, studying bulky content that has no plan in their presentation and assessment is not easy at all). It is a good thing that I know that our professor’s audio file (if clear!!!) and in a better quality than the real class’s recording exists and we can listen to it anytime we desire is a very good happening. Living at home instead of dormitory, in which we have control over everything

and we are not to spend days in a small room full of students, is a motivation to pray to God not to put an end to these days!!!”

Other results of students' expression that were shown in list are as follows: Simulation of regular classes and daily study; exercise and practice to master the content of learning; upgrading information literacy to master various content types; search for auxiliary scientific resources along with the main content; attending classroom debugging sessions; search for scientific resources from other universities and internet resources; earning from peers; managing to learn and changing study methods.

Discussion

Five themes and 11 sub-themes were extracted. Themes include items such as the unknown (Stress and anxiety, vague future, and professional problem), cognitive burden (Information literacy, Bulk contents, need for self-paced, need for mastery), interests (Following interest, compensation process), skills (Self-regulation, self-direction, and time management), and security (Available content, exercise and practice, healthy environment in family).

Unknown: Also, stress, anxiety, worry, and fear of the academic future were mentioned as one of the main reasons for e-learning during COVID-19 pandemic in the present study. The consequences of COVID-19 outbreak have affected all aspects of human life. Results showed psychological problems with COVID-19 associated with psychopathology symptoms among university students. The World Health Organization has issued guidelines for managing this problem from a biomedical and psychological perspective. Preventive and medical measures are the most important measures at this stage (18). University students are prone to psychological symptoms during COVID-19 outbreak, so in the beginning of the outbreak of this disease in Iran, as in other countries, the closure of universities was one of the first and most important measures to prevent the spread of the disease (19).

Similar research conducted in previous crises of infectious diseases shows that a wide range of emotional and psychological problems have been experienced that can be compared to COVID-19 crisis. Evidence suggests that the widespread prevalence of SARS created a level of anxiety, fear, and emotional distress (20). The results of other studies conducted during COVID-19 crisis also showed similar symptoms in individuals. Also, research has shown that in addition to mortality, COVID-19 also has negative psychological problems that have several psychological effects, including anxiety (21). According to a study conducted in China on 7,000 students during

COVID-19 outbreak, the results indicated that the most important cause of anxiety among students is their concern about the impact of the virus on their future education and employment status (22).

Safety: Safety is one of the most important themes in this study. Students can share their concerns and fears about contracting the disease and the adverse effects of the disease, like the closure of classrooms and universities and the uncertainty of the future for them, as well as receive the attention and help of others and achieve an understanding that there are always sources of support in any situation in the days of an outbreak of an infectious disease, including coronavirus, by expanding their network and receiving support from family, friends, and classmates to achieve peace of mind and reduce their stress and anxiety. Thus, perceived social support leads to a kind of self-confidence and assurance of effective and beneficial exposure to COVID-19. As a result, people with high perceived social support are less likely to have anxiety due to COVID-19 (23). It seems that COVID-19 anxiety can be a vulnerable factor for other psychological disorders in this segment of society due to the restrictions, the closure of educational centers and the feeling of danger from the effects of this disease on their future. Therefore, recognizing the factors affecting COVID-19 anxiety will be very important in this group. The use of adaptive mechanisms in reducing its psychological consequences and reducing the negative educational effects caused by it can be in line with the above-mentioned pieces of evidence.

Cognitive burden: The results of the present study showed that the bulk of educational contents has been one of the stressors of e-learning in COVID-19 time. The results of some studies showed that from the students' point of view, the content of the curriculum was at an undesirable level, which is consistent with the results of the present study (24). There is considerable evidence that shows virtual education can put a higher cognitive burden on students. This problem was higher than in face-to-face education (25). Also, there is evidence that students prefer face-to-face teaching to online teaching due to interactive teaching-learning process (26).

Skills: The results of the present study showed that students use different methods in learning in their academic lifestyle. One of these methods is to manage to learn and change the method of study and repetition and practice to master the content of learning. Choi et al. (2021), in their study, examined the effectiveness of peer learning in undergraduate nursing students. They showed the effectiveness of peer-assisted learning on

support, sharing and discussion during the debriefing in simulation practice. The results of the present study are consistent with this study (27). It seems that specialized instructors should be assigned to teaching in cyberspace. To increase interaction, a variety of activities, such as online discussion and computer conferencing, as well as combined methods such as e-mail discussion or audio-visual methods, should be utilized.

One of the active learning methods is peer training. Peer group training is a type of educational strategy that is defined as the development of knowledge and skills through active interaction and support people at the same level. In the peer teaching method, both of the teacher, who designs and directs the teaching situation, and the student, who uses the method, are involved in the continuous teaching experience and participate in the teaching process. This method is one of the most important and effective methods for educating learners, the use of which is increasing in all educational levels of medical sciences (23). It has been reported that peer-to-peer methods can increase intergroup collaboration in the transmission of health information (28).

In fact, this method is a useful way to prepare students to perform their future role as teachers of medical sciences (29). In several studies, the improvement in academic performance has been shown by the peer group using the training method (30-32). The findings of Ramaswamy et al.'s study (2010) showed that students could effectively cover the content of the curriculum. In addition, peer education provides an opportunity for the student to deeply understand the subject and become proficient in the subject he/she is teaching. However, students who listen to us (as learners) concern that they will not learn as well as when the teacher teaches (33). In a study conducted by Mehrabi et al., the results showed that learning with the help of peers effectively increases the clinical reasoning skills of dental students (34). The findings of this study are consistent with the present study, in which the students mentioned peer learning as one of the learning methods. It seems that in the current COVID-19 crisis, the use of peer learning methods along with the use of different other learning methods can prevent the monotony of online classrooms and also prevent fatigue and lack of motivation in students. Therefore, students can participate more in online classrooms by further use of this method. As a result, increasing learning and teaching activities, skills, experience and mastery of students as much as possible may be expected to increase students' participation.

The positive points of COVID-19 crisis also are presented by students. These points include self-efficacy, self-regulation, self-management while

rethinking time management skills. These skills obviate the need for master personal performance and how to move toward achieving educational goals. Self-directed learning is a learning behavior that paves the way for people to learn continuously on their own intuition (35). The benefits of self-directed learning include increased power of choice, motivation, self-confidence, self-efficacy, and enhanced lifelong learning skills. This type of learning encourages learners to develop their ability to measure their knowledge defects and then explore the sources that are effective in fixing the defects. Thus, individuals use their knowledge to identify available resources and make conscious judgments to solve problems (36).

In their study, Ghureshi et al. examined the effectiveness of the native model of student learning. They concluded that the native model of e-learning is consistent with self-strategy and was effective in raising the overall score of self-strategy in learning and its components (37). Fallahi et al. (2020) examined the relationship between self-directed learning and e-learning of students during COVID-19 pandemic. The results showed that there was a significant relationship between self-directed learning and e-learning (38). The results of the present study show the lack of mastery of learning contents at high level of presented contents and complexity of contents are one of the stressors of e-learning in COVID-19 era. In the field of learning activities, it seems that group activities are rarely formed in virtual classrooms and students do not benefit much from each other's experiences (39). Others concluded that although the opportunity for group activities in face-to-face and virtual classes is average to low, this shortage is felt more in virtual classes (40). Inclusive activities that increase students' interaction with each other as well as with the teacher seem to increase group activities and thus help master the learning content. This personal skill is so important in virtual learning. Also, self-promotion and self-pace skills are important issues from the viewpoint of students. It seems that in order to increase the quality of e-learning, a platform should be provided to enhance the ability of self-directed learning so that students can learn in different situations such as COVID-19 outbreak, which reduces the possibility of physical presence and most students pursue home education. Also, anyone with a high ability to learn as a leader can learn better in the context of technology and electronic content.

Strengths and limitations

The limitations of the research can be counted as doing it in a virtual situation and in the form of

its expression in the LMS system of the university without the possibility of face-to-face interviews. However, attempts were made through repeated virtual contacts to provide the possibility to expand and understand the details.

Conclusion

According to the results, it can be stated that the change of academic lifestyle in the COVID-19 time with a virtual nature by having different benefits has created the possibility of planning, self-management, and self-regulation and then improving personal skills and information literacy, but has also changed academic lifestyle in a negative direction with cognitive burden due to the volume of curriculum and the need for personal management in its management and fear of the unknown. These conditions, with a better understanding of policymakers, can become an educational opportunity and provide a basis for taking advantage of the situation.

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Psychological Well-being and the Prevalence of Anxiety among Medical Students during COVID-19: An Online Survey

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Abstract

Background: The COVID-19 pandemic has caused international health concerns. University students, especially medical students, considered to experience higher anxiety levels. This high level of anxiety may lead to many challenges and unfavorable consequences.

Objectives: This study aimed to assess psychological well-being and the prevalence of anxiety among medical students of Kerman University of Medical Sciences during the COVID-19 pandemic.

Methods: An online cross-sectional survey was conducted on Kerman University of Medical Sciences medical students from April to June 2021. The participants were asked to complete Corona Disease Anxiety Scale (CDAS), Goldberg and Hiller's General Health Questionnaire (GHQ-28), and a demographic information questionnaire. Data were analyzed by statistical package for social sciences (SPSS) for windows, version 24, at the significance level of $p < 0.05$ and highly significant level of $p < 0.001$. The multivariate analysis of covariance (MANCOVA) and multiple regression were employed as Statistical tests.

Results: A total of 201 medical students participated, 60.3% being female. The adjusted mean score of COVID-19 anxiety was 11.05 (1.91), and the mean scores obtained for GHQ28 subscales, including somatic, anxiety, social dysfunction, and depression symptoms, were 5.82 (4.41), 7.75 (3.18), 4.49 (5.14), and 10.12 (7.25), respectively. Different factors, including gender and educational level, significantly affected the components of these two questionnaires. Based on linear regression model, anxiety/Insomnia and depression subscales of GHQ28 questionnaire increased COVID-19 anxiety levels.

Conclusion: The COVID-19-related anxiety level of medical students was mild. Female students and students with higher educational levels experienced more anxiety attributable to COVID-19. The general anxiety and depression levels were mild. These data highlight that in critical circumstances such as the COVID-19 pandemic, university authorities need to consider medical students' psychological well-being.

Keywords: COVID-19, Anxiety, Medical Student, Mental Health

Background

The COVID-19 pandemic has caused international health concerns. In December 2019, Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) was discovered in Wuhan, China. It caused an outbreak of unusual viral pneumonia known as COVID-19 (1). On Mar 11, 2020, World Health Organization (WHO) announced the coronavirus outbreak as a pandemic. This disease has spread rapidly throughout the world. According to official statistics from WHO, to date (Sept 15, 2021), there have been 225,024,781 confirmed cases of COVID-19 and 4,636,153 deaths. In Iran, the first official coronavirus case was reported on Feb 19, 2020,

in the Qom province, and this disease quickly spread all across the country. In Iran, 5,318,327 people have been infected, and 114,759 people have lost their lives (2).

The COVID-19 pandemic compelled global governments to impose nationwide quarantines and ban all kinds of gathering (3). These decisions have caused disruptions in businesses, employment, and education, thereby negatively impacting well-being with consequences such as panic and substance use (4, 5). Stress and anxiety are expected during COVID-19 and other similar pandemics, but no definitive treatment and preventive measures exist for COVID-19-related anxiety and stress (6).

Anxiety is generally characterized by a persistent and excessive feeling of worrying that would not relieve even in the absence of a stressor (7). Anxiety can lead to mild, moderate, or severe adverse health issues (8). This global pandemic has increased anxiety worldwide, which can, in turn, attenuate the immune system and make it vulnerable to infectious diseases (9). However, most researchers have focused on the COVID-19 patients' stress, even though the fear of infection, death, and disruption of daily activities can also cause anxiety in healthy individuals (10).

The rate and severity of mental health issues among university students, particularly medical students, are increasing, and they are reported to experience higher anxiety levels (11). The psychological stress caused by outbreaks can lead to adverse outcomes in terms of learning and the overall psychological health of students (12). Multiple stressors have been identified to increase students' stress, anxiety, and negative thoughts. They include the closure of universities, staying at home, not meeting friends, not exercising, not traveling, fear of getting infected or infecting loved ones, attending online classes instead of participating in the university classrooms, and lack of face-to-face learning and clinical/practical or training lessons (3). Arnout et al. conducted a study in Iraq to determine the effects of the COVID-19 pandemic on individuals. Based on the results, the levels of mental problems had increased. Additionally, this study showed differences in psychological issues based on demographic characteristics (13).

Moreover, recent studies worldwide reported that medical students experienced pandemic-related adverse psychological impacts. Medical students experience higher levels of anxiety compared to the general population. This increased stress levels may adversely affect their academic performance, physical health, psychosocial well-being, and quality of life (14, 15). A study reported that globally, one-third of medical students, especially in the Middle East and Asia, suffered from anxiety (16). Ghafari et al. reported that 56% of students suffered from mental disorders and commented that social support might improve their mental health, especially during the stressful era of the COVID-19 pandemic (17). Al-Rabiaah et al. conducted a study in Saudi Arabia to assess MERS-COV-related stress in medical students in Saudi teaching hospitals. According to their result, establishing psychological support programs for medical students during infectious disease outbreaks is critical (12).

Objectives

According to our searches, COVID-19 anxiety has not been measured among the students of this university.

Therefore, the current study aimed to assess the prevalence of COVID-19 anxiety in terms of psychological well-being and demographic characteristics indicators among medical students of Kerman University of Medical Sciences during the COVID-19 era. These findings can be used to implement health-promoting programs for the improvement of the psychological health of medical students.

Methods

Study Design

This descriptive-analytical cross-sectional study investigated psychological well-being and anxiety levels among Kerman University of Medical Sciences medical students from April to June 2021. Data was collected by convenience sampling method. All individuals who met the inclusion criteria were included in the study. Individuals with the exclusion criteria were excluded from the study.

Sample and Setting

In this study, the measurement of the sample size was based on the mean and standard deviation of a pilot study with a sample size of 40 participants. Gpower software was used to estimate the levels of corona-related anxiety at a significant level of 5%, an absolute error of 1%, and a non-response rate of 5% for MANCOVA tests. Data were collected according to the convenience sampling method. The Inclusion criteria included students who studied at the Kerman University of Medical Sciences and could read and understand Persian. The exclusion criteria were lack of informed consent, using psychiatric drugs, and having been diagnosed with psychological disorders.

Measures

Data were collected using a demographic information questionnaire, Goldberg and Hiller's General Health Questionnaire (GHQ-28), and the Corona Disease Anxiety Scale (CDAS).

A) Demographic Information Questionnaire: The demographic information questionnaire included information about students' demographic characteristics such as age, gender, educational level (basic science, physiopathology, pre-internship, and internship), and history of using psychiatric drugs.

B) The Goldberg and Hiller's General Health Questionnaire-28 (GHQ-28): In this research, the Persian version of Goldberg and Hiller's General Health Questionnaire-28 questionnaires was used to measure psychological well-being. This 28-item questionnaire includes four subscales about a person's psychological well-being in the last month. Each subscale contains seven questions. Questions 1-7 are related to somatic

symptoms, questions 8-14 are related to the scale of anxiety/insomnia, questions 15-21 are related to the scale of social dysfunction, and questions 22-28 reflect depression symptoms. To score this questionnaire, a 4-point Likert scale was used (not at all = 0, slightly = 1, very = 2, and extremely = 3). The highest and lowest scores that could be obtained by the respondents are between 0 and 84 (18). For each subgroup with 7 questions, the highest score is 21, and the lowest is 0 (19). In this tool, a lower score indicates better mental health. Taghavi et al., in a study on Shiraz University college students, calculated the reliability coefficients in three methods: test-retest, split half, and Cronbach alpha, which were reported as 0.70, 0.93, and 0.90, respectively. Additionally, Cronbach's alpha coefficients were obtained as ($\alpha = 0.76$) for the somatic symptoms, ($\alpha = 0.84$) for anxiety/insomnia, ($\alpha = 0.61$) for social dysfunction, and ($\alpha = 0.88$) for depression symptoms. The concurrent validity of the questionnaire was measured by Middlesex Hospital Questionnaire and was reported 55 ($p < 0001$). Moreover, the subscale-total GHQ28 questionnaire correlation was reported from .72 to .87. Four questionnaire factors were analyzed by varimax rotation based on the Skree test, covering over 50 percent of the total variance (20).

C) The COVID-19 Disease Anxiety Scale (CDAS):

The COVID-19 Disease Anxiety Scale (CDAS) questionnaire is developed and validated to measure COVID-19 anxiety during the coronavirus outbreak in Iran. The final version of the questionnaire has 18 items and two factors or subscales. Items 1-9 measure psychological anxiety symptoms, and items 10-18 measure physical anxiety symptoms. This tool is scored on a 4-point Likert scale (never = 0, sometimes = 1, most of the time = 2, always = 3); Therefore, the highest and lowest scores obtained by the respondents are between 0 and 54. High scores in this questionnaire indicate a higher level of anxiety. A score of 0-16, 17-29, and 30-54 shows none or mild anxiety, moderate anxiety, and severe anxiety, respectively. In the subscales of psychological anxiety symptoms, scores 0-5, 6-19, and 20-27 indicate mild, moderate, and severe psychological symptoms, respectively. Moreover, in the physical anxiety symptoms subscale, scores 0-1, 2-9, and 10-27 are considered as none or mild, moderate, and severe physical symptoms, respectively. Alipour et al. assessed the validity and reliability of this questionnaire in an Iranian sample (8).

The reliability of this tool was obtained by calculating Cronbach's alpha coefficient as ($\alpha = 0.879$) for the first factor, ($\alpha = 0.861$) for the second factor, and ($\alpha = 0.919$) for the whole questionnaire. Moreover, the value of Guttman's λ_2 was obtained as ($\lambda = 0.882$) for the

first factor, and ($\lambda = 0.922$) for the whole questionnaire (8). CDAS questionnaire has good reliability and validity in the Persian translation and can be used to measure Corona-related anxiety in the Iranian population (8).

Data Collection

Due to the special conditions of society and the limitations of social communication, an online questionnaire was designed by online software for data collection. The link access to this questionnaire was distributed via social media (i. e. Telegram, and WhatsApp). After reading the study description and consent, students completed the online questionnaire. A link to a Gmail address was also added to the online questionnaire so students could ask questions. The respondents' information was only used for this article and was not disseminated elsewhere.

Ethical Issues

This study was approved by the Kerman University of Medical Science Research Ethics Committee (IR.KMU.AH.REC.1400.142). Before information collection, informed consent was obtained from all subjects (before participating in the study). All gathered information remained wholly confidential and anonymous.

Statistical Analysis

Data analysis was performed using SPSS software version 24. Descriptive statistics such as frequency, percentage, and mean (SD) were calculated for each item of the demographic variables. For statistical analysis, a multivariate analysis of covariance (MANCOVA) was used to measure the effect of demographic variables on physical and mental anxiety and mental health dimensions, and multiple regression was used to measure the impact of mental health on physical and psychological anxiety by adjusting

demographic factors. A significance level of 5% was considered in all tests.

Results

A total of 201 medical students participated in this study. Nine participants did not completely fill out the questionnaires. The response rate was 96 %. The mean age was 22.74 ± 2.34 years, with women (60.3%) constituting the majority of the study participants. Nearly half of the medical students were at the basic science level (48.8%). The remaining half of the questionnaires were distributed among medical students at the physiopathology level (3.3%), externs (undergraduate medical students) (22%), and interns (25.8%).

According to CDAS, the lowest, highest, and mean (SD) of the physical anxiety symptom score were

0.26, and 8.39 (3.73), respectively. These scores for psychological anxiety symptoms were 0.27, and 2.06 (5.02). The mean and standard deviation scores obtained for GHQ28 subscales, including somatic, anxiety, social dysfunction, and depression, were 5.82 (4.41), 7.75 (3.18), 4.49 (5.14), and 10.12 (7.25), respectively.

Based on the demographic variables, the mean (SD) of the GHQ28 subscales questionnaires is given in Table 1. In this regard, the multivariate analysis indicated that several factors, including age ($P = 0.021$), sex ($P = 0.021$), and educational level ($P = 0.021$), had a significant effect on the subscales of CDAS and GHQ28

questionnaires. Univariate ANCOVA post hoc tests revealed that with increasing age, the somatic symptoms decreased ($P = 0.021$). Additionally, the mean score of somatic symptoms in men was significantly lower than in women ($P = 0.018$). The mean score of psychological anxiety symptoms among women was higher than among men ($P = 0.005$). The scores of anxiety symptoms ($P = 0.026$) and somatic symptoms ($P = 0.037$) were different in varying educational levels. As a result, age, sex, and academic level were likely confounding variables.

Table 1. The Effects of Demographic Factors on the General Health Questionnaire-28 (GHQ-28)

Variables		Somatic Symptoms	P	Anxiety/Insomnia Symptoms	P	Social dysfunction Symptoms	P	Depression Symptoms	P
		Mean (SD)		Mean (SD)		Mean (SD)		Mean (SD)	
Gender	Men	5.67(3.62)	0.015	6.6(4.62)	0.583	8.12(3.26)	0.159	4.47(5.42)	0.96
	Women	6.8(2.9)		6.98(4.27)		7.5(3.12)		4.52(4.97)	
Education Level	Basic sciences	6.27(3.19)	0.033	6.71(4.09)	0.011	7.79(3.43)	0.425	4.96(5.14)	0.651
	Physiopathology	6.71(4.39)		4.14(4.18)		7.71(3.04)		4.57(5.09)	
	Clerkship	7.37(3.44)		8.43(4.73)		8.28(3.12)		3.98(5.01)	
	Internship	5.39(2.81)		5.87(4.39)		7.17(2.66)		4.02(5.39)	

The effects of demographic variables and different subscales of GHQ28 on COVID-19 anxiety are presented in Table 2. A linear regression model was used to measure the impact of these variables on COVID-19 anxiety. The adjusted mean score of COVID-19 anxiety was 11.05 (1.91). The model revealed that anxiety/insomnia ($P < 0.001$) and depression ($P = 0.001$) increased COVID-19 anxiety levels. Somatic symptoms affected the levels of physical anxiety symptoms ($P = 0.001$). Moreover, somatic symptoms ($P < 0.001$) and social dysfunction symptoms ($P = 0.012$) were associated with psychological anxiety symptoms; therefore, it can be concluded that somatic symptoms and social dysfunction symptoms led to higher and lower levels of

psychological anxiety symptoms, respectively. The COVID-19 anxiety in men was significantly lower than in women ($p = 0.032$). The results indicated that medical students with varying educational levels experienced different levels of COVID-19 anxiety. The medical students from basic science ($p = 0.042$) and physiopathology ($p = 0.028$) levels had lower COVID-19 anxiety levels than medical externs and interns. Levels of COVID-19 anxiety were not significantly different between medical students in basic science and physiopathology stages ($p = 0.521$). Also, medical externs and interns had comparable COVID-19 anxiety levels ($p = 0.311$) (Table 2).

Table 2. Effect of Demographic Factors on COVID-19 Anxiety

Variables	Subclasses	Coefficient	Std. Error	95% CI		P
				Lower bound	Upper bound	
Intercept		11.05	1.91	7.31	14.79	<0.001*
	Men	-1.24	0.17	-1.57	-0.91	0.032*
	Women		Reference			
Age		0.18	0.13	-0.07	0.43	0.088
	Basic sciences	-3.41	0.97	-5.31	-1.51	0.042*
	Physiopathology	-3.99	1.09	-6.13	-1.85	0.028*
	Clerkship		Reference			
	Internship	-1.78	1.59	-4.90	1.34	0.265
GHQ28 Subscales	Somatic Symptoms	0.18	0.13	-0.07	0.43	0.322
	Anxiety/Insomnia Symptoms	0.91	0.92	-0.89	2.71	<0.001*
	Social/dysfunction Symptoms	0.64	0.01	0.62	0.66	0.662
	Depression Symptoms	0.06	0.13	-0.19	0.31	0.001*

*Statistically Significant at $p=0.05$

Discussion

The current study aimed to assess the psychological well-being and anxiety levels among Kerman University of Medical Sciences medical students during the COVID-19 pandemic. Results obtained in our study showed that medical students experienced mild COVID-19-related anxiety during the pandemic. This might be due to conditions such as fear of illness, a sense of loneliness at home, and educational issues (21). These medical education issues could be poor interactions, difficulty adjusting learning styles, having to perform responsibilities at home, canceling exams, no access to technologies, canceling in-person clinical skill sessions and OSCEs, being uncertain about exam dates, shortening of the training periods, inability to explore specialties, and suspending away rotations (22-24). Moreover, the need for social distancing and the long-time closure of medical universities negatively impacted the quality of psychological well-being of medical students.

Although temporary emergency medical schools' closure has reduced exposure to infected people during the peak periods of the disease, this issue has put more psychological pressure on students due to the extended study period and online education (25, 26).

The current study found that the anxiety and Depression scores of GHQ28 were low in medical students. Additionally, the mean scores of GHQ28 indicated that the students didn't have crucial problems in daily personal and social functions. These findings could be attributed to the fact that the time of data collection was several months after the official announcement of the COVID-19 outbreak in Iran, and possibly over time, the ability of people to adapt to the pandemic had increased.

Our results showed that corona-related anxiety was mild among medical students. Some studies have indicated that mild levels of COVID-19 anxiety could be due to the perception of the disease and effective preventive measures (5).

Evidence from previous observations indicates that they are in agreement with our findings in that COVID-19 caused mental health issues among medical students. A study in the United Arab Emirates showed that medical students reported mild or severe anxiety levels (5). Miri et al. (2021) study, conducted in Hamadan, Iran, showed that after the pandemic, about 28.4% of students reported depression, and 21.8% reported anxiety (28). A study by Halperin et al. (2021) in the United States demonstrated that among those surveyed, 30.6% and 24.3% of medical students had anxiety or depression, respectively. Also, this study reported 61%

higher anxiety and 70% higher depression rates during the COVID-19 outbreak, which indicates a mental health risk for medical students (29). The variation in the prevalence of depression and anxiety could be related to differences in socio-cultural conditions, the instruments used, and the study's timing. The results of some studies contradict ours. For example, Nakhostin-Ansari et al. (2020) showed that the prevalence of mild to severe anxiety and depression among medical students was 38.1% and 27.6%, respectively. But their result also indicated that the anxiety and depression in medical students were not changed before and after the COVID-19 pandemic at Tehran University of Medical Sciences in Iran (30, 31). Regardless of the coronavirus disease, there is evidence indicating that medical students' levels of anxiety and depression are higher compared to their peers and the general population (21, 32).

In this study, we found that female students experienced more anxiety than their male counterparts during the pandemic. This result is in accordance with the results of several other studies (27, 33). There are several possible explanations for this, including factors such as biological influences and behavioral, cognitive, and environmental factors (34). In addition, the female reproductive cycles are proposed as an explanation for higher rates of mental disorders among them (35). In contrast to earlier findings, some studies reported no gender differences among students regarding their anxiety levels. Apparently, male and female students' psychological health were equally affected by the COVID-19 pandemic (36-38).

It has been observed that anxiety levels are different in various academic stages. Our results showed that students in higher academic levels experienced more corona-related anxiety. This was especially true among students attending practical courses in hospital settings.

This finding was also reported by Saddik et al. (2020) (27). It seems plausible that these results may be due to the participation of medical students in clinical sessions in hospitals at the early stages of the COVID-19 outbreak when there was colossal panic and concerns about the spread of the disease (29). Conversely, in some other studies, it was observed that medical students in later academic years and those who worked with COVID-19 patients had lower anxiety than those in earlier academic years who had never visited patients (30, 39). This can be explained by the fact that higher knowledge of the disease, medical skills, and prevention measures awareness among later academic year medical students can alleviate panic (30, 31).

Generally, the results of the present study showed that anxiety and depression among students were not at

an alarming level. However, psychological support and counseling services should be available to students to improve their mental health and reduce anxiety levels. In this regard, a study by Siddiqui et al. in 2021 conducted in the United Kingdom showed that identifying and supporting the needs of healthcare professionals can significantly reduce their anxiety (40). Accordingly, the results of this study may be used for managing mental health issues and designing and implementing supportive programs for medical students in the future.

It is also suggested that further qualitative and quantitative research needs to be conducted with a particular focus on the accurate assessment of students' psychological problems and finding the fundamental causes of them during the pandemic.

The main strength of our study was using a valid corona anxiety questionnaire. Using questionnaires not designed for this purpose and measuring anxiety by general anxiety questionnaires may include anxiety from causes other than COVID-19. In addition, because of the COVID-19 pandemic restrictions, data were collected via online platforms, including Telegram and WhatsApp. This study has the following limitations. First, we did not consider the specific course and type of teaching hospitals where the students were trained. Second, the data was collected by convenience sampling, which may not be generalizable to the broader populations of medical students. Third, in the present study, we used self-reporting tools that may have influenced the results. Fourth, the study was conducted in only one medical school. Therefore, the findings may not be generalizable to students of other medical schools. Fifth, due to the study's cross-sectional nature, this anxiety level cannot be exclusively attributed to the corona pandemic, and other factors may have also played a role.

Conclusion

According to our results, the levels of COVID-19 anxiety, general anxiety symptoms, and depression symptoms were mild among medical students. Factors including age, sex, and educational level significantly affect the subscales of CDAS and GHQ28 questionnaires. The findings of this study emphasized that medical schools should consider this issue with more focus on female students and students with higher educational levels. Also, it is recommended that the psychological states of medical students should be considered, and supportive and adaptive strategies should be included in educational policies to effectively overcome the COVID-19 pandemic mental health consequences.

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Developing Accreditation Standards for Undergraduate Health Professions in Iran

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Abstract

Background: Program accreditation is one of the approaches to improve the quality of educational programs and is increasingly used in medical science education. Considering the lack of a program accreditation model at the undergraduate level of medical sciences in Iran.

Objectives: The present study was conducted to develop accreditation standards for educational programs at the undergraduate level.

Methods: This descriptive cross-sectional study was conducted in 2020-2021 using a mixed qualitative-quantitative method in two phases. In the first and qualitative phase, the qualitative opinions of nine experts in the basic fields and standards (assessed by the research team in the previous descriptive-comparative study) were obtained by holding a focus group (semi-structured interview). In the second and quantitative phase, the obtained accreditation domains and standards were prepared as an online questionnaire and sent to 16 Iranian experts to confirm the final standards. After analyzing the data, the accreditation standards for undergraduate educational programs were proposed.

Results: According to our results, 12 domains and 69 criteria were proposed as accreditation standards for educational programs. The results of the analysis of content validity ratio and content validity index showed that the values of all 12 domains and 69 criteria were higher than 0.49 and 0.7, respectively. As a result, all domains and criteria were approved. Moreover, the intraclass correlation coefficient (ICC) in all 12 domains was higher than 0.96, indicating an excellent ICC in the proposed domains.

Conclusion: Providing the framework of local program accreditation standards and criteria helps improve and promote the quality of medical science educational programs and leads to the higher trust of domestic and foreign stakeholders in these programs.

Keywords: Program Accreditation, Medical Science Educational Programs, Focus Group, Delphi Method

Background

In recent years, the Ministry of Health and Medical Education has witnessed an increasing growth quantitatively in both the number of faculties/universities of medical sciences and the variety of fields created. In this regard, maintaining and improving the quality of education and research and providing services have been among the main concerns of policymakers (1). Therefore, it is necessary to pay more attention to the quality of education as the main mean of providing the healthcare needed in the country and, finally, to enhance the health level of the society (2). In order to achieve this goal, continuous evaluation of the quality of the educational system and improving various educational courses and programs seems vital

(3). Studies worldwide confirm that higher education centers require a codified, scientific, and institutionalized evaluation system to assess the quality and accreditation of educational and curriculum programs (4-10). Several evaluation models have been considered to investigate the quality of higher education, among which the accreditation model has been accepted internationally and has been used almost as the exclusive evaluation model of higher education in many countries and universities (11).

Accreditation is the verification of the achievement of organizations and educational programs to predetermined standards, which is carried out by an independent external peer review assessor group of the same organizational level (12). The result of this

process is “granting credit, recognizing, and sometimes issuing an activity license whose validity period has a time limit” (13). In developing the accreditation model, developing standards is of central importance because these standards are instructions and guidelines for universities to which they must conform (14).

In order to be implemented, these standards must be in compliance with the political system, executive structure, and legal duties of higher education institutions in each country. Therefore, accreditation standards cannot be a translation of the standards of other countries at all (1). In Iran, the Secretariat of the Council for Medical, Health, and Specialized Education is directly responsible for evaluating and revising the curricula. The review of the current documentation and structure at this level shows that the accreditation of educational programs has mainly focused on the general doctoral level (15, 16).

In addition, a review of various studies dealing with the formulation and development of accreditation standards in Iran shows that limited studies have addressed the development of accreditation standards for undergraduate educational programs, which have mainly focused on nursing and midwifery fields. The evaluation of these investigations reveals the necessity of formulating and developing national and codified standards for integrating the accreditation of undergraduate educational programs in Iran (10, 17-22). Sharifi et al. (2021) in their study extracted the domains and accreditation standards of undergraduate educational programs using a comparative method (23). However, the evaluation of the mentioned extracted model and development of the proposed standards, as well as determination of the validity and reliability of these standards seem necessary from experts' perspective. According to the need to improve the health level of the society and move towards transformation in the field of medical science education, which is one of the major policies of the Ministry of Health, Treatment and Medical Education, as well as the need to be accountable, guarantee the quality and responsibility of the higher education system, the need to develop the national system, consistent and continuous quality assurance is felt. In this regard, integrated, coordinated, national criteria and standards compatible with local and regional culture for the accreditation of educational programs of various fields and levels of medical sciences would be helpful.

Objectives

The present research was conducted using the model extracted by the researchers in the previous study (23), aiming at developing and quantitatively and

qualitatively evaluating the accreditation standards of educational programs in the clinical and non-clinical fields of the undergraduate level in medical sciences.

Methods

This descriptive cross-sectional study with a mixed method in terms of data collection was conducted in two phases. The first phase of the research was performed qualitatively using the focus group technique. The focus group is one of the qualitative interview techniques designed to create interaction between group members to provide motivation for deeper discussion and reveal different and new aspects of the topic under discussion. This method, in its simplest definition, is a type of interview in the presence of a moderator who guides the discussion based on a preset guide (24).

In the present study, a group discussion meeting was held in the presence of nine accreditation experts. The meeting participants included prominent professors of Islamic Azad Universities and Kerman University of Medical Sciences who were experienced in the fields of institutional and program accreditation and entered the research using the purposeful sampling method. To this aim, a letter of invitation was sent to the participants by email stating the meeting objectives. The number of participants in a group discussion meeting depends on the topic, characteristics of the desired phenomenon, and data saturation. As a result, the number of individuals for a group discussion meeting is considered 4-8 and sometimes 8-12 people (25). At the beginning of the meeting, the objectives of the meeting were explained to the participants. Afterwards, the meeting facilitator presented the domains and criteria for the accreditation of the undergraduate level educational programs resulting from a comparative study that examined the accreditation standards of other countries in the world (23). Following the discussion and exchange of ideas between the participants regarding the proposed accreditation domains and criteria, the initial framework of standards was extracted. Therefore, the required reforms and changes regarding the content necessity and appropriateness, appropriate domains and standards, and the used literature and their writing style were identified and applied. At the end, 12 domains and 69 criteria were finalized.

In the second phase of the research, the information of the findings regarding the accreditation frameworks and standards, which was compiled as a semi-structured questionnaire, was adjusted online using the Porsline questionnaire maker software (<https://porsline.ir>). Next, in order to verify the

information obtained using the Delphi method, the questionnaire was sent to the medical sciences experts of the country via email on two occasions to determine the final factors and criteria. Finally, the data were analyzed and summarized.

The Delphi method was initially designed and implemented in the 1950s by the Rand Aerospace Corporation to examine the experts' opinions and predict future events. The popularity of this method is mostly for its high potential to obtain the opinions of experts who are far from each other (due to using computer or sending consecutive questionnaires) and are not possible to be gathered in one place for various reasons. By using successive rounds and controlled feedback, this method seeks to reach a reliable consensus from the opinions of experts in a field (26). The Delphi method is intended to use the positive features of group interaction. This method has prominent features, such as anonymity, repetition, controlled feedback, and statistical aggregation of responses (27). At this stage, the sampling method was purposeful and snowballed, and a number of experts in the field of accreditation that had responsibility and experience in the accreditation of educational institutions and programs were included in the study. The number of participants in the Delphi method is often less than 50 people, and 10-15 people are enough in homogeneous groups (26). Consequently, the mentioned questionnaire was sent on a three-point Likert scale (completely suitable, suitable, and unsuitable) to 21 accreditation experts and was completed and returned by 16 people. After receiving the completed questionnaires in the first round, organizing the answers, and applying the comments, a new questionnaire was sent to the participants through the Porsline software to collect the opinions and suggestions of experts regarding the compatibility of the proposed standards with the country's educational conditions and to achieve a relative agreement (26).

Following collecting the questionnaires of the second stage of Delphi, data were analyzed to verify the developed standards. For this purpose, content validity ratio (CVR) and content validity index (CVI) were used (28-30). Given the number of study participants ($n=16$), items with a CVR higher than 0.49 were accepted, and items with a CVR lower than 0.49 were removed from the questionnaire (31).

In the present study, items with a CVI higher than 0.79 were considered acceptable, those with a CVI lower than 0.7 were considered inappropriate and removed, and items with a CVI of 0.7-0.79 were modified (32). The intraclass correlation coefficient (ICC) was used to determine the reliability of the questionnaire. The ICC was first introduced by Fisher in 1954 as a modification of the Pearson's correlation coefficient; however, the modern ICC is calculated by the mean square (e.g., estimating population variance based on variability among a given set of criteria), which is obtained through the analysis of variance (ANOVA). Today, ICC is a widely used reliability index in the assessment of interrater and intrarater reliability (33).

Koo and Li (2016) suggested the general guidelines for interpreting ICC values as follows:

Values of <0.5, 0.5-0.75, 0.75-0.9, and >0.9 indicate poor, moderate, good, and excellent reliability, respectively. For example, at a 95% confidence interval, if the ICC estimate is 0.83-0.94, the level of reliability can be considered "good" to "excellent" (34).

Results

According to the demographic characteristics, 70% of the focus group interview participants (the first phase) were female, and 56.3% of the Delphi phase (the second phase) respondents were male. The participants in the first and second phases were experts in educational psychology, curriculum planning, educational management, medical education, nursing education, health services management, health information management, health policy-making, health in disasters, and Occupational Health and Safety. In the first phase of the study, to evaluate the initial framework of the proposed standards, including 14 domains and 78 criteria, the "course evaluation" domain was removed from the main domains. The "continuous review and quality assurance" domains were proposed to be integrated into a single domain, and the "top and executive management" was renamed to "organizational management and structure." Other minor changes were also made to the title of some domains. Moreover, out of the 78 proposed criteria, nine were deleted, 24 were modified based on opinions, and 45 were left unchanged. Table 1 shows the primary standards resulting from the focus group.

Table 1. The primary proposed domains resulting from the focus group

Number	Titles of the Primary Domains	Criteria Number	Titles of the Domains Resulting from the Focus Group	Criteria Number
1	Mission and goals	7	The program's perspective, mission, goals, values, and strategies	7
2	Educational program	12	Educational and curriculum program	8
3	Teaching and learning	4	Teaching and learning processes	4
4	Student evaluation	3	Student evaluation	3
5	Students	6	Students	6
6	Faculty	8	Faculty members and human resources	8
7	Educational resources	7	Educational resources (space, facilities, and equipment)	7
8	Top and executive management	4	Organizational management and structure	6
9	Continuous review	3	Continuous review and quality assurance	5
10	Graduates	4	Graduates	5
11	Research and scholarship	5	Research and scholarship	5
12	Stakeholders' satisfaction and expectations	5	Stakeholders' satisfaction and expectations	5
13	Quality assurance	6		
14	Course evaluation	4		

Based on the second phase to determine the final accreditation standards for the educational programs using the experts' opinions by the Delphi method, the CVR and CVI of all 12 domains and 69 criteria were higher than 0.49 and 0.70, respectively; hence, they were approved. However, the "communication with graduates after graduation" criterion in the "graduates" domain and the "extra-group activities" criterion in the "organizational management and structure" domain, which had CVI of 0.70 and 0.79, respectively, were modified and reviewed as "educational communication with graduates" and "interdisciplinary educational and research activities of the educational department members." Finally, the experts approved 12 domains and 69 criteria. At the end of this stage, the ICC was used to determine the reliability of the questionnaire and the rate of ICC (inter-raters). The findings showed that the ICC was higher than 0.96 in all domains. According to the instructions for interpreting this coefficient (0.05-0.75 = moderate reliability, 0.75-0.90 = good reliability, and >0.90 = excellent reliability), the results showed an excellent ICC in the studied domains. Also, the ICC in 65 of the 69 examined criteria was obtained higher than 0.90, indicating an excellent ICC, and was higher than 0.85 in four criteria, indicating a good and acceptable ICC (Table 2). Finally, all 12 domains and 69 criteria were approved at this stage.

Discussion

The current research aimed to provide local and appropriate criteria by developing accreditation standards for undergraduate educational programs of Iran's medical sciences to improve the quality of the medical science education programs and enhance the trust of domestic and foreign stakeholders in these programs. The study of established accreditation

systems in other countries has shown that the accreditation commissions in those countries have defined program and institutional accreditation standards to help the institution achieve quality and effective education and promote participation (1). Many domestic and international studies have confirmed eight out of the 12 domains in this study, including "mission and goals, educational program, students, educational resources, student evaluation, faculty, organizational management and structure (top and executive management), and continuous review and quality assurance (continuous review)" (4, 7, 9, 10, 17-19, 21, 22, 35). The review of the accreditation models of the countries investigated in the present study also confirms these results. For example, the above eight domains have been included in the nine domains accepted by the national standards of the general medical course of Iran, the World Federation of Medical Education (WFME), and Kazakhstan (16, 36, 37).

The Subcommittee of Undergraduate Medical Education of the Medical Council of Malaysia has developed seven standards for nursing accreditation, which, apart from the mission and goals, cover the other seven domains mentioned above (38). Therefore, it seems that the 12 domains mentioned in this study will cover all aspects of an educational program in the accreditation process.

The proposed accreditation model in the present study includes four innovative domains for the first time in Iran's accreditation standards of educational programs: (1) teaching and learning processes, (2) graduates, (3) research and scholarship, and (4) stakeholders' satisfaction and expectations.

1. Teaching and Learning Processes

Examining the contemporary sources regarding learning and teaching in higher education denotes briefly

that one of the missions of higher education is teaching how to learn and providing conditions for student learning. Teaching and learning mean “interaction between the faculty member and the student,” aiming to make a favorable change in the student’s performance and behavior. Students are one of the subcomponents of the teaching and learning processes that should be evaluated in the best manner (39).

Although the “teaching and learning processes” domain was not used as an independent domain in the reference standards investigated in this study, it was one of the main domains of the accreditation models of Australia, South Africa, and the European Union and also a subdomain and criterion in other investigated models, e.g., in the United States, the United Arab Emirates, Malaysia, and Caribbean countries (38, 40-45). The research team decided to add the “teaching and learning processes” domain to the main domains of the proposed model (10, 17, 18, 35, 46).

2. Graduates

Identifying graduates as the most important output of the higher education system creates a correct understanding of the concept of graduation, recognizes the graduates’ characteristics, needs, attitudes, goals, and expectations, helps universities in reforming customer-oriented policies and becoming a responsive organization, and promotes the graduates’ scientific level and society’s progress. Therefore, the university’s inattention to graduates and the lack of planning to identify and communicate with them will create an incomplete relationship and a vicious cycle between the educational system and its main elements, Depriving both parties of the extensive benefits of continuous communication (47). According to Konzak and Teague, creating a strong connection between the university and graduates is essential for the university’s success and development.

Table 2. Content validity ratio, content validity index, and intraclass correlation coefficient of questionnaire domains and criteria

Domains and Criteria	CVR ^a	CVI ^b	ICC ^c
The first domain: The program’s perspective, mission, goals, values, and strategies	0.713	0.857	0.970
A1: The program’s perspective, mission, goals, values, and strategies	0.667	0.834	0.838
A2: Compatibility/appropriateness of the program’s perspective, mission, and goals with the supporting institution (university/faculty) and national and global upstream documents	0.708	0.854	0.824
A3: Designing the program’s set of perspectives, missions, goals, values, and strategies	0.679	0.839	0.932
A4: The participation of all related people (stakeholders) in developing the program’s mission and goals	0.750	0.875	0.800
A5: Periodic assessment of the program’s goal achievement level	0.689	0.844	0.841
A6: Periodic evaluation and review of the program’s mission and goals	0.625	0.813	0.875
A7: Social accountability	0.875	0.938	0.811
The second domain: Educational and curriculum program	0.850	0.925	0.986
B1: The program’s quality and adequacy (competency)	0.734	0.867	0.928
B2: The program’s educational content	0.750	0.875	0.870
B3: The program’s design and implementation	0.860	0.930	0.942
B4: Educational strategies	0.812	0.907	0.837
B5: Training clinical sciences and skills	0.875	0.938	0.941
B6: Distance (virtual) learning	0.732	0.866	0.856
B7: Curriculum	0.967	0.984	0.951
B8: Curriculum evaluation processes	0.813	0.907	0.924
The third domain: Teaching and learning processes	0.839	0.923	0.988
C1: Teaching-learning methods	0.857	0.929	0.978
C2: Educational materials and tools	0.918	0.960	0.932
C3: Learner-trainer interaction	0.777	0.889	0.966
C4: Learning and teaching methods in clinical and practical environments	0.829	0.915	0.917
The fourth domain: Student evaluation	0.839	0.931	0.974
D1: Student evaluation system	0.912	0.956	0.911
D2: Evaluation methods and tools	0.778	0.914	0.952
D3: Analysis and improvement of tests	0.846	0.923	0.957
The fifth domain: Students	0.825	0.907	0.993
E1: Student’s admission and selection	0.692	0.885	0.956
E2: Advising and supporting students	0.819	0.909	0.984
E3: Participation of student representatives	0.784	0.892	0.954
E4: Student services	0.846	0.923	0.985
E5: Extracurricular activities	0.815	0.908	0.963
E6: Students’ academic progress and performance	0.846	0.923	0.969

The sixth domain: Faculty members and human resources	0.746	0.893	0.988
F1: Characteristics and composition of faculty members	0.670	0.908	0.904
F2: Faculty members' activities (a: Educational activities; b: Executive activities)	0.846	0.923	0.955
F3: Faculty and non-faculty members' professional qualifications	0.786	0.905	0.960
F4: Administrative and technical staff	0.790	0.895	0.958
F5: Rank promotion, professional development, and empowerment of professors	0.884	0.942	0.957
F6: Assistant clinical instructors and laboratory experts	0.810	0.923	0.967
F7: Recruitment and employment conditions of faculty members	0.624	0.819	0.975
F8: Faculty members' evaluation	0.703	0.879	0.974
The seventh domain: Educational resources (space, facilities, and equipment)	0.763	0.888	0.993
G1: Physical resources	0.754	0.877	0.981
G2: Clinical and educational resources (hospitals, healthcare centers, and laboratories)	0.615	0.847	0.962
G3: Library	0.858	0.929	0.975
G4: Computer facilities and services	0.820	0.910	0.970
G5: Clinical skills center and simulated department	0.784	0.892	0.942
G6: Educational and teaching aids	0.846	0.923	0.989
G7: Information technology	0.637	0.836	0.947
The eighth domain: Organizational management and structure	0.666	0.849	0.983
H1: Top and executive management	0.810	0.929	0.926
H2: Administrative organization	0.622	0.846	0.919
H3: Interdisciplinary educational and research activities of the educational department members	0.500	0.750	0.875
H4: Crisis management	0.718	0.859	0.946
H5: Development of department's resources	0.590	0.831	0.942
H6: Financial sources and budget	0.615	0.824	0.946
The ninth domain: Continuous review and quality assurance	0.736	0.865	0.992
I1: Program monitoring and evaluation system	0.775	0.904	0.967
I2: Program review and development	0.739	0.870	0.968
I3: Quality assurance policies and procedures	0.739	0.870	0.970
I4: Quality assurance unit	0.615	0.808	0.980
I5: Management of quality assurance processes	0.750	0.875	0.963
The tenth domain: Graduates	0.621	0.854	0.968
J1: Graduates' education continuation	0.692	0.846	0.951
J2: Educational communication with graduates	0.500	0.750	0.943
J3: Graduates' research activities	0.539	0.846	0.924
J4: Graduates' employment status and specialized skills (from the employers' and service recipients' perspective)	0.667	0.861	0.929
J5: Analyzing graduates' performance	0.670	0.908	0.884
The eleventh domain: Research and scholarship	0.742	0.878	0.977
K1: Strategies and policies	0.824	0.912	0.943
K2: The output of research studies and scholarly activities	0.661	0.866	0.856
K3: Participation of professors and students in research	0.846	0.923	0.962
K4: Research facilities and equipment	0.641	0.845	0.911
K5: Scholarship	0.648	0.846	0.940
The twelfth domain: Stakeholders' satisfaction and expectations	0.766	0.887	0.979
L1: Stakeholders' expectations	0.644	0.878	0.929
L2: Students' satisfaction	0.852	0.926	0.961
L3: Faculty members' satisfaction	0.924	0.962	0.953
L4: Employers' satisfaction	0.700	0.850	0.924
L5: Other external stakeholders' satisfaction	0.633	0.817	0.976

^aContent validity ratio, ^bContent validity index, ^cIntraclass correlation coefficient

The "graduates" factor was not among the independent domains in the reference models used in the research; however, as some models recognized it as a criterion of the main domains, such as the accreditation models of the United Arab Emirates, Malaysia, and Kazakhstan (8, 10, 17), it was proposed as an independent domain in the current research.

3. Research and Scholarship

By definition, scholarship refers to any outstanding scientific activity in the areas of discovery, education,

application of the results of original studies, integration of information obtained from different components of a field or different fields, research and innovation in each of the above areas, performing an outstanding activity to solve the problem, expanding the boundaries of knowledge, and entering new arenas. Educational scholarly activities include all educational activities at different levels, such as teaching, educational planning, guidance, counseling, educational management and leadership, and learners' evaluation (48).

The important aspect of scholarship is its educational aspect. Hence, publishing and expanding the process and the results of the performed activities provides the possibility of criticism and evaluation by other individuals and guides the educational community to take its next steps based on these results. Although the faculty members are first hired as teachers, they are evaluated in the role of researchers, and the functions of teaching and learning are diminished in the shadow of the research orientation governing the university. Research governance and the weakening of other roles of faculty members also exist in most universities in the world (49).

Since the academic research activities are extensive and some research components in the university are necessary for the promotion of faculty members, it can be said that after education, research is an inseparable part of the functioning of the university system and should be considered in the evaluation of educational institutions (50). Therefore, the third domain that was considered the main domain in the proposed model for the first time was the “research and scholarship” factor (5, 8, 17, 19, 50-52).

4. Stakeholders' Satisfaction and Expectations

The fourth factor proposed in this model as an independent and main domain is the “stakeholders' satisfaction and expectations” domain. In the literature, only the European Union accreditation model had included a criterion called “students' satisfaction with the program” in the two “continuous review” and “information management” domains (42), and the Saudi Arabia accreditation model had placed the “students' satisfaction” criterion in the “facilities and equipment” domain; however, other investigated models did not have such a domain. Also, only Blouin (2020) proposed the “stakeholders' satisfaction” and “

Shouri Bidgoli et al. presented five approaches “based on the goal, evaluating the program's actual results, ensuring the stakeholders' satisfaction, complying with educational standards and artistic criticism and educational expertise” to evaluate educational effectiveness (53).

Knowing the stakeholders' expectations and satisfaction causes knowing the society's needs and level of satisfaction, which, in turn, leads to better communication between the health area and society. On the other hand, the stakeholders' satisfaction and expectations affect the quality of healthcare services provided by medical science graduates. Hence, it seems this factor in the proposed accreditation model is necessary due to the simultaneous use of the opinions of internal (main) stakeholders, such as officials of educational-medical-health centers, faculty members,

students, graduates, professional activists, and officials of the health system, and external stakeholders, such as patients, community members such as recipients of healthcare services, representatives of other health care professions, relevant institutions such as the medical system and insurances, specialized scientific associations, and relevant officials of the relevant ministry.

By examining the selected models investigated in this research, many accreditation systems were found, some of which had standards while some were qualitative. Some were focused on generalities, and some dealt with the smallest details, such as the area of laboratories in square meters (18). These differences can be because accreditation standards are purposeful and need-based. It is clear that since the educational system of developed countries is advanced, there is no need to include broad domains and criteria with specific and measurable indicators in accreditation models. In contrast, developing countries probably require broad domains and criteria with specific and measurable indicators due to poor educational facilities, educational and clinical spaces, and unfavorable quality of education provided by educational institutions (54).

Due to the technological advances and the high expansion of basic science knowledge, medical science educational programs, which depend on these continuous changes, must be updated simultaneously following the changes in the healthcare service delivery system after evaluation, validation, and recognition of deficiencies. In order to respond to the health needs of society, the policy-makers and designers of the educational programs of the health system should perform long-term planning and macro-educational policy-making considering social conditions and awareness of existing educational facilities. Thus, the first step toward realizing this issue is to evaluate the educational programs using national and local standards appropriate to the sociocultural conditions and considering the facilities available in the educational system of medical sciences in Iran.

Finally, it is suggested that the proposed standards of the present study be implemented as a pilot by formulating scientific and accurate processes for carrying out activities related to accreditation and training expert evaluators with sufficient knowledge and skills for program accreditation. Also, it is recommended to conduct more research to improve the proposed standards' capabilities, especially their flexibility and modernity.

Conclusion

Due to the high importance of health in societies, evaluating and measuring the status of medical science educational programs using standards is desirable and of particular importance. Therefore, the results of the present research aiming to integrate the accreditation standards of undergraduate educational programs can be provided to policy-makers, decision-makers, and those involved in medical science education and accreditation of educational programs in the country to pay special attention to the accreditation process of educational programs. It is hoped that this will improve the quality of medical science education.

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

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Evaluation of the Feasibility and Usefulness of the LMS Acceptance Questionnaire: Technology Confirmation During the Covid-19 Pandemic in Medical Students Users in Iran

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Abstract

Background: Technology acceptance comprises cognitive and psychological elements about using technology.

Objectives: This descriptive study evaluated the feasibility and applicability of the LMS acceptance questionnaire in medical sciences students using native LMS during the COVID-19 pandemic.

Methods: This study was conducted to assess LMS acceptance and the validity of the questionnaires in Iranian society. Ten faculty members and ten students reviewed and evaluated the questionnaires for the validity of translation (content validity). Exploratory and confirmatory factor analysis methods were used for questionnaire items to determine the constructive validity. Moreover, a technology acceptance questionnaire was distributed among 200 users to determine the convergence validity. Finally, the reliability of the questionnaire was assessed by 30 people before, after, and simultaneously.

Results: The results of this descriptive study showed that the average scores of people in finding helpful content for lessons, having a support system for problem-solving, and being convenient to use were high. In another part, confirmatory factor analysis confirmed the criteria and items by four factors. Test reliability on 30 students before and after showed that the questionnaire has good reliability in all factors. Convergence validity with the technology acceptance questionnaire showed that there was a direct and positive relationship.

Conclusion: The four factors questionnaire, which comprised performance expectations, effort expectations, facilitative situations, and social influence, with feasibility, and usability, can be used as a valid questionnaire in an Iranian population.

Keywords: LMS, Usability, Feasibility, Validation, Iran, Medical education, Active learning

Background

The third millennium has exposed man to challenging terms, such as the century of speed and change and the age of information and communication. An era that is considered a powerful platform and tool that can have tremendous economic, social, cultural, and political impacts (1). In the third millennium, human is trying to accelerate the development and use of information technology in different aspects of life in terms of distancing from traditional models and creating a new model per the requirements of the information age (2, 3).

Integrating Information Communication Technology (ICT) into the learning process facilitates communication and access to a wide range of learning resources, provides a curriculum tailored to the learners'

needs, ensures equitable opportunities for all learners, and promotes social and cultural development of communities through widespread internet access (4). One of the characteristics of electronic learning is the provision of the potential for learning at any time and place. This advantage enabled information to transform education in the all users and extend the main knowledge (5).

Today, numerous shortcomings of the face-to-face education system have led to the development of various educational methods exploiting information and communication technologies (6). It is necessary to plan for the development of new technology, secure the positive attitude of managers towards this technology, equip training workshops, and create a suitable atmosphere for the use of this technology (7, 8). Based

on several studies, various models and methods have been used to investigate factors affecting the adoption of information technology.

The Framework for the Rational Analysis of the Mobile Education model (FRAME) describes how mobile technology, human learning capacities, and sociocultural factors interact and the processes involved in virtual learning (9, 10). One of the most valid models is the Technology Acceptance Model (TAM), which examines factors at an individual level. The TAM model is used for different technologies in different situations with varying control factors and diverse statistical populations (11). The acceptance technology model is based on acceptance information systems. It is determined by two main variables: mental perception of usefulness and mental perception of ease of use (12, 13) (Figure 1).

Technology in educational environments facilitates every step of the training process (course design, classes, and assessment) (14, 15). learning management system (LMS) is an example of such technology (16-18). LMS is an integrated management tool and system for teaching content management, monitoring learners and teachers, customized learning and teaching processes, and a software program for managing learning activities. Malikowski (2007) used a three-tier structure based on the frequency of the use of LMS to group system user interaction. They found that LMS was mainly used to convey content to the learners. In this context, files were uploaded to the learning environment, learning content was transferred to the system, announcements were made, and students' progress level was assessed (19). LMS systems play an undeniable and important role in education (20). To achieve the optimal use of these technologies in educational environments, students should have a positive attitude, belief, and intention toward them. The relevant literature shows that the use of technology is related to the beliefs, attitudes, and goals of potential users (21).

LMS has several functions: sharing educational materials, discussing, managing classes, assigning

assignments or tasks, holding exams, receiving feedback, arranging learning materials, keeping records of students and teachers, and creating a reporting system. LMS systems are potential tools in education with the following advantages. LMS systems improve the effectiveness of education (22, 23), learning (24), interaction (25), performance (26, 27), motivation (28), and communication in students (29) and facilitate their wider use. Using different models of technology acceptance, several studies on LMS acceptance have examined the acceptance of these technologies at various academic levels (30).

Due to the innovative nature of e-learning in Iran and many other countries, it is essential to examine its related challenges. On the other hand, the Covid-19 crisis and its circumstances have influenced education and quality. Exploring the tools and infrastructures of virtual education and its application in local environments and their usage can be considered essential issues in any country, highlighting the importance of their evaluation.

Objectives

The aim of this study was evaluation of the Feasibility and Usefulness of the LMS Acceptance Questionnaire in Medical Sciences Students Technology acceptance in e-learning during the Covid-19 pandemic in Iran.

Methods

To answer research questions about evaluating the feasibility and application of the LMS acceptance questionnaire in medical sciences students, a national LMS (Navid LMS in the web address of jumsnavid.ac.ir) was used. This research was a descriptive study by consensus sampling on LMS users at Jahrom University of Medical Sciences. As mentioned above, the first part of the study analysis was followed by descriptive analysis. Items were analyzed for their means and variance of main dimensions. The second part of the study was the validation of the questionnaire (Figure 2).

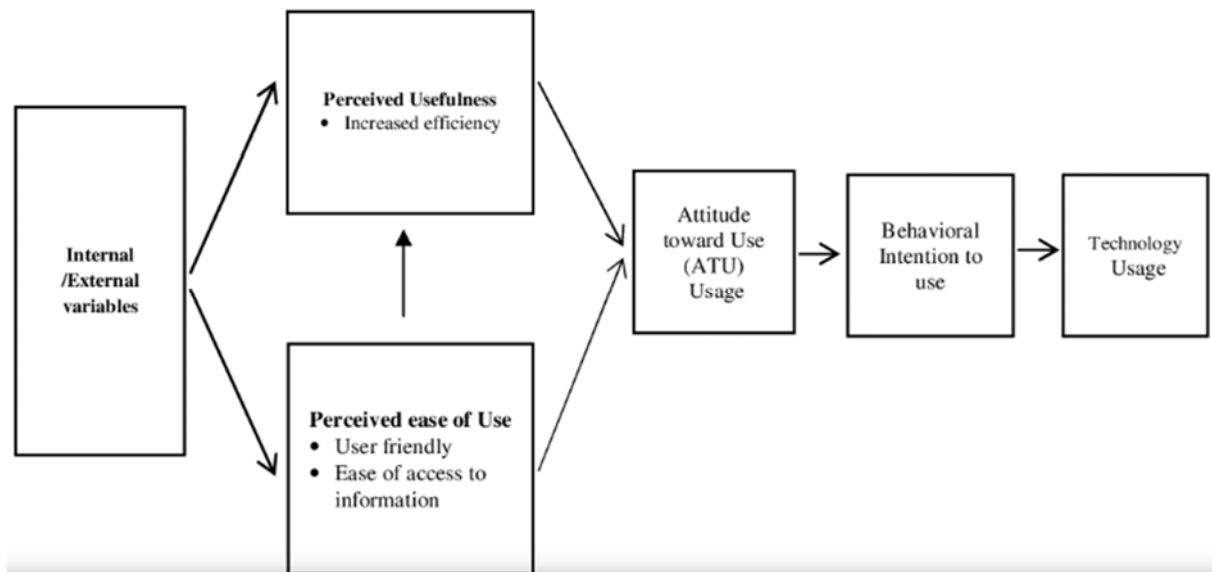


Figure 1. Technology acceptance model and elements

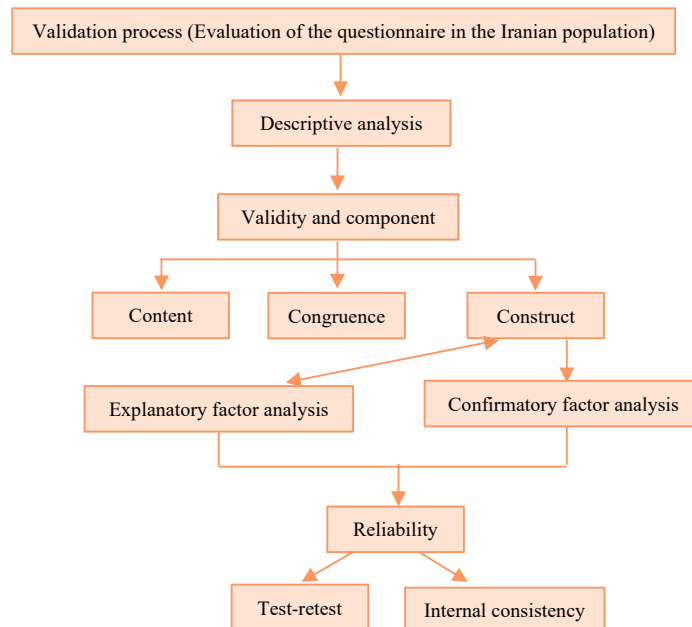


Figure 2. Study design and process

We proceeded with this study with item analysis of the questionnaire by assessing validity (content, concurrent, and construct). Construct validity was followed by exploratory factor analysis (EFA), confirmatory factor analysis (CFA), and then reliability tests. The 21 items of the questionnaire Learning Management System Acceptance Scale (LMSSAS) were analyzed.

EFA followed by Bartlett sphericity test and the KMO index for the suitability of factor analysis in the study. Then Scree plot diagram assessed the number

of questionnaire factors after adjustment for Iranian society.

The principal axis factoring method with varimax rotation was used in EFA, and the Eigenvalue of 1.00 was considered to determine the number of factors/dimensions. The threshold factor loading of 0.40 was chosen.

CFA was also followed by a confirmatory factor analysis on the questionnaire (relationship between each item and dimension/item with overall score/domain

factor load and calculating the overall variance of the questions).

Reliability was checked on 30 students to evaluate the reliability of the questionnaire in the pretest-posttest and the correlation between them for internal consistency. A relationship higher than 0.50 was considered an acceptable correlation for reliability.

Ethical consideration: All ethical considerations were adhered to in this study.

Users were not forced to complete the questionnaire.

Participants completed the online questionnaire quite willingly. No credits or merits were considered for participation. The proposal of this study was approved by the ethics committee with the registration number (IR.JUMS.REC.1399.087).

Learning management system acceptance scale (LMSSAS): LMSAS consists of 21 items. A scale ranging from *strongly disagree* to *strongly agree* was chosen as the response format. The total score on the scale varied between 21 and 105. Higher scores on the scale indicated high levels of LMS acceptance among students.

Questionnaire areas included: performance expectancy, effort expectancy, facilitating conditions, and social influence (31).

Participants: All users of Navid (National LMS) in the web address of (jums.navid.ac.ir) were included in this study in the departments of medicine (two courses), health (two courses), and laboratory sciences by consensus sampling.

Validity

Content validity (cultural): This study aimed to standardize the LMS acceptance questionnaire. The following steps were taken to evaluate and standardize the questionnaire. Content validity, including translation and retranslation, was conducted by a researcher and reviewed by an English expert. Ten faculty members reviewed the questionnaire for translation validity, and ten students ensured fluency and comprehensibility of the translation.

Construct validity: explanatory factor analysis: Exploratory factor analysis was performed to investigate domains and items in an Iranian population.

Firstly, the Bartlett sphericity test and the KMO index were calculated to determine the suitability of factor analysis in the study.

The size of the Kaiser test was at least 0.6. The values of the test (0.78) and Bartlett test ($\chi^2 = 766.28$ $p = 0.000$) indicated that the completed questionnaire was suitable for factor analysis.

Then Scree plot diagram assessed the number of questionnaire factors after adjustment in the Iranian society. The principal axis factoring method with

varimax rotation was used in EFA, and the Eigenvalue of 1.00 was considered to determine the number of factors/dimensions. The threshold factor loading of 0.40 was set. Finally, all dimensions and factors were extracted from Iranian society.

Investigation of domains and items in terms of the possibility of application, feasibility, and usefulness in the Iranian sample (approval factors and items or reducing and correcting it) was conducted.

Confirmatory factor analysis: A confirmatory factor on the questionnaire (relationship between each item with dimension/item with overall score/domain factor load and calculating the overall variance of questions) was performed.

Congruent validity: Congruent validity evaluation was performed with the Technology Acceptance Questionnaire as a valid and reliable questionnaire in the Iranian population. The technology acceptance questionnaire was used to assess convergence. This questionnaire was standardized in Iranian society. The scoring of the questionnaire was as follows:

Electronic learning acceptance is the score that respondents give to an 11-item electronic learning acceptance question in 5 continua (strongly agree to disagree strongly)

The scoring of the questionnaires was as follows:

Analysis (Interpretation) based on the score of questionnaires. The score was collectively obtained in this T-analysis method and then marked based on the table below. Note that the following scores are for the questionnaire. For example, if you have ten questionnaires, you should multiply the following scores by 10.

The minimum score will be 11, and the maximum score will be 55.

- Score between 11 and 18: The acceptance rate of e-learning is low

- Score between 18 and 37: The acceptance rate of e-learning is moderate

- Score above 37: e-learning acceptance rate is high (13, 15).

Reliability

The sample size for reliability testing should be at least 5 to 10 people per item. A questionnaire was distributed among 200 students by the census. Due to the drop in the questionnaires and the number of respondents, 170 questionnaires were used as an online open test on 30 students to evaluate the reliability of the questionnaire in pre-test- post-test, and the correlation between them for internal consistency and stability was analyzed. Relationships higher than 0.70 were considered an acceptable correlation for reliability (32, 33).

Results

The questionnaire was distributed among 200 students by census sampling. Due to the drop in the questionnaires and respondents, 170 questionnaires were used online. Different groups and disciplines participated in this study. Medical / public health/laboratory sciences with three groups of two entrances participated in this study. Medical students were in three groups (120 people), the field of laboratory sciences with two groups (35 people), and the rest were public health groups. Among them, 58.4% were women, and the rest were men.

Explanatory Factor Analysis (EFA): In the first stage, all items of the questionnaire were analyzed. Factor load and descriptive results showed that due to the high factor load of each item with a high value of 0.3, all items could be analyzed, and none were deleted. SPSS 18 was used for the analysis of the data Analysis based on the components of the questionnaire.

Table 1 shows that the average score of people in finding useful content for lessons, the existence of a support system in problem-solving, and ease of use were the highest levels required. It was easy to start working with LMS, people had higher prestige in using it more effectively in LMS, and their peers thought that more individual efficiency in LMS had lower average scores. The total item predicted 64.39 % of the variance.

The diagram shows four factors in the diagram that can be considered as a factor (Figure 3). These four factors were extracted in the exploratory factor analysis section and were included in other analyses.

Extraction Method: Principal Component Analysis.

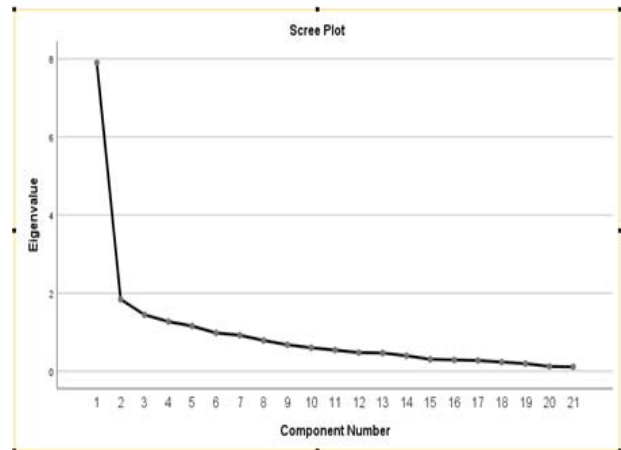


Figure 3. Scree plot diagram on several questionnaire factors after adjustment for the Iranian population.

The size of the Kaiser test was at least 0.6. The values of the test (0.78) and Bartlett test ($\chi^2 = 766.28$ $p = 0.000$) indicated that completed questionnaires were suitable for factor analysis (31).

Four factors were extracted in EFA and included in CFA. A confirmatory factor analysis examined the items in the target community. In the first part, descriptive analysis and in the second part, the relationship and coherence of items were examined. All dimensions had high mean averages.

Table 1. Descriptive analysis and factor loading of each questionnaire item

	Questions	Mean (SD)	Factor loading
1	Using an LMS in my courses enables me to accomplish tasks more quickly.	3.306 (1.05)	0.817
2	Using an LMS in my courses improves my performance.	3.321(0.97)	0.835
3	Using an LMS in my courses improves my productivity.	2.874(0.98)	0.689
4	Using an LMS in my courses improves my motivation.	3.024(0.92)	0.811
5	Using an LMS in my courses makes it easier to do my homework.	3.291(1.13)	0.816
6	Using an LMS in my courses improves the quality of the work I do.	3.323(1.25)	0.703
7	I find using an LMS in my courses applicable.	3.719(1.20)	0.607
8	Using an LMS in my courses enhances the effectiveness of the learning process.	3.251(1.18)	0.763
9	I find learning how to use an LMS easy.	2.273(1.02)	0.558
10	I can easily use an LMS	3.512(1.29)	0.814
11	I can accomplish tasks more quickly when I use an LMS.	2.893(1.23)	0.604
12	I feel comfortable when using an LMS.	2.922(1.18)	0.754
13	I can do anything I want using an LMS.	2.921(1.10)	0.694
14	I have the required information to make effective use of an LMS.	3.034(1.16)	0.781
15	There are people I can turn to for support when I have difficulty using an LMS.	3.149(1.21)	0.803
16	Using an LMS is similar to using other computer systems.	2.946(1.15)	0.683
17	When using an LMS, I know whom to ask for help to solve problems I encounter.	3.46(1.35)	0.773
18	The help function of an LMS is sufficient to solve the problems I encounter.	3.36(1.20)	0.757
19	People around me think I need to use an LMS effectively.	2.16 (1.30)	0.675
20	My effective use of an LMS increases my prestige among fellow students.	2.45(1.17)	0.623
21	Friends of mine who make effective use of an LMS have more prestige.	2.04(1.08)	0.795
% variance explained (total = 64.39)		3/00(1.07)	0.817

Mean and SD of all dimensions concluded: Performance expectancy 25.21 (6.55), effort expectancy, 13.92 (3.49), facilitating conditions 15.77 (3.72), social influence, 7.67 (2.36); the number of question in each dimensions was 8,5,5,3 questions, respectively.

Based on the above table and considering the load and variance factor of the items, it was found that there were four factors in compiling items that explain the

factor load of the questionnaire (Table 2).

Results from EFA showed that four factors in compiling items explain the factor load of the questionnaire. The study's results (validity) showed that all factors were related to the questionnaire. Results showed that all four elements positively correlate with the total test and other items (Table 3).

Table 2. Factors of the questionnaire with varimax rotation to identify factors

Factors	Initial eigenvalues			Extraction sums of squared loadings			Rotation sums of squared loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	10.62	44.28	44.28	10.62	44.28	44.28	60.05	25.22	25.22
2	2.53	10.55	54.83	2.53	10.55	54.83	3.67	15.30	40.52
3	2.00	8.35	63.19	2.00	8.35	63.19	3.21	13.82	54.34
4	1.33	5.57	68.76	1.33	5.57	68.76	2.79	11.63	65.97
5	1.29	5.39	74.16	-	-	-	-	-	-
6	0.96	4.02	78.19	-	-	-	-	-	-
7	0.96	4.00	82.19	-	-	-	-	-	-
8	0.64	2.68	84.88	-	-	-	-	-	-
9	0.55	2.29	87.17	-	-	-	-	-	-
10	0.42	1.77	88.95	-	-	-	-	-	-
11	0.39	1.64	90.60	-	-	-	-	-	-
12	0.34	1.43	92.03	-	-	-	-	-	-
13	0.30	1.26	93.30	-	-	-	-	-	-
14	0.26	1.09	94.39	-	-	-	-	-	-
15	0.23	0.95	95.35	-	-	-	-	-	-
16	0.21	0.88	92.24	-	-	-	-	-	-
17	0.19	0.80	97.04	-	-	-	-	-	-
18	0.15	0.65	97.69	-	-	-	-	-	-
19	0.15	0.63	98.32	-	-	-	-	-	-
20	0.11	0.47	98.79	-	-	-	-	-	-
21	0.08	0.36	99.16	-	-	-	-	-	-

Convergence validity: The study showed that there was a direct and positive relationship between the LMS acceptance questionnaire and the technology acceptance questionnaire, although the statistical values were not significant ($r = 0.45$, $p = 0.39$).

Reliability: The internal consistency of the questionnaire in each dimension was good, with Cronbach's Alpha coefficient (0.89). Moreover, the reliability of the test before and after in 30 students showed that the questionnaire had good reliability in all factors on test-retest. This relationship between the two-part was (0.82) (Table 4).

It can be concluded that the questionnaire with four factors of performance expectations, effort expectations, facilitative situation, and social influence was valid in Iranian society.

Discussion

The results showed that the questionnaire with data validity and reliability, including four areas, can be used in the Iranian population.

Considering the increasing use of technology in education, it is necessary to examine its level of

acceptance in Iranian populations and justify its use in Iranian society (34, 35). LMS is used as a distance learning method (36). Several studies have demonstrated that using LMS in higher education can increase students' motivation and attention, provide a more flexible learning environment, and enable better management of learning-teaching time. It also helps facilitate electronic learning that provides educational material without the constraint of time or place (37-39)

All the above findings confirmed the importance of technology acceptance and relative components in all cultures.

The existing literature suggests that the acceptance of LMS among students in higher education vary from country to country (40). Arab universities in the Middle Eastern region have recorded low levels of electronic learning acceptance (41). In contrast, a high acceptance rate of the electronic learning system is reported in Western countries (42).

Considering virtual education's novelty and wide use in the Covid pandemic, it is necessary to examine the

different dimensions of technology acceptance and its effects in Iran.

Considering the obtained results, it seems that students of medical sciences have accepted this technology in

Iran based on the factors analyzed in this study. These results were confirmed in other countries in Asia (41).

Table 3. Relationship between factors and technology acceptance questionnaire in the samples

Dimensions	PE	EE	FS	SI	Total
Performance expectations	1	*0.747	*0.789	*0.654	*0.918
Effort expectations	*0.747	1	*0.748	*.549	*0.870
Facilitative situation	*0.789	*0.74	1	*0.80	*0.94
Social influence	*0.65	*0.54	*.80	1	*0.83
Total	*0.91	*0.87	*0.94	*0.83	1

PE: Performance Expectation, EE: Effort Expectation, FS: Facilitative Situation, SI: Social Influences

*P<0.05

Table 4. Examination of the reliability of the test by two indicators

Factors	Cronbach's alpha	Test-retest reliability
PE	0.88	0.86
EX	0.87	0.76
FC	0.83	0.82
SI	0.89	0.72

PE: Performance Expectation, EE: Effort Expectation, FS: Facilitative Situation, SI: Social Influences

Technology acceptance models have similar criteria for acceptance and use (4). Other models confirmed factors extracted in this study.

The technology measures people's willingness and intention to use based on perceived usefulness, perceived ease, and behavioral intention to use (11, 12).

Many criteria in this model were similar to the LMS acceptance model.

Another model was the unified theory of acceptance and use of technology (UTAUT Model). The four essential elements defined in this model (hope for performance, hope for effort, facilitation of conditions, and social influence) determine behavioral intention for using this model (43). Also, in this technology acceptance model, LMS acceptance elements (hoping to try, social influence, and functional expectations) are considered.

Some of these factors are similar to the LMS acceptance model in recent research.

Regarding models employed in LMS studies in SSA, the Technology Acceptance Model (TAM) was the most dominant framework used by researchers. UTAUT was the next, in terms of frequency of usage, in the LMS-related reviewed studies (43, 44).

TAM was the dominant model employed, and students were the main subjects of studies. Moreover, the quantitative approach was the preferred design, with regression as the primary statistical tool for data analysis. The study recommended, among others, that more UTAUT or TAM3-based studies employing mixed method design with instructors as subjects, using

structural equation modeling analysis, are needed in LMSAS research. Leadership and top management of higher education institutions should focus more on ICT infrastructure, LMS usage skills/training, LMS quality-related issues, support, and ICT policy formulation (43, 44).

A systematic review of 31 studies revealed key determinants of LMS acceptance/adoption: attitude and perceived usefulness followed by performance expectancy, perceived ease of use, and social influence (45).

Significant challenges to LMS implementation were ICT infrastructure, LMS usage skills and training, LMS system quality, and LMS use policy and management support.

The above research results can be seen in the current questionnaire with four factors (performance expectations, search expectations, facilitation measures, and social influence). It was demonstrated that instructors' belief about technology needs to be understood to support the complex interrelationships between students and the general educational setting (46). Also, instructors' and students' behavioral intentions to use LMS are examples of specific functional environments and social intervention factors. To enhance an information system's effectiveness and ease of use, end users may only utilize the system after they have been motivated by essential others, which later influences their attitude and behavior (47).

These results emphasized the similarity of items/dimensions and indicators from technology acceptance models with LMS acceptance. All Dimensions extracted by this study were similar to other countries in the Region, and congruent models confirm this.

Some essential factors in the LMS acceptance questionnaire are individual motivation, social influence, and functional expectations, which are also observed in this realization. Also, a positive impact on perceived ease of use is essential. Users' perception of the ease of LMS use determines how the system is practical

for them. Later, other factors convince them to accept it (48, 49), such as policy comprises goals, values, and resources that institutions are eager to commit to LMS implementation (50).

It is recommended that this study should be conducted in other universities and multi-central universities to investigate the effects of virtual learning infrastructure in these environments. Also, this research can help policy maker in planning in this regard.

Conclusion

It can be concluded that this questionnaire with four components can be used as an indicator of LMS acceptance in Iran. The rate of accepting new technologies in education is acceptable. It is noteworthy that qualitative studies on the extent of acceptance of the questionnaire have been performed on other users, and researchers also considered Iranian samples.

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Conflict of interests: None to declare.

Ethical approval: Proposal extracted from this paper confirmed by ethical committee in Jahrom University of Medical Sciences.

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Assessment of the Knowledge and Attitudes of Dental School Faculty Members towards two Student Assessment Tools

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Abstract

Background: Assessment plays a great role in encouraging learning and evaluating whether the learning objectives have been achieved.

Objectives: This study aimed to assess the knowledge and attitudes of dental faculty members toward Patient Management Problem (PMP) and Multiple-Choice Question (MCQ) tests.

Methods: In this descriptive-analytic cross-sectional study, a questionnaire was used to collect information from 54 faculty members of the dental school of Kerman University of Medical Sciences from 2019 to 2020. This study's questionnaire consisted of two parts: the first part included demographic information, and the second included questions related to the faculty members' knowledge (10 questions) and attitudes (8 questions) towards MCQ and PMP tests. Cronbach's alpha was considered to be 0.8. Content validity was assessed to determine the validity of the questionnaire. SPSS 20 was used to analyze the data, which included descriptive statistics such as percentage, mean, and standard deviation, as well as non-parametric tests such as the Kruskal-Wallis and linear regression tests.

Results: Fifty four dentistry faculty members returned the completed questionnaires in this study. Amongst them, 34(63%) were female, and 20(37%) were male. The mean scores of the knowledge and attitudes questionnaire toward the MCQ and PMP tests were 7.20 and 27.83, respectively. The Mean scores of the knowledge and attitudes had no significant relationship with age, gender, and teaching experience.

Conclusion: Based on the results, it can be concluded that the dental faculty members had good knowledge about MCQs and PMPs structures and their strengths and weaknesses. There was also a good awareness of the shortcomings of the MCQ test in the assessment of clinical reasoning and the lack of transparency of this assessment tool.

Keywords: Dentistry; Patient Management Problem Test; Multiple Choice Question Test; Process Assessment

Background

Assessment is essential in encouraging learning and evaluating whether the learning goals have been reached. A multiple-choice question (MCQ) is composed of two parts: a stem that identifies the question or problem and a set of alternatives or possible answers that contain a key that is the best answer to the question and several distracters that are plausible but incorrect answers to the question. Students respond to MCQs by indicating the alternative they believe best answers or completes the stem. The patient management problem (PMP) is an instrument increasingly used to assess medical competence. The PMP attempts to put the student

figuratively into a setting recognizable as belonging to real life and, within that setting, presents a clinical problem for solution or management. In contrast to the MCQ, which would simply have the choices scored as correct or incorrect, the PMP records such scores and gives the test-taker the results of the selected actions. Classic student assessments are generally based on knowledge-based models. Assessing medical students' knowledge and information is possible through MCQ, while assessing clinical skills requires more powerful methods (1-3). The PMP is a written test that begins with a description of the patient's problem, and students should gather the necessary information from the clinical files. Finally, they make a decision about the

appropriate diagnosis and treatment plan (3). The PMP test exposes students to realistic situations and forces them to find a solution to a clinical problem (2). A study by Ben Abdelaziz et al. in 2018 showed that more than 90% of PMP-evaluated students considered it a valuable educational tool and agreed with its everyday use in education in Tunisia (4).

Zamani et al. (2017) compared MCQ and key features of this examination method in measuring the strength of students' clinical reasoning strength. Their results showed that MCQ tests could not measure students' clinical reasoning strength (5). Mahmoodi et al. (in 2014) compared students' ability to answer the PMP test and the Modified Descriptive Question (MEQ) with the MCQ test and found that low scores on the PMP tests and MEQ indicated the inability of students to answer these types of tests compared to MCQ (6). Zafar et al. (2011) showed that a well constructed MCQ is superior to MEQ in testing the higher cognitive skills of medical students in a problem based learning setup (7).

Besides technical expertise, dental care's success depends on the dentist's and the patient's behavioral patterns and the way they interact with each other. A dentist's positive attitude and communication skills significantly affect a patient's well-being. In the past decade, measuring the clinical performance of dental students has received much attention. In 2011, Monajemi et al. showed that clinical reasoning in Iranian dental education had not received enough attention and that tests conducted in the country evaluate archives and knowledge (1). In 2005, Fakhri et al. evaluated the quality of the assessment of dental students by the faculty at Ahvaz Jundishapur University of Medical Sciences. They showed that 94.9% used multiple-choice questions in the exams (2).

Most studies have examined the knowledge and attitudes of students toward various scientific and clinical evaluation methods (7-9). Still, the knowledge and attitudes of faculty members in conducting these tests are far more important.

This importance stems from the fact that faculty members should be able to choose the type of test according to their expectations of the students' learning levels. If the designer of the questions does not know the proper features of the p-questions, a low-quality question is formed, and the students' information cannot be adequately examined. Adequate design of questions is essential for medical students because they perform clinical procedures, and if their knowledge is assessed inadequately, there is the possibility of misdiagnosis and malpractice. Therefore, being

familiar with the proper forms of question design methods is very important for faculty members.

Objectives

This study aimed to assess the knowledge and attitudes of Kerman University dental faculty members toward PMP and MCQ exams in assessment dental students.

Methods

This descriptive-analytic cross-sectional study was conducted by distributing a questionnaire among faculty members of Kerman Dental School of Kerman University of Medical Sciences in 2019 - 2020. The study population consisted of faculty members of Kerman Dental School. The inclusion criterion worked in the School of Dentistry in 2019-2020. The exclusion criterion was less than one year of teaching experience. Among all 65 faculty members, 54 were included in the study after controlling the inclusion and exclusion criteria. Questionnaires were distributed among them in every department, and every question was answered. Then the questionnaires were collected. This study was approved by the Research Ethics Committee of Kerman University of Medical Sciences. (Ethics Code: IR.KMU.REC.1399.136)

The researcher-made questionnaire for this study consisted of two parts: the first part included demographic information (age, gender, employment status, and the duration of teaching in the dental school). The second part consisted of questions related to the knowledge (10 questions) and attitudes (8 questions) of the faculty members towards MCQ and PMP tests.

For evaluation of the content validity of the questionnaire, it was sent to 10 medical education specialists, and their opinions were integrated into the questionnaire. The content validity index (CVI) of the questionnaire in all questions except three was above 75%, which is desirable. Questions with a CVI of less than 75% were adjusted according to the experts' recommendations. For evaluation of the reliability of the questionnaire, it was completed by 20 faculty members of the School of Dentistry, and Cronbach's alpha coefficient was calculated as 0.8 for the whole questionnaire.

The answers to the knowledge questions were rated as true (1), false (0), and I don't know (0). Therefore, the total score was between 0 and 10. Also, the answers to the attitude questions were rated on a five-point Likert scale as strongly agree (5), agree (4), no opinion (3), disagree (2), and strongly disagree (1). Therefore,

the total score was between 1 and 40. A higher score in both subscales indicated better knowledge or attitude toward MCQ and PMP tests. Data analysis was conducted by SPSS 20, and descriptive statistics such as percentage, mean, and standard deviation, as well as the nonparametric Kruskal Wallis and linear regression tests. The significance level was set as $P\text{-value} > 0.05$.

Results

In this study, 54 faculty members of the Kerman School of Dentistry participated; among them, 63% were female. The mean age of the study subjects was 39.87 ± 9.3 years old. In the Kolmogorov-Smirnov test, the distribution of the knowledge score and attitudes was normal; therefore, regression was used ($P\text{-value} > 0.05$). Descriptive statistics of the demographic data are presented in Table 1. The results of this study showed that females over 40 years old, those with more than ten years of teaching experience, or those employed had a higher awareness score than other individuals, but this difference was not significant. The results also showed that people with a teaching experience of 5 to 10 years and academics with a service commitment period had higher attitude scores, but this difference was not significant.

Table 1. Descriptive statistics of demographic variables

Variables	Categories	N(%)
Age	Below 40 years	35(64.8%)
	Above 40 years	19(35.2%)
Graduation from general dentistry course	1980-1990	5(9.3%)
	1990-2000	9(16.7%)
	2000-2010	21(38.8%)
	2010-2020	19(35.2%)
Graduation from specialty dentistry course	1980-1990	0(0%)
	1990-2000	9(16.7%)
	2000-2010	9(16.7%)
	2010-2020	36(66.6%)
Employment status	Committed to service	14(25.9%)
	Recruitment	40(74.1%)
Teaching experience	Less than five years	24(44.4%)
	5 to 10 years	13(24.2%)
	More than ten years	17(31.4%)

The frequency of the responses to the knowledge and attitudes toward PMP and MCQ tests are presented in Table 2 and Table 3. According to Table 2, the most frequent correct answer was in response to question 1 about the framework of the questions. Also, the least frequent correct answer was related to question 8 about the validity and reliability of the questions. According to Table 3, the most agreement was that scoring is faster with MCQ, but the most disagreement was observed in question 3, which related to MCQ thinking skills.

The mean and standard deviation of the knowledge questionnaire was 7.20 ± 1.8 , and the mean and standard deviation of the attitude questionnaire was 27.83 ± 3.2 . The mean scores of knowledge and attitudes were not significantly related to age, gender, and teaching experience ($P\text{-value} > 0.05$) (Table 4).

Discussion

The study results showed that the faculty members of Kerman Dental School had an acceptable level of knowledge about the correct structure and appropriateness of MCQ and PMP tests and their other strengths and weaknesses. They had a positive attitude towards combining other assessment tools with MCQ tests for assessing students and a positive attitude toward the PMP test's ability to assess students' clinical reasoning skills. Attitude and knowledge scores did not differ significantly amongst different age groups, and the time elapsed since graduation was relatively high in all these groups. It can be contended that this demonstrates a good understanding of the educational staff of this college about the correct and appropriate structural frameworks of MCQ and PMP exams.

In 2009, Fakhri et al. demonstrated that 94.9% of the faculty members used the MCQ test in exams (2). In the present study, most faculty members of Kerman Dental School believed that the MCQ test was the best form of objective test in terms of ease of evaluating the answers, and it is a quick and easy-to-score assessment method.

Table 2. Frequency of the responses to the knowledge questions

Questions	True N(%)	False N(%)	I don't know N(%)
Question 1: Multiple-choice test includes several questions ,each consisting of a central part and several answers, and the student chooses the correct option (question-answer) from the proposed options	47(87)	3(5.6)	4(7.4)
Question 2: In the multiple-choice test ,each question must measure an important topic or an educational goal.	44(81.5)	6(11.1)	4(7.4)
Question 3: In the multiple-choice test ,a question's options must be homogeneous and related to a single topic.	38(70.4)	13(24.1)	3(5.6)
Question 4: In the multiple-choice test ,between 3 and 5 options should be designed for each question.	46(85.2)	5(9.3)	3(5.6)

Question 5: In a multiple-choice test ,no more than one problem should be included in each question.	33(61.1)	19(35.2)	2(3.7)
Question 6: In the multiple-choice test ,the test is measured only in the field of knowledge.	41(75.9)	8(14.8)	5(9.3)
Question 7: In the patient problem management test, a clinical scenario is presented, and then questions about obtaining a history, examination, diagnosis, and treatment measures are asked of the subject.	46(85.2)	2(3.7)	6(11.1)
Question 8: The reliability and validity of the patient problem management test are low.	15(27.8)	18(33.3)	21(38.9)
Question 9: In the patient problem management test, the test subject is measured in the areas of knowledge, attitude, and skills.	41(75.9)	4(7.4)	9(16.7)
Question 10: The patient problem management test is time-consuming.	38(70.4)	10(18.5)	6(11.1)

Table 3. Frequency of answers to the attitude questions

Questions	Strongly Disagree	Disagree	No Opinion	Agree	Strongly Agree
	N(%)	N(%)	N(%)	N(%)	N(%)
Question 1: In my opinion, the multiple-choice test has uniform questions and is the best type of objective test in terms of ease of correcting the answers.	5(9.3%)	3(5.6%)	4(7.4%)	29(53.7%)	13(24.1%)
Question 2: In my opinion, multiple-choice testing is a quick method, and it is easy to score.	1(1.9%)	2(3.7%)	1(1.9%)	33(61.1%)	17(31.5%)
Question 3: In my opinion, the multiple-choice test assesses thinking skills.	9(16.7%)	32(59.3%)	3(5.6%)	9(16.7%)	1(1.9%)
Question 4: In my opinion, the multiple-choice test covers evaluating different educational areas in one test.	1(1.9%)	15(27.8%)	9(16.7%)	28(51.9%)	1(1.9%)
Question 5: In my opinion, the multiple-choice test evaluates only the knowledge of the test subject.	0(0.0%)	10(18.5%)	2(3.7%)	34(63%)	8(14.8%)
Question 6: In my opinion, multiple-choice testing is not a transparent review tool and should be combined with other evaluation tools.	0(0%)	1(1.9%)	4(7.4%)	38(70.4%)	11(20.4%)
Question 7: In my opinion, the patient problem management test assesses limited areas of learner knowledge about diseases.	8(14.8%)	30(55.6%)	3(5.6%)	11(20.4%)	2(3.7%)
Question 8: In my opinion, the patient problem management test is a method of assessing students' clinical reasoning power.	0(0%)	3(5.6%)	4(7.4%)	31(57.4%)	16(29.6)

In the present study, most faculty members believed that the MCQ test was not a transparent assessment instrument and should be combined with other assessment tools. In 1998, Hammond et al. observed that the scores obtained in an MCQ exam were higher than the actual information of the students about the questions, and some of these scores were obtained by conjecture and chance. It was concluded that the MCQ test is not a transparent assessment tool for evaluating students (10). Also, in 2022, Darmiani and Ebrahimipour demonstrated that students' scores on the PMP test were lower than their scores on the MCQ test, implying their unfamiliarity with the PMP tests and poor performance in responding to PMP tests (11). Students' viewpoints and attitudes toward the MCQ demonstrated negative impressions and proposed the superiority of other learning methods (12). As an evaluation method, MCQ might be a valuable process to enhance medical students' learning, despite doubts raised on its real efficiency and pitfalls in terms of time and effort.

In a study by Zamani et al. conducted in 2017, the MCQ, the most common method of assessing students

today, could not adequately measure students' clinical reasoning power (5). In the current study, most faculty members believed MCQ tests could not evaluate thinking skills.

The findings of Esmaeili (2015) (13), Mahmoudi (2014) (6), Palmer (2007) (14), and Zafar (2011) (7) studies indicated that a lack of correlation between PMP and MCQ test scores and academic achievements indicate students' weakness in reasoning and clinical judgment despite their high GPA and scientific knowledge. Moreover, in 2017, Zamani (5) and in 2018, Ben Abdelaziz (4) concluded that the PMP test is an excellent way to evaluate students' clinical reasoning skills. In the present study, most faculty members believed that PMP was an effective method for assessing students' clinical reasoning power.

In 1985, the findings of a study conducted by Norcini et al. showed that the reliability and validity of the PMP test were lower than MCQ (15). In the present study, the majority of the faculty members were unaware of the reliability and validity of the PMP test, were ill-informed about it, and 27.8% considered the reliability and validity of the PMP low.

Table 4. Measuring the effect of demographic factors on knowledge and attitude towards PMP and MCQ by linear regression

	Categories	Dependent variable = total Score of knowledge			Dependent variable = The total score of attitudes		
		Coef	SE of Coef	P-Value	Coef	SE of Coef	P-Value
Constant		5.22	0.71	<0.001	0.64	0.52	0.22
Age	Below 40 years	Reference			Reference		
	Above 40 years	1.04	1.37	0.45	0.87	0.76	0.26
Gender	Male	Reference			Reference		
	Female	0.02	0.37	0.97	-0.20	0.41	0.62
Employment	Committed to service	Reference			Reference		
	Recruitment	0.51	0.45	0.26	0.03	0.50	0.94
Teaching experience	0-5 years	Reference			Reference		
	Less than five years	0.47	0.71	0.51	-0.25	0.79	0.75
	5 to 10 years	0.11	0.61	0.85	0.04	0.68	0.95

In designing MCQ tests, the examiner considers whether the question impacts students' competence and decides to include the theme in the question. Therefore, each objective question should either measure an educational goal or include an important part of the curriculum. Nitko says: "First, select an educational goal or an important topic, and decide how many questions you wish to allocate to it; then take the necessary steps to design each question" (16). In the present study, 81.5% of the faculty members agreed with the notion that in the multiple-choice questions, each question should measure an important topic or an educational goal.

In multiple-choice questions, all options in a question should be homogeneous in content, and they should not be related to different subjects (17). If necessary, the question should be excluded, and each option should become a right-or-wrong question and independent of other options. In the present study, 70.4% of the faculty members were aware that all the options should be homogeneous and related to one topic in the MCQ.

In MCQ tests, the selection of 3 to 5 options is not technically different. Designing more options makes it more difficult for students to guess the correct answer. However, as it is challenging to design many deviant options, sometimes a smaller number of options (3 to 4 options) is favored. In particular, having fewer options decreases the time necessary to read them (18). In the present study, 85.2% of the faculty members were fully aware of this issue.

Each question should be related to only one subject or one educational goal. If there is more than one subject or goal in the question, it can complicate the question (19). In the present study, 61.1% of faculty members agreed with this notion.

According to the famous taxonomy of Benjamin Samuel Bloom, learning includes cognitive, emotional (attitude), and psychomotor (skill) domains (20). Patient problem-solving tests can assess clinical competency in these areas (21). In 2017, a study by

Kalhari et al. showed that considering the average validity of the whole test, the mean difficulty coefficient, and taxonomy indexes I, II, and III, the tests designed by the faculty of Allied Science were within an acceptable standard range (22). In the present study, most faculty members were aware of this feature of the PMP test.

However, MCQs frequently have imperfections called item-writing flaws (IWFs). The occurrence of IWFs in question may arise from inadequate training and knowledge of academic teachers in the subject of MCQ writing (23), lack of engagement (24), and time constraint due to other academic obligations (25). In 2008, Vyas and Supe et al. reported that flaws in MCQ writing were primarily due to insufficient faculty member training (18). In 2020, a study by Gupta et al. showed that a single short-duration training session was insufficient to prevent MCQ-writing flaws. Therefore, there is a need to focus on faculty member training on MCQ writing. Implementation of longer-duration courses supplemented by repeated or continuous faculty development programs is pivotal. (26) On the other hand, in 2020, Sezari et al. showed that a one-day short workshop for MCQs improved the faculty members' capacities and was practical for the faculty. Still, short-term repetitive workshops could yield better results (27).

Since the Patient Problem Management test has low validity, achieving the desired validity takes a long time. Ideally, this test requires 90 minutes to respond (21). In the present study, most faculty members were aware of the time-consuming nature of this type of test.

The results of the present study showed that the faculty members of Kerman Dental School have a good level of knowledge about the correct and appropriate structure of MCQ and PMP tests, as well as their strengths and weaknesses. The reason faculty members do not use the correct form of designing questions even though they are aware of their characteristics is unclear. Proper design of questions within the standard framework can lead to an accurate assessment of

students and may result in more accurate clinical decisions. Despite the appropriate level of information of faculty members, the need for retraining courses to refresh their knowledge of question design seems necessary. After all, students who pass a poorly designed exam without possessing adequate knowledge of the topic can pose a real threat to their future patients.

The main limitation of this study was the lack of cooperation of all dental school faculty members due to the COVID-19 outbreak.

Conclusion

The results of the present study showed that the faculty members of Kerman Dental School had good knowledge of the structure of MCQs and PMPs and their strengths and weaknesses. There was also a belief amongst faculty members that, in contrast to the PMP test, the MCQ test had limitations in assessing the clinical reasoning and transparency of dental students. This study's results should be used to analyze this type of evaluation test, and faculty members should be provided feedback to improve their question-design skills.

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The Effect of Implementing the Competency-Based Education Model on the Clinical Skills Among Midwifery Students

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Abstract

Background: From the past to the present, the traditional lecturing method has been the usual and preferred method for teaching, and instructors use learner-oriented methods such as group discussion less due to reasons such as being time-consuming and low-experienced in both groups of learners and professors in this regard.

Objectives: The present study was conducted to compare the effect of implementing the competency-based education model on the clinical skills among midwifery students.

Methods: This study was semi-experimental; the samples consisted of 34 midwifery students randomly assigned to two experimental and control groups. The procedures of pelvic examination, Leopold maneuvers, and suturing were taught in the form of competency-based education during six 60-minute sessions for the experimental group, and the control group was trained according to the conventional method. The required information was collected by the triple skills checklist, and finally, the data were analyzed using descriptive statistics and analysis of covariance (ANCOVA) test in SPSS software.

Results: After the intervention, in the experimental and control groups, the pelvic examination skill scores were 38.00 ± 8.41 and 20.76 ± 7.91 , the Leopold maneuvers scores were 35.40 ± 6.29 and 23.18 ± 6.73 , and the suturing scores were reported as 30.71 ± 6.93 and 22.12 ± 9.58 , respectively ($P < 0.050$). The results of the ANCOVA test showed that competency-based education affected learning the pelvic examination skill with an effect size of 0.893, suturing with an effect size of 0.644, and Leopold maneuvers with an effect size of 0.860.

Conclusion: Given that students' skill needs are considered in detail in the competency-based model and are accompanied by continuous evaluation and feedback, they can affect clinical learning. Based on the obtained results, it is suggested that instructors and professors use the competency-based education method as a strategy in addition to the conventional method for teaching professional skills in midwifery.

Keywords: Competency-Based Education; Clinical Skills; Midwifery

Background

Midwifery education is a part of the health system that deals with human life, and paying attention to its quantitative and qualitative aspects is of particular importance. The largest amount of education is provided in clinical form in hospitals, and during education, students learn various skills to play their professional roles in the future. Therefore, the effectiveness of education can significantly impact professional skill learning. The results of some studies have shown that achieving maximum efficiency, production, and productivity depends on the evolution of the professional role, and despite having a strong

theoretical base, graduates in the fields of nursing and midwifery do not have sufficient expertise, skill, and efficiency in clinical environments and are weak in the problem-solving process (1).

Experts believe that in order to enter a professional position and provide the highest amount of productivity and efficiency, students in some fields, such as midwifery and nursing, need appropriate theoretical and practical education (2). In this regard, teaching effectiveness is one of the most important concerns of those in charge of education. Effectiveness refers to investigating the effectiveness of the actions taken (education) to achieve predetermined goals (skill) (3). It seems that education with conventional approaches

does not have the necessary durability, and the need to use new teaching methods in educating clinical skills in midwifery is felt (4). Midwifery graduates have mentioned the lack of coordination of educational planning as an inhibiting factor in learning (5), while despite the existence of problems in clinical education and the need to review the method of clinical internships due to the complexity of education in the clinical environment, only a few research on teaching and learning has been conducted in this environment and on how to improve it (6).

Having sufficient knowledge and skill is one of the necessities of a midwife. In this regard, the first strategic guideline for strengthening midwifery services was provided by the World Health Organization (WHO) in 2002-2003 and continues until 2030. One of these strategies is competency-based education in the stages before starting the service (7). Competency is defined as the acquisition of a set of knowledge, characteristics, attitudes, and skills related to each other that has a great impact on individuals' jobs, is correlated with individuals' performance at work, can be evaluated with acceptable standards, and can be improved through education and development (8). The competency-based education approach is an active and learner-oriented method (9) in such a way that the final performance is obtained according to the goals of each academic course, structural items, and evaluations (10). The main emphasis of this approach is on defined achievements and the needs of society and the labor market (11). In most competency-based definitions, the concept of competency includes the three dimensions of "knowledge, attitude, and skill" (12). In fact, this type of education emphasizes both how to learn and the achieved performance (13).

In the competency-based education model, at the beginning of each course, a list of learning goals, content, and desired competencies that students are expected to achieve at the end of the course and the knowledge required to achieve these competencies are provided to and approved by the students. This method can lead to identifying capabilities and help students make decisions during the clinical course. In this model, results and consequences are emphasized more than knowledge acquisition (14).

The effectiveness of the competency-based education approach on the clinical skills has been investigated and verified in a range of job positions; of course, most of the evaluated statistical samples have been among the nursing community. The results of Soheili et al.'s research, which was conducted among the 8th-semester nursing students

of the Urmia Faculty of Nursing and Midwifery, showed that the clinical performance of the students in the experimental group who had spent their course based on the competency-based education model, both in terms of specific and general clinical performance, was significantly better than those in the control group (15). Also, numerous other studies have been conducted on clinical nursing skills inside and outside the country (16, 14). Nevertheless, not much research has been reported about the effectiveness of the competency-based education model on the clinical skills of midwifery students. Although many studies have been conducted on the effect of different teaching methods, the question is still raised: "Among the teaching methods, which one is more effective in the clinical education of students?" (14).

Midwifery students receive a lot of training and need a variety of clinical skills. Some of these skills are pelvic examinations, Leopold maneuvers, and suturing. Performing pelvic examinations during childbearing will lead to detecting the lack of progress and possible dystocia, which can cause irreparable consequences for the mother and the baby. Also, Leopold maneuvers help estimate the fetus's weight, prevent dystocia or restriction of fetal growth, and detect the fetus's placement and presentation, which a mistake in the diagnosis of each one will have serious consequences. Failure to perform an on-time episiotomy with indication and the correct way to repair it will cause urinary and fecal incontinence, fistula, and dyspareunia in the future (17). Considering the sensitivity of the midwifery profession, the need for high accuracy and promptitude, the power of decision-making, and observing the importance of the subject, and also numerous weaknesses in this field and on the other hand, the lack of comprehensive research on the clinical skills, the present study examined the effect of the competency-based education model on the clinical skills among midwifery students.

Objectives

The present study was conducted to compare the effect of implementing the competency-based education model on the clinical skills among midwifery students.

Methods

This study was conducted in a semi-experimental way with pretest-posttest stages in two experimental and control groups in 2020. The research samples included all the 5th- and 7th-semester midwifery students of Razi Faculty of Nursing and Midwifery, Kerman University of Medical Sciences (n = 34).

Inclusion criteria included passing theoretical pregnancy and childbirth courses as a prerequisite and participating in all educational sessions in both groups. Refusal to continue participation in the research during the educational sessions and not attending the educational sessions for the experimental group were also considered exclusion criteria.

After obtaining informed consent, the participants were placed in the control and experimental groups based on random allocation in the form of a lottery and the code they received. Before the intervention, both groups were evaluated in terms of procedural skills in such a way that the students' practical skills were observed by an evaluator, and the checklist was completed for each student. The evaluator was a specialist in the field of midwifery, for whom blinding was done, and the evaluator did not know which individuals were in the control group and which were in the experimental group and only completed the checklists based on the code assigned to the individuals.

The data collection tool was the checklist of triple procedural skills. This checklist included a personal information form (age and diploma grade point average [GPA]) and a procedural skill checklist (vaginal examination skill with 16 items, Leopold maneuver skill with 17 items, and suturing skill with 13 items). For each item in the skill assessment forms, there was a Likert scale (with a scoring rate based on performing the skill perfectly (score 4), well (score 3), averagely (score 2), poorly (score 1), and not performing the skill or performing it wrongly (score 0). The maximum scores for the vaginal examination checklist, Leopold maneuvers, and suturing skills were considered 64, 68, and 52, respectively. This tool was designed in a study by Hatamirad et al., its content validity and reliability were calculated using the inter-observer agreement method, and its value was confirmed at 0.85 (18). In the present study, the values of content validity ratio (CVR) and content validity index (CVI) with the opinions of 10 experts in this field for all questions were higher than 0.63 for CVR and 0.79 for CVI. Also, to check the research tool's reliability, Cronbach's alpha coefficient was used, and this value was reported as 0.97, 0.97, and 0.98 for pelvic examination, Leopold maneuvers, and suturing, respectively.

In order to prevent data contamination, the control group was first evaluated, and then the intervention was performed for the experimental group. A group instructor for the control group and an instructor proficient in competency-based education were used. A third instructor was also used as an evaluator for whom blinding was done in the study. As usual, the control

group received its usual educational program, and the experimental group also received competency-based education. The education time of the experimental group was six 60-minute sessions. Two months later, individuals in both groups were examined again in terms of procedural skills.

The model design was based on the general competency-based education model in three stages: "Needs assessment and designing, education implementation, and evaluation." The education implementation stage was performed during the educational intervention. In the educational intervention stage for the experimental group, the instructor proceeded to educate the midwifery students in interaction with the research team within the framework of the course objectives listed (Table 1). The instructor of the experimental group adhered to the principles of the competency-based education model and was thoroughly familiar with the education method and goal. In the current study, competency-based education was implemented in four stages, which are described below.

The first step: Defining the tasks and activities that midwifery students are expected to achieve;

The second step: Standardizing competencies to clarify the roles and responsibilities of midwifery students;

The third step: Implementing the educational program and following it;

The fourth step: Evaluation.

The first step: The tasks and skills expected from the students were determined based on the approved educational program and the opinion of the professors and students of the course.

The second step: Standardizing competencies: Clarification of roles and responsibilities and planning for students' education were performed. The duties of the instructor and the students were specified, and based on the students' level, it was determined how many educational sessions were required. Educational goals (in the fields of knowledge, attitude, and performance) were also formulated.

The third step was implementing the educational program carried out in the present study for the students in the experimental group.

The fourth step: The evaluation in this stage was different from the final evaluation that was performed by the evaluator instructor and during the education process was performed by the instructor with quick feedback to the students.

Data were analyzed using descriptive statistics (mean, frequency) and research hypotheses using paired t-test and covariance, and assessment of the statistical

prerequisites of normality of data distribution, homogeneity of regression slope, and homogeneity of variance in SPSS software version 22 (version 22, IBM Corporation, Armonk, NY).

Results

The results related to the descriptive statistics of the distribution of students' age and GPA showed that the two groups were similar (Table 2).

In all the examined skills, the performance scores of the two groups in the pretest stage had no significant difference, and the groups were homogeneous in this respect in the pretest stage (Table 3).

The descriptive statistics related to the scores of the experimental and control groups in the pretest and posttest stages are presented in Table 4. Based on the results, the scores of the three skills in the experimental group increased following the competency-based education method ($P < 0.001$). Also, the difference in the mean scores of suturing and Leopold skills was observed in the posttest stage in the control group compared to the pretest stage, meaning that conventional education was effective in the mentioned procedures ($P < 0.001$).

The results showed that the students who were educated by the competency-based method had higher levels of pelvic examination, suturing, and Leopold examination skills than those who were educated by the conventional method, with an effect size of 0.893, 0.644, and 0.860, respectively (Table 5).

Table 1. The implementation steps of competency-based education

Education Type	Defining Tasks and Activities	Standardizing Competencies	Implementing the Educational Program	Evaluation
Pelvic examination	<p>Pelvic examination is a way for midwives to look for disease symptoms in specific organs of a woman's body. This examination is used to check things such as the vulva (external genitals), uterus (womb), cervix (opening from the vagina to the uterus), fallopian tubes (tubes that carry the ovum to the uterus), ovaries (organs that produce ovum), the bladder (the bag that holds urine), and rectum (the sheath that connects the large intestine to the anus).</p> <p>When are pelvic interventions performed?</p> <p>Pelvic examinations are performed during an annual physical examination, when a woman is pregnant, when a doctor or midwife is investigating an infection (such as chlamydia, vaginosis, trichomoniasis, and others), or when a woman has pelvic or back pain, which the clinical skill in this education aims to pelvic examination for when a woman is pregnant.</p>	<p>Before the examination, the midwife will ask the person to undress, put on the disposable examination gown, sit on the examination table, and then the midwife will ask about any health concerns.</p> <p>Then the person will lie on her back and place her feet on the footstool. The midwife asks her to calm down, puts pressure on the person's lower stomach, and performs an organ examination. Then the doctor or midwife asks the person to move to the end of the table and bend her knees.</p> <p>First, the doctor or midwife examines the parturient for signs of infection, swelling, and wounds. In the next step, the midwife inserts a speculum into the vagina, making it wider, and observes the internal organs more easily.</p> <p>Then they may do a Pap smear test. This test involves a sample of cells from the cervix to check for abnormalities, especially cervical cancer. The midwife may also use a sample of vaginal discharge to check for infection.</p> <p>Then, with a speculum, the midwife performs a two-handed examination, which includes placing two fingers inside the vagina and pressing the pelvis with the other hand, aiming to investigate changes or abnormalities in the reproductive organs. The doctor or midwife can then perform a rectal examination by inserting a gloved finger into the rectum to check for tumors and other abnormalities behind the wall of the vagina, uterus, and rectum.</p>	Educational intervention in the experimental group	Checklist by the evaluator officer
Leopold maneuvers	<p>Leopold maneuvers are used with an empty bladder to check things such as checking the number of fetal placentas, showing fetal placement and position, estimating fetal weight and uterine height, checking fetal head flexion and extension, and checking engagement.</p>	<p>The first maneuver (Fundal)</p> <p>Place the fingers of both hands on the fundus of the uterus.</p> <p>Touch the fetal progenitor (head or bottom of the fetus) at the fundus of the uterus.</p> <p>A large and nodular body is felt when touching the bottom of the fetus.</p> <p>A round body is felt when touching the head, which is more mobile and flexible.</p> <p>The second maneuver (Lateral)</p> <p>Place your palms on both sides of the mother's abdomen.</p> <p>Squeeze the abdomen gently but deeply.</p> <p>On one side, a hard and resistant structure, i.e., the back of the fetus, is felt; on the other side, some numerous, irregular, and moving parts are touched, which are the fetus's organs.</p> <p>By determining which side the back of the fetus is on, you can find the place where you can hear the sound of the fetus's heart.</p> <p>The third maneuver (Pawlik)</p> <p>Using the thumb and other fingers of one hand, the mother's lower abdomen, just above the symphysis pubis, is firmly grasped between the fingers.</p> <p>If the presentation organ is not engaged, a mobile mass, often the fetal head, is touched. The way to distinguish the head and bottom (breech) is the same as the first maneuver. However, if the fetal presentation organ is deeply engaged, the results of this maneuver will only show the place of the fetal lower pole in the pelvis, and the examination details will be determined in the fourth maneuver.</p>	Educational intervention in the experimental group	Checklist by the evaluator officer

		<p>The fourth maneuver (Pelvic)</p> <p>To perform this part of the examination, the face of the doctor or midwife must be toward the patient's legs.</p> <p>With the tips of the first three fingers of both hands, the examiner puts deep pressure in the direction of the axis of the pelvic inlet.</p> <p>If, during movement, one of the hands hits a bump, it stops, and if the bump is on the back side of the fetus, the head has an extension, and if the bump is in the direction of the limbs, the head of the fetus has a flexion, and it is when the head of the fetus has descended into the pelvis.</p>		
Suturing	<p>It is necessary for students in this part to get familiar with the types and methods of stitching, its reasons and importance, its tools, and the correct method. In this regard, in this part, the students of the experimental group are taught the suturing types, tools, correct way of doing, reasons, and importance.</p>	<p>The following three methods are used to close the stitches on the abdomen:</p> <p>Stapler: The midwife uses a skin stapler to close the incision with metal staples. This option has many usages and is a simple and fast method.</p> <p>Suture: In this method, the incision on your abdomen is sewn using thread and a needle. This method takes a long time and may take up to 30 minutes. According to some midwives, this method is better. A study in 2014 demonstrated that women who had used sutures had experienced fewer complications than those who used a stapler.</p> <p>Glue: Surgical glue closes the incision made on the abdomen and is filled with a transparent solution. According to some experts, the glue heals faster and leaves the least scar on the skin, but this method is not always a good option. In order to use this method, the midwife has to check several factors, including the method of cesarean delivery, creating a horizontal incision, and the harmony of the skin and abdominal fat.</p> <p>Absorbable cesarean suture: It is one of the types of sutures used for wound healing. In the following, we will explain more about this type of suture. In order to perform a cesarean delivery, two incisions are made on the mother's abdomen: The first incision is in the lower abdomen, about one or two inches above the pubic hair; the second incision is made in the uterus through which the baby is removed. The incisions made on the abdomen may not be the same as those on the uterus.</p> <p>Each of the incisions is in one of the following two ways:</p> <p>Horizontal: Transverse incision is used in most cesarean sections. The reason for using this type of incision is that it is performed in the lowest part of the uterus, which is also thinner, and less bleeding is created after the operation. Also, it has the advantage that if the delivery is vaginal, the amount of separation will be small in the next pregnancy.</p> <p>Vertical: The use of this method is known as the classic cesarean section. The incision made in this method starts from the bottom of the middle part of the abdomen and continues to the pubic line. This method was commonly used in the past, but today it is used more for special cases, for example, in situations where there is a wound in a previous surgery, if the fetus is in an unusual position, or when an emergency delivery must be performed. Vertical incisions are more painful and take longer to heal.</p> <p>Examination of the birth canal: The genital-urinary system should be examined for the presence of rupture. Grading of episiotomy should be determined based on the following grades:</p>	Educational intervention in the experimental group	Checklist by the evaluator officer

		<p>First degree: Damage to the epithelium of the vagina, rupture of the fourchette, and rupture of perineal skin.</p> <p>Second degree: Rupture of fourchette and perineal skin, vaginal mucosa, bulbospongiosus muscles, and transverse-superficial perineum.</p> <p>Third degree: Rupture of fourchette, perineal skin, vaginal mucosa, perineal muscle, and anal sphincter.</p> <p>Fourth degree: Rupture of the perineum, anal sphincter, and anorectal mucosa.</p> <p>After the removal of the placenta and before the repair of the episiotomy, if there is a rupture, the ruptures that bleed or lead to changing the anatomical shape are repaired first.</p> <p>Episiotomy head and bleeding areas should be checked, and if there is a bleeding vessel, the vessel head should be blocked, similar to an 8. In order to have a better view and absorb blood, before doing this, a tampon should be placed in the vagina, and then with the help of a forceps, its continuation should be connected to the mother's abdomen. U methods and the cross method should be taught in restoration.</p>		
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Table 2. Descriptive statistics and homogeneity test of the experimental and control groups based on age and academic GPA

	Group	Mean \pm Standard Deviation	Statistics t	P-Value
Grade Point Average	Experimental	16.64 \pm 1.05	1.65	0.254
	Control	16.11 \pm 1.60		
Age	Experimental	21.29 \pm 0.92	-1.650	0.109
	Control	21.82 \pm 0.95		

Table 3. The performance scores observed in the two groups for the procedures examined in the pretest stage

Procedure	Group	Mean \pm Standard Deviation	Statistics t	P-Value
Pelvic examination	Experimental	15.41 \pm 10.10	0.034	0.973
	Control	15.53 \pm 10.24		
Suturing	Experimental	7.71 \pm 6.68	0	> 0.999
	Control	7.71 \pm 7.15		
Leopold maneuvers	Experimental	13.41 \pm 9.04	0.139	0.890
	Control	13.82 \pm 8.19		

Table 4. Descriptive statistics and test results of the assumption of difference in mean scores in the pretest and posttest stages of the experimental and control groups

Procedure	Experimental Group	Mean ± Standard Deviation	Result of the Mean Difference Hypothesis Test	
			Statistics t	P-Value
Pelvic examination	Pretest	15.41 ± 10.10	-7.083	0.001
	Posttest	38.00 ± 8.42		
Suturing	Pretest	7.71 ± 6.68	-9.720	0.001
	Posttest	30.71 ± 6.93		
Leopold maneuvers	Pretest	13.41 ± 9.04	-10.083	0.001
	Posttest	40.35 ± 6.29		
Control Group				
Pelvic examination	pretest	15.53±10.23	-1.669	0.106
	posttest	20.76±7.910		
Suturing	pretest	7.71±7.15	-4.970	0.001
	posttest	22.12±9.59		
Leopold maneuvers	pretest	13.82±8.19	-3.635	0.001
	Posttest	23.18±6.74		

Discussion

The effectiveness of education can greatly impact the professional skill learning of students in the field of medical education. The results of the present study showed that both traditional and competency-based education affected the skill acquisition of midwifery students. The experimental group had higher scores in all three investigated procedures (Leopold maneuvers, pelvic examination, and suturing) than in the pretest stage, while the control group scored higher in Leopold maneuvers and suturing. It seems that since competency-based education is more consistent with the goals, structure, and evaluations, and on the other hand, it is based on completely clear and need-based achievements and also includes the three dimensions of knowledge, attitude, and skill (18, 19), the obtained results are not far from expectations.

Based on the results of the present study, the difference in improving the scores of suturing, pelvic examination, and Leopold maneuver skills was significantly higher in the experimental group than in the control group. Although previous studies have

clearly less evaluated the effectiveness of this method on professional skills in a specific way, it can be said that the results of the present study are consistent with the findings of Hakimi et al.'s study that competency-based education affects the levels of awareness, skill, and self-confidence of midwifery students (3). Hosseini et al. also compared competency-based education and lecturing methods in their research and concluded that there was a significant difference between the mean score of knowledge and performance in the two groups before and after the intervention, and the comparison between the two groups showed that regarding performance, the competency-based group obtained a higher score (19), which was similar to the results of the present study.

By conducting a study, Soheili et al. found that the clinical performance of the experimental group students who had completed their course based on the competency-based education model was significantly better than the control group students, both in terms of special and general clinical performance (15), which was consistent with the findings of the present research. In a study, Naderi et al. investigated the effect of two competency-based and traditional education methods on the active learning of cognitive and clinical skills of nursing students in the 7th semester of internship in the intensive care unit (ICU) of one of the hospitals of Urmia University of Medical Sciences.

Table 5. The covariance test of the effectiveness of education through the competency-based model on improving pelvic examination, suturing, and Leopold maneuvers skills

	Source of Changes	Statistics F	P-Value	Effect Size	Test Power
Pelvic examination	Pretest	185.512	< 0.001	0.857	1.000
	Groups	258.649	< 0.001	0.893	1.000
Suturing	Pretest	168.933	< 0.001	0.845	1.000
	Groups	55.976	< 0.001	0.644	1.000
Leopold maneuvers	Pretest	69.179	< 0.001	0.691	1.000
	Groups	190.162	< 0.001	0.860	1.000

They concluded that the application of the competency-based education method provided the necessary opportunity to promote and improve learning the clinical and cognitive skills of nursing students more than the conventional method (14) and in this sense, it can be said that this finding is similar to the results of the present study.

Woeber concluded in a study that the competency-based education method contributed to the students' clinical skill learning by highlighting learning goals for clinical skill learners, showing the content plan in the curriculum, as well as strengths and gaps in clinical education for all programs (20). Also, Imanipour et al. reported in their research that competency-based education could increase the clinical performance of healthcare service providers (21). Given that the competency-based education model in all educational departments and components has considered midwifery students in the form of predicting the education and skill needs and also is accompanied by feedback from the instructor and continuous evaluation, it can affect learning and the quality of clinical learning more than other educational models.

Conclusion

Based on the results obtained from the present research, using the competency-based model in addition to the conventional and traditional methods is suggested due to the emphasis on all three learning areas of knowledge, attitude, and performance; on the other hand, continuous evaluations should be used to ensure the skill acquisition as a suitable educational method to promote the quality level of midwifery clinical education. Diversity in the use of educational methods can both improve the quality of teaching and help increase the students' motivation and also significantly affect the students' profession-learning and professionalization. Since some professors may not know how to implement this method and do not have the experience of using it, it is suggested that the training of professors be provided in the form of practical workshops during empowerment courses.

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

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The Desirable Features of Content in Higher Education with an Emphasis on the Lifelong Learning Approach: A Qualitative Research

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Abstract

Background: Nowadays, expectations from higher education systems have changed, and the purpose of these centers is not only to transfer information. One of the solutions to respond to higher education's new need is to move toward lifelong learning.

Objectives: This research was conducted to investigate the desirable features of content in higher education with an emphasis on the lifelong learning approach.

Methods: This qualitative study was conducted with a content analysis approach in 2019. Nineteen faculty members of Isfahan University, Shahid Bahonar University of Kerman, and Medical Sciences Universities of Kerman and Isfahan, who were experienced in the fields of curriculum planning, higher education, and teaching and learning, were selected to participate in the study through purposive sampling. Data were collected through open-ended semi-structured interviews. Graneheim and Lundman's qualitative method was used to analyze the data. The results of data analysis were presented during three stages of open, axial, and selective coding. The peer check method and external observer were used in order to ensure the reliability and acceptability of the data.

Results: According to the results of this research, three main categories were identified as the desirable features of content with an emphasis on the lifelong approach. The first category was "suitability of the content for society and its needs", which includes the components of being up-to-date and applicability and usefulness. The second category is "suitability for the learner and his/her needs", which includes the dimensions of matching with the learner's interest, need, and ability, developing individual skills according to the learners' potential, and developing excellent thinking skills. The third category is "suitability for curriculum regulations", which includes the components of continuous education, learning with multiple methods, quality, flexibility, diversity, coherence, and self-direction.

Conclusion: The results of this research can be used in revising higher education content with an emphasis on educating individuals with the feature of lifelong learning.

Keywords: Lifelong Learning, Content, Higher Education, Qualitative Research

Background

Lifelong learning is one of the most important capabilities needed in today's information society. In this society, it is not possible to deal with occupational and social problems with previous information. In order to adapt to these conditions, we need to improve learning (1). Lifelong learning has become a necessity for individuals. Obviously, educational systems, especially higher education, play an important role in achieving this goal (2). Higher education, as the highest level of society's education, is of significant importance and plays a critical role in the growth and development of society in various scientific, cultural, technological, economic, social, and political dimensions (3). In order to meet these needs, universities must make changes in the goals and content of their curricula (4). Human scientific advances and the human life's achievements

have not only provided a huge amount of information to present but have also become the main factor of instability of information and have made previous information obsolete (5). In the curriculum planning process, after assessing the needs and specifying the goals, determining the content is of particular importance and sensitivity because trying to pave the way for realizing goals is the first step (6). In a university with a lifelong learning approach, there is a need for the content to make some fundamental changes in itself in accordance with global developments (7). Although the number of studies conducted in the field of lifelong learning is small, and their relationship to the curriculum subject is superficial and insignificant, we can mention some of these studies.

Haddadnia et al. suggest that the content element in the curriculum of lifelong education should have

features such as being need-oriented, coherent, flexible, attractive, systematic, diverse, fit, comprehensive, specialized, and stimulating (8).

Farooq et al. stated that lifelong learning was an important element in education and an influential factor in the management of educational institutions and the creation of scientific health (9).

Mashhadi et al. believe that the curriculum content should be such that learners can facilitate and acquire knowledge based on their favorite skills and according to individual differences (10).

Duke and Hinzen have pointed out the commitment and performance of universities in supporting adult education and lifelong learning and believed that the role of higher education centers was research on learning, learning needs, staff career development, and even the new idea of holding global classes, and viewed the role of higher education centers as the fulfillment of learning needs and staff career developments (11).

Karimi et al. suggest inapplicability of learning, unfamiliarity with research methods in the field of study, inattention to teaching an international language, not using interdisciplinary content, low emphasis on general abilities, and inattention to the quality of research work as the problems of the university when content selection and organization (12).

Nasiri, Jafari, and Khazaei, state that the curriculum content with a lifelong learning approach should be an action for learning how to learn, the applicability of the content, suitability of the content for the needs of the society, information literacy, and citizenship education. Instead of emphasizing the content volume, attention should be paid to the content quality. In content organization, attention should also be paid to the interdisciplinary method so that the learner can gain a more comprehensive view of the subject (13).

Nongnafat et al. showed in their research that universities should include lifelong learning in their educational philosophy through goals, content, teaching-learning strategies, etc. (14).

Maleki et al. showed in a study that higher education required a specific model of the curriculum with a lifelong education-based approach in all its elements, including goals, content, teaching-learning strategies, educational materials and resources, comprehensive learning activities, educational time, educational space, and learners' grouping and evaluation (15).

Kamyabi et al. introduced four main categories entitled creating equal and continuous learning opportunities, flexibility in accepting those who have not entered higher education, diversity of education programs, and inclusiveness as some basic policies of

higher education regarding lifelong learning that should be revised (16).

The results of Mohammadi et al. study showed that the degree of tendency to be lifelong regarding the goal, content, and teaching-learning strategies' elements significantly differed from some current learning elements (17).

According to the mentioned studies, paying attention to the curriculum with a lifelong learning approach in educational centers is necessary. In order to actually implement this important issue, paying attention to the primary and important role of the curriculum based on lifelong learning components is essential. Among the curriculum elements, it is critical to pay attention to the educational content, and the content should not merely convey past and outdated information to the individual.

According to the stated points, this article aims to answer the question of "if higher education wants to move toward a program with a lifelong learning approach and provide better learning opportunities for individuals, what characteristics should the content of this program have?"

Objectives

This research was conducted to investigate the desirable features of content in higher education with an emphasis on the lifelong learning approach.

Methods

Based on the target criterion, the current research is an applied study. This research was conducted as a qualitative study with a content analysis approach in 2019. The studied population included professors and experts of Isfahan University, Shahid Bahonar University of Kerman, and Medical Sciences Universities of Kerman and Isfahan, whose fields of study were educational sciences (with different majors) and medical education. The sampling method in this study was purposeful, and data collection (conducting interviews) continued until data saturation. Theoretical saturation means a stage in which no new data appears concerning the category and the relationships between the categories have been established and confirmed (18).

Finally, 19 people were interviewed, 7 of them were experts from the Medical Education Development Center of Medical Sciences Universities of Kerman and Isfahan, and 12 were experts in the field of planning and education at Isfahan and Kerman Universities. The interview location was determined at the professors' offices based on the agreed time. Each interview lasted

about 45 minutes. The interviews were semi-structured, and the questions were asked in an open-ended manner.

The general questions of “What is your understanding of lifelong learning in higher education?” and “What elements do you think are necessary to change to guide higher education in the path of lifelong learning?” were raised at the beginning. Then, based on the participant responses, the interview questions were guided to find the content features at a university with an emphasis on lifelong learning. The data obtained from the interviews were analyzed with the content analysis method with the Graneheim and Lundman’s (2004) approach. Based on this approach, interviews were initially conducted and implemented immediately after each interview.

After reading the text and a general understanding of the content, meaningful units and primary codes that contained concepts were extracted. In the next step, similar initial codes were classified into more comprehensive categories, and finally, the general category was determined (19). Polit and Beck (2006) methods were used to increase the scientific reliability and validity of the research results. These researchers consider the four criteria of confirmability, dependability, credibility, and transferability necessary to ensure the robustness of qualitative data (20). Therefore, to ensure the data dependability, the researcher followed this criterion by observing the interview principles, long-term interaction with the participants, and avoiding bias.

In order to ensure confirmability, after forming codes to measure the correctness of the codes and ensure the interpretations, the codes were provided to the participants, and if the codes contradicted the participants’ opinions, they were modified. Also, the control method was used by a faculty member expert in the field of qualitative research, and a consensus was reached on the selected codes and categorization. In order to obtain transferability, the extracted categories were provided to two professors who did not participate in the research to determine whether there was any similarity between the research results and their experiences. Credibility was also provided by the complete and continuous recording of the researcher’s activities on how to collect and analyze data and how to present excerpts from the interviews for each category.

Ethical considerations were respected in this research by providing the participants with oral and written information about the study, the optionality of

their participation, and completing the written consent form. The participants were assured about keeping the interviews confidential, respecting the principle of confidentiality, recording the interview anonymously, and deleting the interview file after 6 months. By providing his contact number and e-mail address, the researcher created this opportunity for the participants to inform the researcher of their withdrawal from participating in the study at any stage of the research, and if they wished, the research results would be made available to them. This research has the code of ethics IR.IAU.KERMAN.REC.1400.023 issued by the ethics committee of Islamic Azad University, Kerman branch.

Results

By examining 19 oral interviews, including interviews with 10 women with the academic ranks of 2 full professors, 3 associate professors, and 5 assistant professors, and 9 men with the academic ranks of 1 professor, 4 associate professors, and 4 assistant professors selected from Isfahan University, Shahid Bahonar University of Kerman, and Medical Sciences Universities of Kerman and Isfahan, 153 codes were obtained from the analysis of the interviews; after removing duplicate codes and merging similar cases, finally, 48 codes remained, which were placed in 3 secondary categories and 12 sub-categories (Table 1).

A) Suitability (Attention) for Society and its Needs

According to the participants in the research, one of the desirable features of content in higher education is the suitability for society and its needs. Experts believe that regarding content with an emphasis on lifelong learning, paying attention to the needs of society and the content novelty is of particular importance, and without attention to the needs of society, learning will not be practical.

1) Being Up-to-Date

Participant number 7 stated: *“Lifelong curriculum content should be up-to-date and consistent with the needs of science and the progress of society. It should also be consistent with the needs of the individual.”*

2) Applicability and Usefulness

Participant number 4 stated: *“Learners want to acquire skills that are useful for their personal and professional lives; that is, they can be useful for them at the same moment. They are not looking for a specialty that will help them in the future. So, this must be a feature of content, i.e., its immediate application in individual’s lives.”*

Table 1. The coding framework in the analysis of interviews (the results of open coding)

General category	Secondary Category	Sub-Category
Desirable features of content in higher education with an emphasis on the lifelong learning approach	Suitability (attention) for society and its needs	Being up-to-date
		Applicability and usefulness
	Suitability for the learner and his/her needs	Matching with the learner's interest, need, and ability
		Developing individual skills according to the learners' potential
		Developing excellent thinking skills
	Suitability for curriculum regulations	Continuous education
		Learning with multiple methods
		Quality
		Flexibility
		Diversity
		Coherence
		Self-direction

Participant number 8 stated: *"An adult person participates in the courses with a specific purpose. If the person feels that this course is useless for him/her, he/she will no longer participate. That is, a person who participates in this course must be aware of these goals and know the purpose of this course to participate and know that it will be useful for his/her life and work."*

B) Suitability for the Learner and His/Her Needs

According to the participants, one of the appropriate features of the curriculum content in universities is the suitability of the content for the learner's needs. Planning experts believe that responding to the learner's needs is necessary to move toward the goal of lifelong learning; therefore, they believe in the necessity of this issue.

1) Matching with the Learner's Interest, Need, and Ability

Participant number 13 stated: *"Learning is personal, like a fingerprint. People have different learning speeds, different rhythms, and different attention. So, the instructor's role is to determine the appropriate learning method based on individuals' personal characteristics."*

Participant number 3 stated: *"After graduation, we realize that there are many things we should have known, but they were not in our curriculum; that is, the programs had not been prepared based on the needs of the learner. Curriculum planning should make this feeling go away."*

Participant number 15 stated: *"Curriculums should be based on the needs assessment of students, not just copying the program of other countries. The curriculum must be consistent with the needs of society. Paying attention to the cultural contexts of the society is very important."*

2) Developing Individual Skills According to the Learners' Potential

According to the participants, "talents and capabilities are different from one person to another, i.e.,

the formal education system should be flexible and open to be based on the learners' needs and potential."

Participant number 6 believed: *"An adult person participates in the courses with a specific purpose. If the person feels that this course is useless for him/her, he/she will no longer participate. That is, a person who participates in this course must be aware of these goals and know for what purpose this course is held, how it will help him/her, and how much it matches with his/her talents to participate in that course."*

3) Developing Excellent Thinking Skills

Participant number 1 stated: *"In today's world where the job market is unknown and changing, learning how to learn problem-solving skills, critical understanding, and forward-looking learning is part of the skills required for everyone, and everyone should be familiar with these skills."*

Participant number 12 believed: *"Our emphasis should be on problem-based learning. This type of learning stimulates learners to learn through real engagement with problems and is more focused on critical questions and developing critical skills. This type of learning is learner-oriented and creates a fundamental change: Moving from teaching to learning."*

C) Suitability for Curriculum Regulations

By analyzing the interviews, seven features were identified from the participants' perspective in the dimension of curriculum regulations, which are mentioned in the following:

1) Continuous Education

Participant number 10 pointed out: *"In today's world, the skills that a person has acquired during the last 50 years are not enough to continue his/her life and work. An individual must be a continuous learner."*

Participant number 8 believed: *"Learning is not limited to childhood and the classroom; it should happen throughout life and in different situations. Learning*

cannot be limited to a specific time, people, and place, and we cannot say that learning is done only in educational centers."

2) Learning with Multiple Methods

Participant number 2 pointed out that: *"In higher education, we should have all education methods, such as formal, informal, and casual education."*

3) Quality

Participant number 16 stated: *"Due to the limited time of each semester and the limited time of professors, students only memorize materials for the exam and learning is not stable; it means, we emphasize the quantity of materials and distance ourselves from the quality of learning, while the important thing is the quality of materials and learning."*

Participant number 9 stated: *"We must teach a specific amount of basic information for each field of study to the student for deep learning and the student's mastery of his/her field of study. Here, the emphasis should be on quality, not quantity, i.e., the student really knows the framework of his/her field of study, and from then on, we want him/her to seek more learning by him/herself."*

4) Flexibility

Participant number 7 stated: *"The learning content, the learning method, and the learning place depend on the learner. All these show that the formal learning system should be more flexible and open to adapt to the learner's needs and potential."*

Participant number 13 believed: *"It is a wrong expectation that we want our adult learners to learn a set of compulsory subjects with the least choice and a specific period of time with a specific beginning and end and in a specific and focused place. It means lack of flexibility, and we need flexibility and the right to choose for adult learners."*

5) Diversity

Participant number 1 stated: *"It is important to pay attention to the principle of linguistic diversity because, in lifelong learning, other cultures and people must be respected."*

Participant number 12 believed: *"Now the information volume and diversity is high and a fixed content cannot provide all of this to people. The content should be diverse so that people can choose the content according to their needs."*

Participant number 3 stated: *"In the university, individuals are not homogeneous in terms of age, occupation, etc. For this heterogeneous population, we need flexible and diverse educations that fit their conditions."*

6) Coherence

Participant number 7 believed: *"In lifelong learning, attention should be paid to the principle of integration, and this integration should be in vertical and horizontal manners between courses, i.e., the materials should be integrated and connected."*

Participant number 2 stated: *"We should have a series of cores; other materials should be related to these cores and main materials."*

7) Self-Direction

Participant number 12 stated: *"There comes a time when the student graduates from the university and finds out that all that he/she has read is not useful. A student should know what is useful for him/her, i.e., he/she should be able to recognize his/her learning needs."*

Participant number 11 stated: *"A lifelong learner must know what experience has been created for him/her, how to use it, and what correction to make in the field of learning."*

Discussion

Given the importance and necessity of universities' moving toward the goal of learning, the desirable features of content in higher education were investigated with a lifelong learning approach in this study.

The analysis of the findings obtained from the interviews in this research showed the three main features of "suitability (attention) for the society and its needs", "suitability for the learner and his/her needs", and "suitability for curriculum regulations" as the desirable features of content with an emphasis on lifelong learning. Other studies conducted on the features of content with a lifelong learning approach have listed features inconsistent with the features of the present study.

The first main category in this study was suitability of the content for society and its needs. This main category had the sub-categories of being up-to-date and applicability and usefulness. In fact, one of the characteristics of a modern university is the increasing expectation that the curriculum should be more responsive to society (21). The UNESCO guide also emphasizes the integration of educational centers and organizations to transfer learning results from work to life and vice versa, and the adult learner also expects to transform the knowledge he/she has acquired into a product and be able to use it (22). Attention to society should be considered the most important issue in formulating the goals and the content of the higher education curriculum (23).

The suitability of the content for the learner and his/her needs was expressed as one of the requirements

for having a type of content with an emphasis on the lifelong learning approach. The sub-categories of this main category included matching with the learner's interest, need, and ability, developing individual skills according to the learners' potential, and developing excellent thinking skills.

In its report "Toward a knowledge-based society", UNESCO emphasized that the student's needs should be studied and be considered the basis of educational changes. In this way, the learner's developing personality is the main axis, but neither the individual sacrifices the society nor the society sacrifices the individual because it creates an overlap between the goal of individual fulfillment and social progress (22). In Chen's (2019) study, four factors influencing on learning motivation were identified. These factors included: Family, individual characteristics, social factors, and educational environment. Also, these four groups can influence planning for learning, content, goals, and future development (24).

Not recognizing the needs of students and society and revising the curriculum in accordance with the evolution, not predicting the possibility of flexibility in the curriculum, and the existence of centralism in the development of curricula are among the problems of designing higher education curriculum with a learning society approach (10). Also, individuals should be directed toward the appropriate contexts of their learning, which motivates individuals to learn more (25).

Paying attention to the content of learning and individual cultural values is one of the necessary changes in the cultural infrastructure to move toward lifelong learning (26). Karimi et al. stated that the learning community in Iran should provide the opportunity to learn throughout life, learning according to abilities and interests and using different methods of learning motivation, self-directed ability in learning, and learning how to learn in individuals. Also, attention should be paid to the development of various informal and casual types of education (27).

Suitability for curriculum regulations was expressed as one of the main features, and continuous education, learning with multiple methods, quality, flexibility, diversity, coherence, and self-direction were also expressed as its sub-categories. The obtained findings regarding the content features are consistent with various research findings.

In this regard, Lall and Salamati, enumerated some policies for moving toward lifelong learning as follows: Facilitating open access, increasing flexibility, motivating individuals to learn, and increasing the effectiveness and usefulness of learning (28). Observing

criteria such as emphasizing the content quality instead of quantity, providing flexible and diverse content, suitability of content for the goal of nurturing lifelong learners, suitability of content for the needs of society, supporting the professor to change the content, using other learning resources in addition to the textbook, and involving students in choosing the content are necessary (29). In Keshavarzi et al. study entitled "Curriculum content based on the development of futurism in Iran's higher education", the phenomenon-oriented categories and revision of curriculum content with an emphasis on futurism, strategies, context, intervening conditions, and consequences were emphasized (30). Lifelong learning includes individuals' personal and professional lives. Also, the learning process should be performed in a formal and informal way and be useful for the learner (31). Regarding lifelong learning, Lall and Aliramaei, consider the flexible learning form necessary to enable the person to learn at all times and places and also learns in his/her own ways (32). Lifelong learning is learning that occurs at all stages of life and covers the entire context of life, from school to work. Lifelong learning is the continuous construction of skills and knowledge and using them throughout an individual's life (33). The diversity of educational programs is one of the desirable features of higher education to move toward lifelong learning (16). Yazdani et al. concluded that Iran's higher education health system should consider new solutions such as changes in technology infrastructure, changes in knowledge management, and network cooperation in the use of smart technology and strategic planning (34).

The strength of this research is that it is one of the few studies in Iran that has examined the content features considering the lifelong learning approach. Since the present study has focused on the factors with a qualitative approach, it has been able to deeply examine the professors' experiences and use these experiences for practical applications.

One of the major limitations of the current research is that the research sample is limited to the professors of Kerman, Isfahan, and Tehran universities. Other infrastructures and curriculum components with a lifelong learning approach can be investigated in future studies. Examining the current status of higher education regarding the amount of attention and application of lifelong learning is also suggested.

Conclusion

In general, it can be concluded that changes in the curricula content can pave the way to move toward lifelong learning. Given the cultural, social, and political changes and the learning needs of today's society, it is

suggested that higher education centers provide individuals with new and applicable information in addition to transferring the basic content of each field of study and pay attention to the needs of students and their individual differences. Curriculum content should be diverse and flexible and help develop features such as thinking skills, problem-solving, self-direction, etc.

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

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Training by Multimedia Messaging Service Method, a Solution to Improve Knowledge, Attitude, and Performance of Health Workers: A Quasi-Experimental Study

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Abstract

Background: Since health workers are the leading providers of health services, increasing their knowledge and performance can play an essential role in preventing diseases, especially Coronavirus Disease 2019 (COVID-19).

Objectives: The current research was conducted to compare the effects of lecture training and Multimedia Messaging Service (MMS) training on health workers' knowledge, attitude, and performance in preventing COVID-19.

Methods: This quasi-experimental study was conducted in two groups with a pretest-posttest design. The study population included 60 health workers in Nikshahr selected by random sampling. The data collection tool was a researcher-made questionnaire, including demographic questions and items on health workers' knowledge, attitude, and performance in preventing COVID-19, completed in two training groups by lecture and MMS methods online before and after the intervention.

Results: The participants' mean score of knowledge increased significantly after training in both lecture and MMS methods ($P < 0.050$), but no significant difference was observed between the two methods ($P > 0.050$). The mean attitude score in the two groups before and after the intervention showed no significant difference ($P > 0.050$). In the performance dimension, a significant difference was observed between the two groups post-intervention, and this score significantly increased in the MMS group ($P < 0.050$).

Conclusion: Considering the effect of the MMS method on health workers' knowledge and performance, this method can be considered a suitable solution to meet the growing demand for training.

Keywords: Health Education; Knowledge; Attitude; Performance; Coronavirus Disease 2019

Background

In December 2019, a new type of coronavirus (Coronavirus Disease 2019, COVID-19) was detected in Wuhan, China, which quickly spread all over the world so that the World Health Organization (WHO) declared this disease a pandemic in March 2020 (1). COVID-19 has spread to almost all countries, affecting all nations, infecting millions of people, and killing hundreds of thousands of people. This disease has disrupted the world economy and challenged countries from a political-social perspective (2). Therefore, to control this disease, it is essential to prevent contracting it and eliminate the cycle of disease transmission in society.

Due to the respiratory transmission of COVID-19 and the persistence of this virus in the environment, the way people behave in society plays a vital role in its transmission process (3). Individuals need to be taught healthy behaviors to recognize healthy ways of life, act according to them, maintain and improve health, and avoid contracting diseases (4).

The learning process is critical for promoting and developing society (5). Health education programs aim to provide information, influence attitudes and beliefs, improve decision-making skills, and empower individuals to change themselves and their society (6). Providing training in various health fields is one of the

crucial duties of health workers. Therefore, the awareness of health workers as the first individuals responsible for providing healthcare services can influence society's health.

It is essential to measure health workers' information and attitude continuously and, if necessary, organize training and retraining workshops to increase their awareness and attitude (7). At present, training is mostly face-to-face. Besides advantages, it has disadvantages, including time and place restrictions for both trainers and trainees. Electronic learning (e-learning) is a new training method (8). E-learning can cover many individuals simultaneously so they can continuously receive their required information remotely without spending much time and money and leaving the house to participate in visits or face-to-face sessions (9). This advanced technology is an essential part of care training in developed countries. With the recent advances in information and communication technology, new platforms of e-learning have emerged, including Multimedia Messaging Service (MMS)-based training in virtual space, providing the possibility of sending various audio and video messages and even short educational videos at any time; hence, less cost and time are required than face-to-face training (10).

Norouzi et al. compared the effect of training by lecture and multimedia methods on emergency ward nurses' knowledge, attitude, and performance regarding applying a communication model in nursing registration and reporting in selected military hospitals in Tehran. They showed that both methods affected the nurses' knowledge, attitude, and performance; however, the multimedia method was more effective (11). Aligholipour et al.'s study investigated the effects of face-to-face and MMS training on glycosylated hemoglobin and fasting blood sugar of diabetic patients on insulin treatment in Tabriz. The results showed that MMS-based training in the Telegram environment improved self-care and reduced the average glycosylated hemoglobin in patients with diabetes compared to face-to-face training (10). In a descriptive-analytical study conducted to compare the knowledge and attitude of 93 virtual education students and 130 non-virtual education students about e-learning in Guilan, Pakseresht et al. concluded that the knowledge of the virtual group was higher. However, no difference was observed between the attitudes of the two groups (12). Kardan Barzoki et al. investigated the effects of lecture and MMS training on the knowledge, attitude, and performance of nurses working in heart wards regarding caring for patients with temporary pacemakers on 52 nurses working in Shahid Rajaei

cardiovascular center in Tehran. The results indicated no difference in the effects of the two lecture and MMS training methods on knowledge, attitude, and performance regarding caring for patients with a temporary pacemaker, meaning that MMS training could be as effective as the lecture method (13). Holanda and Pinheiro's study compared undergraduate nursing students' learning using educational hypermedia and the traditional lecture approach on sexually transmitted diseases and showed no significant difference in learning performance between the groups (14).

Since health workers are the leading service providers in the country's healthcare system, increasing their awareness, attitude, and performance can play an essential role in educating healthy individuals., it is expected that health workers expand their knowledge, apply new things in their skills, and are aware of new changes in health issues. Since the needs of society are constantly changing and COVID-19 is becoming a health crisis in the world, human resource training is of particular importance. Also, the significance of people's health adds to it. On the other hand, the resources available in the health and treatment sector are limited, especially concerning the training, prevention, and treatment of COVID-19. Therefore, it is essential for officials, managers, and healthcare professionals to implement training courses and evaluate their effect.

Objectives

The current research was conducted to compare the effects of lecture training and Multimedia Messaging Service (MMS) training on health workers' knowledge, attitude, and performance in preventing COVID-19.

Methods

This quasi-experimental study was conducted in two groups with a pretest-posttest design in 2020-2021 on health workers of health centers in the city of Nikshahr. Health workers working in health centers participated in the present study if they wished to participate and had a smartphone. It was decided that if more than 10% of the questions in the questionnaire remained unanswered, that questionnaire should be removed, and no item was observed in this regard. The sample size was 30 people in each group, with a confidence level of 95%, an accuracy of 0.5%, and a test power of 80%. First, according to the list of city health workers, 60 were selected by simple random sampling and divided into two control and intervention groups based on random allocation and registration number in the list (odd numbers: lecture group and even numbers: MMS group).

The tool used in the study was a researcher-made questionnaire consisting of four parts. The first part contained nine questions related to the health workers' specifications (age, gender, work experience, marital status, education level, household income, place of residence, history of COVID-19 infection in the individual or family, and history of participation in similar training courses). The other three parts contained questions related to health workers' knowledge (30 questions), attitude (25 questions), and performance (20 questions) regarding the prevention of respiratory infections caused by COVID-19, which were prepared according to the research objective and review of the latest sources and related articles. The validity of the questionnaire was confirmed by 10 professors of medical education, health, and nursing departments of Kerman and Iranshahr Universities of Medical Sciences. The tool's reliability was also obtained as 0.73 by internal consistency.

Data collection in the present study was performed in two stages before and immediately after the intervention for the lecture and MMS groups simultaneously. After the approval of the university research council and the ethics committee (IR.KMU.REC.1399.622), the intervention content was sent to the participants through MMS for three weeks on the WhatsApp platform. In this method, during the day, we presented at least four short educational messages as texts, images, and videos related to COVID-19, including COVID-19 definition, transmission, symptoms, and prevention. It was also performed for the lecture group during three 90-minute sessions with an interval of one week. The first session included the COVID-19 definition, the time to see the virus

and the disease history and classification. The second session included the clinical symptoms of the disease, pathogenesis, epidemiology, transmission, and guidelines for diagnosis. The third session included the risk factors of COVID-19, the differences between COVID-19 and influenza, and COVID-19 prevention and treatment. The sessions were presented online by the researcher in the form of a lecture, and the summary of each session was provided to the participants of this group in the form of educational slides. The participants were followed up for one month after the intervention. After the end of the intervention, the questionnaires were given to the participants of both groups at the same

time and were completed by them online. The lecture and MMS groups (intragroup comparison) were compared before and after the intervention in terms of knowledge, attitude, and performance using the paired t-test. The comparison of these variables between the two groups (intergroup comparison) was performed using the independent t-test. The data were analyzed in SPSS version 16 software (IBM Corporation, Armonk, NY).

Results

The personal and professional characteristics of the participants are presented in [Table 1](#). Most participants (22%) were female in the lecture group and male (16%) in the MMS group. The mean age of health workers in the lecture and MMS groups was 33.8 ± 1.1 and 30.4 ± 1.4 years, respectively. The participants in both lecture and MMS groups were homogenous in terms of gender, marital status, education level, residence status, history of COVID-19 infection, and family monthly income.

Comparing the mean knowledge score of health workers in the two investigated groups using the independent t-test (intergroup comparison) showed no significant difference between the two groups regarding the prevention of COVID-19 respiratory infection in the pre-intervention and post-intervention stages. Also, comparing this mean score in the pre-intervention and post-intervention stages in the MMS group (intragroup comparison) using the paired t-test showed a significant difference between the two stages ($P = 0.003$) so that in the post-intervention stage, this score significantly increased by two points compared to the pre-intervention. In the lecture group (intragroup comparison), the paired t-test showed that the mean knowledge score did not change from pre-intervention to post-intervention ($P = 0.125$) ([Table 2](#)).

Table 1. Personal and professional characteristics of the studied units in the lecture and multimedia messaging service groups

Variable	Training Group		P
	Lecture N(%)	Multimedia Messaging Service N(%)	
Gender			0.055
Female	22 (73.3)	14 (46.7)	
Male	8 (26.7)	16 (53.3)	
Marital Status			0.353
Single	3 (10.0)	6 (20.0)	
Married	27 (90.0)	24 (80.0)	
Education level			0.017
Secondary school	1 (3.3)	3 (10.0)	
Diploma	26 (86.7)	11 (36.7)	
Associate'	1 (3.3)	13 (43.3)	
Bachelor'	2 (6.7)	3 (6.7)	
Place of residence			0.063
City	6 (20.0)	9 (30.0)	
Village	24 (80.0)	21 (70.0)	
History of COVID-19 infection			> 0.999
Yes	2 (6.7)	2 (6.7)	
No	28 (93.3)	28 (93.3)	
Household monthly income (Toman)			0.215
2-3 million	2 (6.7)	3 (10.0)	
3-4 million	5 (16.7)	4 (13.3)	
4-5 million	16 (53.3)	6 (20.0)	
5 million or higher	7 (23.3)	17 (56.7)	

Table 2. Comparison of the mean knowledge score before and after the intervention in two lecture and multimedia messaging service groups

Stage	Group					Independent T-Test Results	
	Lecture		Multimedia messaging service		Total		
	Mean (SD)	Frequency	Mean (SD)	Frequency	Mean (SD)	Frequency	
Pre-intervention	25.6 (3.8)	30	25.8 (2.8)	30	25.7 (3.3)	60	df = 57, P = 0.804, t = 0.249
Post-intervention	27.5 (3.2)	30	29.6 (3.9)	30	28.6 (9.4)	60	df = 58, P = 0.409, t = 0.832
Paired t-test results	df = 28, p = 0.125, t = 1.580		df = 29, p = 0.003, t = 3.300				

df: Degree of freedom; SD: Standard deviation

Comparing the mean attitude score of health workers in the two investigated groups (intergroup comparison) using the independent t-test showed no significant difference between the two groups in terms of the attitude toward the prevention of COVID-19 in the pre-intervention and post-intervention stages ($P > 0.050$). Also, based on the paired t-test, no significant difference between the two stages was observed in the MMS group ($P = 0.898$). There was no significant difference in the lecture group ($P = 0.160$) (Table 3).

The independent t-test showed no significant difference between the two groups in terms of performance in the pre-intervention phase ($P = 0.141$); however, this score in the post-intervention phase was significantly higher in the MMS group than in the lecture group ($P = 0.035$). In the lecture group (intragroup comparison), no significant difference was observed between the two stages in terms of performance score, but in the MMS group, this score increased significantly in the post-intervention stage compared to the pre-intervention stage ($P = 0.016$) (Table 4).

Table 3. Comparison of the mean attitude score before and after the intervention in two lecture and multimedia message service groups

Stage	Group					Independent T-Test	
	Lecture		Multimedia messaging service		Total		
	Mean (SD)	N	Mean (SD)	N	Mean (SD)	N	
Pre-intervention	99.6 (14.7)	30	100.2 (10.9)	30	99.9 (12.9)	60	df = 58, P = 0.866, t = 0.169
Post-intervention	103.8 (10.5)	30	104.3 (15.1)	30	104.1 (12.9)	60	df = 58, P = 0.0898, t = 0.129
Paired t-test results	df = 29, p = 0.160, t = 1.441		df = 29, p = 0.206, t = -1.295				

df: Degree of freedom; SD: Standard Deviation

Table 4. Comparison of the mean performance score before and after the intervention in the two lecture and multimedia message service groups

Stage	Group					Independent T-Test Results	
	Lecture		Multimedia messaging service		Total		
	Mean (SD)	N	Mean (SD)	N	Mean (SD)	N	
Pre-intervention	63.0 (8.3)	30	63.9 (7.0)	30	99.9 (12.9)	60	df = 58, P = 0.141, t = 1.492
Post-intervention	64.4 ± 5.9	30	67.7 (5.8)	30	104.1 (12.9)	60	df = 58, P = 0.035, t = -2.113
Paired t-test results	df = 29, p = 0.091, t = 3.085		df = 29, p = 0.016, t = -2.571				

df: Degree of freedom; SD: Standard Deviation

Discussion

The present study indicated the effect of the training methods on improving the health workers' knowledge and performance in the two lecture and MMS groups, but the MMS method was more effective than the lecture method in improving the health workers' performance. Comparing the mean knowledge score in the pre-intervention and post-intervention phases in the MMS group (intergroup comparison) showed a significant difference between the two methods ($P = 0.003$). After the intervention, no significant difference was observed between the lecture and MMS groups ($P = 0.898$).

Based on the present study's findings, both lecture and MMS methods effectively increased the health workers' awareness, but this increase was two points in the lecture group and four points in the MMS group, indicating the higher effectiveness of the MMS method. According to previous studies, the most important advantages of training through MMS include no need for a trainer, ease of use, time efficiency, and cost-effectiveness (15). Wang et al.'s research showed that the MMS method could increase the participants' knowledge and awareness. This approach allows individuals to receive the required information through their mobile phones (16). Furthermore, since the messages were delivered at specific times, participants were motivated to skim and store them systematically (17, 18). Based on available studies, MMS can be very effective for educational purposes because this method is pretty flexible and resistant to power outages and forgetting (19). The findings of various studies indicate that the MMS method can be used as a complementary tool for various face-to-face training courses (13, 20-24).

Comparing the health workers' mean attitude scores showed no significant difference in the pre-intervention and post-intervention stages between the lecture and MMS groups (intragroup comparison) ($P = 0.160$). There was no significant difference between the two groups ($P > 0.050$). Regarding attitude, although this score increased by four points in both groups, these changes were insignificant. Kardan Barzoki et al. (13) and Pakseresht et al. (12) studies also showed that the effects

of the lecture and MMS methods on the participants' attitudes were insignificant, which is in line with the results of the present study.

Prasetyo et al. investigated the effect of changes in educational methods during the COVID-19 pandemic and the effect of integrated e-learning on readiness for change and interest in learning among Indonesian university students. They also showed that students with e-learning had more interest and readiness to learn, and this method was more effective for them (25), which was inconsistent with the present research findings.

In Xiong et al.'s research, the attitude improved significantly in the intervention group compared to the control group ($P < 0.010$) (22). Lin et al.'s study showed a significant increase in the changes in attitude and motivation after training ($P < 0.001$). Also, MMS training changed participants' attitudes and increased their motivation (26). In Norouzi et al.'s study, the changes in the nurses' attitude scores were significantly more in the MMS training group than in the lecture group (11). The difference between the findings of the mentioned studies and the present study is probably due to the difference in the study population, the tools used, and the type of training intervention. It should be noted that the attitude score of the two groups in the present study was favorable in the pre-intervention phase; therefore, it was difficult to change; however, in the mentioned studies, the attitude score in the pre-intervention phase was unfavorable. Therefore, they mainly changed under the influence of the intervention.

The present research results showed that the performance score in the MMS group increased significantly and considerably compared to the lecture group. Given that the primary goal of health education is to change behavior or performance, this finding shows the positive effect of the MMS approach.

The results indicated that after the intervention, there was a significant difference between the lecture and MMS groups ($P = 0.035$) and the performance score of the MMS group was significantly higher than that of the lecture group. In the MMS group (intergroup comparison), a significant difference was also observed

between the pre-intervention and post-intervention stages ($P = 0.016$), so this score increased in the post-intervention phase compared to the pre-intervention phase.

In Abdel-Rasoul et al. (27), Norouzi et al. (11), Aghajani et al. (19), and Zhang et al. (28) studies, the MMS method was also more effective in improving individuals' performance than the lecture method, which is consistent with the findings of the present study. The ability to send various audio and video files or even short educational video clips at any time in MMS-based education provides visual education for individuals without the time and place restrictions and has a greater effect on individual memory (29). In Kardan Barzoki et al.'s study, the performance score was significantly increased in both methods, but no difference was observed between the two methods (13), which is contrary to the present study findings. The reason for this difference is possible because Kardan Barzoki et al.'s research was conducted on nurses, and the nurses could not correctly use the educational content of the MMS approach due to lack of time and fatigue stemming from long and rotating work shifts; hence, using training methods inside the work environment was more beneficial for them (13).

The present study had some limitations, including health workers' differences in sensitivity to the training methods, which could not be fully controlled. Also, the lack of full control of information exchange between MMS and lecture groups was another limitation of this study, so to reduce the spread of information, two groups were asked to refrain from disseminating information until the end of the research. In this way, the exchange of information was controlled as much as possible, but it may be happened partially, which was out of control. According to the research findings, suggestions are presented in two sections below.

A) Practical Suggestions: It is suggested that community health department officials in local and national comprehensive health service centers pay particular attention and planning to health workers' training in the form of retraining classes. Considering suitable interactive environments and making virtual environments attractive to motivate health workers and using frequent encouraging feedback as well as removing obstacles such as low speed and network traffic, it led health workers to train by the MMS method.

B) Suggestions for Future Studies: It is suggested that the reverse classroom method be compared with MMS among health workers for preventing COVID-19.

Conclusion

The present study showed that MMS training could significantly increase the health workers' knowledge and performance regarding COVID-19 preventive measures. Given that health workers are considered the pioneers of the health field and the first level of primary healthcare provision, and there is a possibility of the return of COVID-19 in the regions, empowering them through retraining programs can significantly help the health system to fight COVID-19 in these areas.

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

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The Effect of Blended Learning Approaches in Faculty Development Programs

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Abstract

Background: The necessity of responding to changes and promoting the quality of education has increased the necessity of applying new approaches to empowerment programs.

Objectives: The present research aimed to determine the effects of mid-term empowerment programs using a blended approach in the form of flipped classrooms (asynchronous, live meetings) before the coronavirus disease 2019 (COVID-19) epidemic and a virtual (asynchronous-synchronous) approach during the COVID-19 epidemic on teachers' learning and satisfaction concerning teacher roles in the medical science education system.

Methods: This study was quasi-experimental, and its participants were faculty members of Shahid Sadoughi University of Medical Sciences, participating in the empowerment program. This program was implemented in four periods, including 20 training sessions concerning the roles of a teacher in educational systems in the areas of "professional commitment, lesson planning, teaching-learning methods, assessment and evaluation methods, production of educational products, effective communication, and classroom management". The program evaluation was performed using the participants' levels of learning and satisfaction by scenario-based questions and a questionnaire, respectively. The results of different blended education approaches were compared in two time periods, before and during the COVID-19 epidemic. Data were analyzed using descriptive (mean and standard deviation) and inferential (independent T-test) tests. $P < 0.05$ was considered the significance level.

Results: One hundred and eighteen faculty members participated in the study, of whom 56 were female (47.5%), and 62 were male (52.5%). The faculty members' satisfaction scores with blended empowerment courses with the flipped classroom were reported as 4.34 ± 0.16 and the virtual blended classroom as 3.26 ± 0.59 . A significant difference was observed between satisfaction scores in different periods ($P = 0.001$). The participants' learning scores in the programs held by the blended approach with the flipped classroom (82.16 ± 32.20) were significantly higher than those held during the COVID-19 epidemic (virtual approach) (59.23 ± 48.53).

Conclusion: The satisfaction and learning of participants in the flipped classroom program and the virtual blended classroom were at favorable and average levels, respectively. This difference in learning and satisfaction from the perspective of faculty members was significant. Therefore, interactive approaches in different virtual education platforms and a blended approach in empowerment programs are recommended.

Keywords: Empowerment of Faculty Members; Teacher Role; Blended Approach

Background

Medical science education has encountered increasing changes in recent years, such as the development of educational standards, the growth of educational technologies, and new educational approaches (1). They increase the need to respond to changes and promote the quality of education (2). Today, the development of professional and competent teachers, researchers, and managers in medical education through empowerment and solutions influencing it is considered among the critical issues in educational

systems (3, 4). It was thought in the past years that every individual who graduated from the university had the teaching ability, but gradually it became clear that teaching was not an innate issue, and in addition to content mastery, it required a design process. Therefore, faculty members needed training and support for teaching (3). Hence, planning to empower faculty members has become one of the necessities of educational systems.

Nowadays, empowerment programs are expanding, aiming at improving teachers' teaching abilities (5). In

other words, any type of activity or process that is performed by an individual or a group of individuals to promote and improve professional functions, qualifications, or skills in education at the institutional level is defined as the process of empowering faculty members (6). Empowerment programs for teachers have been recommended to achieve more awareness and gain enough knowledge in various areas of education (7). In these programs, by emphasizing the use of diverse approaches and methods, reinforcing faculty members' knowledge and professional skills are facilitated (1), and their relationships with other teachers are reinforced, leading to their occupational progress (8-11).

McLean et al. proposed three phases and six stages to compile an empowerment program for faculty members. The first phase (planning) includes problem identification and needs assessment, participants' needs assessment, and explanation of measurable objectives. The second phase (implementation) includes an explanation of educational strategies and final implementation. Finally, the third phase includes evaluation and providing feedback (3). In the empowerment program of faculty members, paying attention to items such as making new members familiar with university culture, developing specialized skills through implementing new evaluation methods or online learning, making teaching professional in various fields, developing educational scholarship, supporting individuals active in the medical education field, and developing educational leadership are necessary (3). Therefore, empowerment programs have to be organized for faculty members in such a way that meets different needs at the systematic and individual levels (3). Moreover, it is necessary to provide the opportunity for practical-experiential learning so that participants can apply their learnings regarding the principles of education. The use of diverse, interactive, and blended approaches is recommended in empowerment programs (3).

Empowering faculty members is not easy and needs supportive-institutional leadership, allocation of suitable resources, and recognition of teaching excellence (12). In the present study, the empowerment program was designed and implemented to establish a structured training course and empowerment in a proper opportunity in two periods: before and during the COVID-19 pandemic. Before the COVID-19 pandemic, the training program was designed and implemented in the form of flipped classrooms, and during the COVID-19 pandemic, the blended and synchronous and asynchronous approach was used. The current research was carried out to determine the effects of empowerment programs using a blended

approach in the form of flipped classrooms (asynchronous, live meetings) in the pre-COVID-19 period and a virtual approach (asynchronous-synchronous) during the COVID-19 epidemic on teachers' learning and satisfaction concerning teacher roles in the medical science education system.

Objectives

The present research aimed to determine the effects of mid-term empowerment programs using a blended approach in the form of flipped classrooms (asynchronous, live meetings) before the coronavirus disease 2019 (COVID-19) epidemic and a virtual (asynchronous-synchronous) approach during the COVID-19 epidemic on teachers' learning and satisfaction concerning teacher roles in the medical science education system.

Methods

This research was a quasi-experimental study conducted at Shahid Sadoughi University of Medical Sciences. In the first stage, the present status of the formal and informal empowerment program in university was assessed using the existing documents and also needs assessment from the perspective of teachers via a poll to compile a training program. The upstream documents were reviewed to explain the needs and requirements of the relevant ministry. Also, the results of faculty members' assessment (including asking the opinions of learners and educational managers) and educational documents were considered in needs assessment. In the second stage, the related texts regarding empowerment programs of pioneer universities were reviewed, and the results of the text review and needs assessment were provided in the expert panel. The expert panel members consisted of 15 educational managers, members of the Empowerment Committee, and teachers who familiar with the field of medical education and participated in empowerment programs for faculty members for at least two years.

In the empowerment program that was implemented to develop the teachers' skills in the fields of educational planning, the use of new methods of teaching-learning, assessment-evaluation, educational products, professional commitment, classroom management, and effective communication was underlined. In the expert panel sessions, the empowerment program was compiled based on six categories of the basic role of a teacher in the medical science education system and finalized by consensus. In the second step, the training program was implemented in four courses from 2019 to 2021. Each course consisted of 20 training sessions lasting at least four

months. Each session also lasted three hours on average. In the pre-COVID-19 period, the training program was held in a blended form based on the flipped classroom (asynchronous, live meetings). During the COVID-19 epidemic, considering the limitations of holding live sessions, a new definition of blended education was provided in which the use of virtual education (asynchronous-synchronous learning) was recommended. In this regard, 80% of the sessions of the empowerment program during the epidemic have been held in a blended form (asynchronous-synchronous learning) and 20% in an asynchronous virtual learning form. The assessment was evaluated using the participants' levels of satisfaction and learning. The learners' satisfaction was performed using a questionnaire (n=9-question). The questionnaire psychometrics has been confirmed in the previous Kashmiri's study (Cronbach's $\alpha = 0.91$) (13). Scoring was based on a five-point Likert scale from 1=strongly disagree to 5=strongly agree (minimum score: 1 and maximum score: 5). The participants' level of learning was measured using modified (scenario-based) descriptive questions (22 questions). The questions were designed by the teachers based on the educational goal, and their validity was approved in the expert panel with the presence of five education experts. The scores of the questions of each area were calculated based on 100 levels and the mean scores by area and total score. The maximum and the minimum scores were considered 100 and 1, respectively.

Data were analyzed using descriptive tests (mean, standard deviation (SD), and percentage) to describe the participants' characteristics and scores and inferential tests (independent t-test) to compare the difference between the scores in each area and the total score in two blended education approaches in SPSS version 19 software (version 19, SPSS Inc., Chicago, IL). $P < 0.05$ was considered the significance level.

Results

One hundred and eighteen faculty members from the faculties of health (n=20, 16.94%), medicine (n=28, 23.72%), allied medical sciences (n=10, 8.40%), nursing and midwifery (n=15, 13.27%), pharmacy (n=10, 8.47%), and dentistry (n=22, 8.64%) participated in the present study. All the individuals who participated in the program were included in the research as a census. Fifty-six people of the samples were female (47.5%), and 62 were male (52.5%). The participants' mean age was 37 ± 4 years, their academic rank was assistant teacher, and their mean working experience was 2 ± 1

years. The training program was designed in seven axes, including professional commitment (Four sessions), educational planning (Three sessions), producer of educational products (Four sessions), teaching-learning methods (Three sessions), communicator (One session), assessor (Three sessions), and classroom management (Two sessions). Each session included one hour of asynchronous training and two hours of synchronous virtual training.

The mean evaluation scores of the participants based on the roles of a teacher in the educational system, using the flipped classroom method and the blended approach, are presented in Table 1. According to the findings, the mean scores were significantly different in the two methods ($P=0.0001$).

The faculty members' satisfaction scores with their empowerment courses were reported as 4.34 ± 0.16 in the blended course with flipped classrooms and 3.26 ± 0.59 in the virtual blended course.

Discussion

One of the duties of educational systems is to design and implement empowerment programs that prepare teachers to play the roles of a teacher in medical science education systems.

In the present research, the empowerment course was designed and implemented based on the national comprehensive training program. The program developed the teachers' educational abilities according to the seven categories of "teachers' roles in the medical science education system". The results showed that the participants' levels of learning and satisfaction with the flipped classroom program and the virtual blended classroom were favorable and average, respectively. This difference in learning and satisfaction from the perspective of faculty members was significant.

The present program was designed based on the roles introduced in Harden and Crosby's model. In their study, they proposed six role categories for faculty members in 2000 (13). In 2018, Harden and Lilley reviewed the roles of teachers in medical science education systems, which involved eight categories (11). In the current study, educational goals were designed based on categories extracted from the basic roles of a teacher in the educational system. Educational planning, teaching-learning methods, evaluation methods, and production of educational products are considered the technical skills that the teachers must be able to acquire necessary skills to play roles at the classroom level and also in the institution/system (14).

Table 1. The mean evaluation scores of faculty members based on the roles of a teacher in the educational system before and after the COVID-19 epidemic

Roles of a Teacher in the Medical Educational System	Educational Goals	Flipped Classroom Education	Blended Education (Asynchronous-Synchronous learning)	P-value
		Aligned Scores Mean (SD)	Aligned Scores Mean (SD)	
Professional commitment	Professionalism	82.61(38.32)	62.22(49.03)	0.0001
	The roles of a teacher in the medical science education system	73.37(39.58)	60.93(49.54)	0.0010
	Educational scholarship	75.54(36.70)	51.11(49.42)	0.0001
	University expectations from faculty members	80.43(38.70)	57.78(49.95)	0.0001
Educational planning	Virtual education design	85.19(30.43)	54.17(50.90)	0.0001
	Virtual education approaches and methods	83.65(36.70)	45.83(50.90)	0.0001
	Instructional design	77.72(33.43)	58.89(48.02)	0.0001
Educational product	Compiling learning guide	72.32(32.16)	53.33(48.15)	0.0001
Teaching-learning methods	Interactive lecture	89.29(31.50)	55.56(50.25)	0.0001
	Active learning-teaching methods	80.78(37.26)	65.12(48.22)	0.0001
Communicator	Effective communication skills with students	96.15(19.61)	60.00(49.54)	0.0001
Classroom management	Management of difficult students	92.86(26.23)	77.78(49.54)	0.0001
Assessor	Assessment methods of cognitive domain	77.68(26.65)	54.44(47.46)	0.0001
	Behavioral and attitudinal assessment methods	71.20(36.50)	61.11(48.72)	0.0010
Total mean		82.16(32.20)	59.23(48.53)	0.0001

One of the considerable characteristics of the current empowerment programs was holding special empowerment courses specific for newcomer faculty members. The organizational structure, values, and expectations of the personal and professional development of faculty members as teachers should be clarified and specified for newcomer faculty members. The newcomer faculty members' ability to guide the first years of their entry into the university is vital for their success and satisfaction.

Using the blended approach has been considered not only because of the attractiveness and increased quality of learning experiences, but also because of the cost-effectiveness (15, 16). The results of a meta-analysis study showed that the blended learning program positively affected the participants' learning (16). In the present research, the empowerment program was implemented using a blended method. In the pre-COVID-19 period, blended programs were held using the flipped classroom method (asynchronous- live meetings). In these sessions, theoretical topics and principles were presented through asynchronous virtual education. In live sessions, the topics as small group discussions provided a proper opportunity for practice and practical application of the learnings. During the COVID-19 period, due to the limitations of attending

the programs, blended training was provided through virtual education as asynchronously and synchronously. A blended approach was used in training programs and courses to integrate and benefit from the best characteristics of blended and live meetings methods. The results of Vaughan and Garrison's research indicated that the participants in blended educational courses preferred live sessions due to creating better communication, but they also recognized online sessions as useful and effective because of participants' more control over the training speed and perceiving the range of conversational concepts (17). Tolks et al. also used the blended approach to empower faculty members at a university in Munich. The use of this approach caused faculty members to further accept live courses (18). In action research, McQuiggan investigated empowerment programs for faculty members in the field of virtual education and concluded that learning how to teach online to faculty members led to changes in their beliefs and attitudes toward virtual education. The faculty members' levels of satisfaction regarding implementing empowerment programs in the field of virtual education were also reported as favorable (19). The results of this research showed that the level of satisfaction of the participants in blended programs using the flipped classroom was significantly higher than the virtual

blended approach, which can be due to interactions and group activities to deal with real issues and sharing experiences between teachers in the flipped classroom.

Based on the results, the participants in both methods gained the highest scores in the field of classroom management. These sessions were held using the scenario-based learning method. To this end, the participants were faced with positive and negative scenarios concerning difficult students and problematic classes and experienced the way of analyzing and the proposed solutions that could cause better learning in this area. In the present study, the lowest scores were obtained by the participants in flipped classrooms in the areas of educational products, compilation of learning guides, and cognitive-attitudinal evaluation. In the virtual blended method, the lowest scores were reported in the areas of virtual education principles, scholarship, and compilation of learning guide in the field of products.

Regarding the learning guide, a lack of previous familiarity with the discussed topics can affect gaining low results. Furthermore, in all three mentioned topics, the participants were supposed to do specific task-based activities, such as designing a learning guide, explaining the educational scholarship process, and designing reasoning questions in scenario-based questions, which could affect their lower scores. These types of task-based questions can affect the difficulty of the questions and participants' lower scores.

One of the important goals of the present program was the growth of the "professional commitment" ability. Professional commitment has been stressed in Stripling and Barrick's study as a general ability (14), also being taken into account in the current program. Professional commitment is one of the most critical roles of a teacher, which emphasizes emotional dimensions and model building for learners (20). The teachers' professional behaviors in the areas of altruism, honesty, justice, excellence, conscientiousness, and respect are discussed in this role (11). According to the results of Steinert et al.'s study, adherence to professional commitment is underlined in different frameworks of teachers' abilities (21).

Lu et al. planned and implemented the empowerment program with the subject of professional behavior using objective structured experiences. The results showed the faculty members' satisfaction and positive attitude toward observing the principles of professional behavior after implementation of the training course (22). Cruess emphasized that gaining adequate experience regarding professional behavior will be possible by establishing a relationship between the

values and attitudes of faculty members, which will result in encouraging rethinking and self-evaluation of professional behavior among teachers (23). The current results showed that the participants in the flipped classroom obtained higher scores than those in the virtual blended method, which could be due to the opportunity to analyze and apply learnings to solve the problem in the flipped classroom method.

The role of teachers in producing educational products, especially in virtual education, was considered in this program. Faculty members need to acquire skills regarding interactive teaching methods and the use of new educational technologies in the virtual education process and new approaches. Reilly et al. introduced the role of faculty members in virtual education, including facilitation, course design, coordinator, and expert in educational technologies. They stated that paying attention to multiple roles for teachers in virtual education was necessary and believed that they should design learning activities, proportionate evaluation methods, and appropriate educational content (24). Mastery of these skills can improve teachers' attitudes and acceptance of virtual education (24). In a study, Vaill and Testori used a three-step approach of faculty members' training, counseling, and permanent support to acquire the required skills regarding virtual education for them. Eighty-four percent of the faculty members participating in this course reported their readiness to design and implement the virtual education process; 76% of them reported the received educational content as valuable and effective. The participants also declared the highest level of satisfaction with the course (25). An interesting point was that the participants' learning scores regarding virtual education in the flipped classroom method were higher than those in the virtual blended method. It seems that the teamwork opportunity has led to the participants' learning more than the experience of learner-centered in the virtual education environment.

The results of the present study showed that the mean scores of participants' level of learning in all the investigated areas were reported as medium to high. Investigating the trend of the results reveals that during the COVID-19 period, when live sessions were not held, the learning scores were significantly lower than the flipped classroom method in the pre-COVID-19 period, when live sessions and group interactions were emphasized. Providing opportunities for discussion, analysis, and rethinking in the process of the flipped classroom education was effective in increasing the participants' learning. The results of Safavi and

Sadeghi's research based on analyzing the empowerment programs for faculty members indicated that designing long-term and short-term educational interventions led to maintaining and promoting the teachers' educational abilities. Applying educational strategies can influence the efficiency and usefulness of empowerment programs for faculty members and mainly affects their cognitive-scientific field (26). The results of the empowerment workshop of faculty members using an interactive approach in Salerno et al.'s study showed that their levels of learning increased after the workshop; also, the interactive approach improved the participants' functioning in using interactive approaches and written feedback (27). Chappell et al. held seven empowerment workshops for faculty members using an interactive approach in four regions of America, Europe, Asia, and the Middle East and concluded that the participants' scores of knowledge and skills increased significantly, and no difference was observed in the results obtained in different communities. This finding reveals the significant effect of the interactive approach in small groups and the effect on faculty members' learning and skills (28). In a systematic review, 37 studies on empowerment programs for faculty members were investigated, and the results showed that the effects of empowerment programs for faculty members in increasing their knowledge and professional abilities were significantly positive (1). According to Salih et al.'s study on implementing empowerment programs regarding new teaching-learning methods, such as problem-based learning, team-based learning, interactive lectures, case-based learning, and seminars and their effects, more than 80% of the participants believed that the empowerment program was beneficial and guided them in academic matters; it was also a rich educational experience and helped them in designing high-quality tests (29). Qazvini et al. showed that the faculty members' levels of knowledge and attitude increased after empowerment workshops (7). Thus, the use of interactive approach and analysis and reflection-based methods played an effective role in the development of teachers' educational abilities in empowerment programs.

Strengths and limitations

The small sample size and conducting the intervention in one university can limit the generalizability of the results. The non-equivalent control group was also another limitation of the research. The evaluation of scenario-based questions was reviewed by two people; however, scoring in

descriptive questions can be one of the limitations of the present study.

Conclusion

The results showed that the levels of learning and satisfaction of the participants in the program with the flipped classroom approach were at a favorable level and in the virtual blended classroom were at an average level. This difference in learning and satisfaction from the perspective of faculty members was significant. Therefore, it is recommended to design and implement empowerment programs based on the faculty members' expected roles using a blended approach with an emphasis on making training sessions practical and interactive.

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

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Survey of Medical Students of Regarding the Effectiveness of the Implemented Program of Theoretical Courses of Skin Diseases based on the PBL Method

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Abstract

Background: Problem-based learning (PBL) has been one of the most attractive and effective teaching-learning programs during the last 40 years and is one of the newest methods of medical education. In this method, students usually work on a problem in small groups and learn the objectives of education, which include basic and clinical knowledge. The purpose of this study was to seek the opinions of dermatology department students about a viral skin diseases course delivered in a PBL style.

Objectives: The purpose of this study was to seek the opinions of dermatology department students about a viral skin diseases course delivered in a PBL style.

Methods: This survey-type cross-sectional collected the opinions of 175 medical students (99 externs and 76 interns) at the dermatology department of Sinai Educational, Research and Treatment Center from April to July 2022. In this study, a researcher-made questionnaire with 25 questions that evaluated learning of viral skin diseases through the PBL method was utilized for data collection. The validity of the questionnaire was confirmed by experts.

Results: The collected opinions of the students showed that this teaching method improved their learning attitude and performance, developed critical thinking skills, improved their ability to learn interactive communication and self-evaluation, and enhanced their time management capacities and motivation to learn clinical subjects.

Conclusion: According to the results, the PBL method is effective in teaching theoretical courses on skin diseases, and this method can be recommended for delivering other similar courses.

Keywords: Problem-Based Learning, Teaching, Theoretical Courses, Viral Skin Diseases

Background

One of the challenges of traditional education is the inability of students to apply scientific information in real conditions and perform their professional duties. Researchers believe that teachers should evaluate the existing teaching methods and create more effective alternatives to improve student's knowledge and skills (1). In medical education, considering the technological advances and the unprecedented growth in medical information and basic medical sciences, there is a need for change (2).

After a while, students may forget what they have learned in traditional models because they are not given the opportunity to think, which is essential in learning (3). For this reason, experts in education and training sciences propose another method known as Problem-Based Learning (PBL), which has been widely used by several universities in different countries (4). In this method, a practical and clinical situation is presented to learners. This model is intended as a stimulus to obtain necessary information about that problem and provide solutions (2).

Due to the complex nature of some topics, students need to share their current knowledge, discuss proposed ideas, search for information, and develop fundamental discussions to test their proposed solutions (5). Therefore, PBL is an inclusive educational technique in which students learn science through the experience gained from interacting with one another on a topic through discussion (6).

Problem-Based Learning has become increasingly common in curriculum design in medicine, among many other disciplines (7). The first progress in problem-based learning was made in the 1950s at the medical college of Western University in the United States. Subsequently, in 1969, at the medical school of McMaster University in Canada, a new educational model called problem-based learning (PBL) was developed in which the neurologist Howard Barrows made the revolutionary decision to implement the PBL method in the department of neurology. He described the PBL method as a process with seven steps, including explicit expression of terms, defining problems, brainstorming, forming structures and hypotheses, setting learning objectives, studying, and independent, which in short, would evaluate students' knowledge and determine what they should know, and how and where to access new information required for problem-solving. In 1984, following the publication of the report of the Panel on Preparatory Medical College (from the Association of American Medical Colleges) for the general education of the medical profession, the importance of self-directed and problem-based learning was highlighted. In the late 1990s, this method was spread to the Pacific region, especially Australia and China, and was used in medical applications (8). Since then, this new medical education teaching model has gained global prominence. The PBL method is currently used in the education of medical students in many countries, including Australia, Sweden, the Netherlands, and England (1).

Objectives

Several studies have demonstrated that learning through problem-solving method has significant advantages for clinical students over the traditional methods, such as improving the attitude and performance of learning (3), developing critical thinking (9, 10), improving the ability to learn two-way communication and self-evaluation (10), optimal use of clinical training time (11) and motivation to learn clinical and applied topics (12). In a study in 2000, Nandi and her colleagues compared problem-based learning with traditional teaching methods in medical education and evaluated the variables of the

educational process, program evaluation, academic progress, and the attitude of students and professors towards the course. The outcomes of this research confirmed the superiority of PBL over other conventional methods (13). In a research conducted by Kermaniyan and his colleagues in 2007, which compared the PBL method with the traditional lecturing method in medical courses, the use of this method resulted in increased participation of the students in the educational activities. It enhanced learning and deep understanding of the material, which, in turn, caused the content to be memorized in the students' long-term memory (14).

Although many studies in recent years have declared the PBL method as effective compared to other traditional methods in medical and other sciences, traditional methods have been dominant in medical sciences education (14). With the circumstances of the COVID-19 pandemic and the barriers to using traditional lecture teacher-centered methods in education, it seems that by identifying and designing the components of the problem-oriented curriculum, great assistance can be offered in the education and academic progress of medical students. Therefore, in this research, we aimed to use the PBL method on one of the critical topics of skin diseases (viral skin disease), where most students have difficulty diagnosing and managing the related disease.

After completing the training course, the students' opinions were sought.

Methods

The nature of this research was practical and quantitative in terms of its purposes. In this study, 175 medical students (99 externs and 76 interns) who were allocated to the dermatology of Sina- Educational, Research and Therapeutic Center of Tabriz University of Medical Sciences participated from April to July 2022. In each training course, a training session on viral skin diseases was assigned to each group of the students.

At the end of the training course, the students were surveyed regarding the PBL teaching method and its impact on their learning. Each training course lasted one month for the externs and two weeks for the interns. For the survey, a researcher-made questionnaire containing 25 questions was used. Standard PBL Works questions from the Buck Institute for Education were used in designing this questionnaire. The validity of the questionnaire was confirmed by professors of the Faculty of Educational Sciences at Tabriz University and professors of the Department of Dermatology Tabriz University of Medical Sciences.

To obtain the results, the following steps were taken:

Collecting and organizing students' opinions on the subject, specifying the main topics, examining ideas, extracting and recording information, analyzing the extracted data, and concluding and summarizing. The frequency of each of the questions was considered to determine its importance.

The PBL implementation process is performed in 7 steps in the classroom:

Step 1: Explicit expression of unfamiliar terms

The professor provides titles and basic information about viral skin diseases and patient treatment information.

Step 2: Problem definition and goal setting

By showing a slide of the skin lesions of the disease, the professor asks the medical students to discuss the diagnosis, differential diagnoses, cause of the disease, duration of treatment, and common prescription drugs based on the essential explanations given and their previous experiences and hypotheses.

For example, the professor shows a picture of a skin lesion and asks students to guess the type of lesion.

Step 3: Data collection

Medical students make hypotheses based on the professor's initial explanations and previous background information. They also collected information regarding the questions that were asked of the professor.

For example, medical students ask the professor about a patient's gender, job, history, the duration of the disease, number and size of lesions, sites involved, the color of lesions, patient occupation, age of the patient, co-morbidities, pathological information of the patient, etc.

Step 4: Brainstorming

In this way, the medical student collects random or selected information based on the assumptions made by other students. The students also benefit from each other's knowledge by listening to questions, answers, and hypotheses. Students sometimes have different views about issues, but all opinions are considered and discussed.

Finally, the professor provides necessary information that medical students may have failed to ask.

Step 5: Structure, teaching, and learning goals, and organization of the collected information

Medical students organize the collected information and information that is approved by the professor.

The information gathered on learning objectives is agreed upon. After discovering the stages of diagnosis and treatment, the professor gives a general summary and overview of the disease. They then give students the opportunity to point out the scientific shortcomings that have impaired their ability to understand the problem.

Clear articulation of academic deficiencies prepares the student for independent study activities.

Step 6: Independent study

All medical students collect and record information about each learning goal. After discussing each image, the teacher allows the students to look at the photos of the patients that will be displayed on the following slides. Based on the discussions in the previous educational slides, they state the possible diagnoses, suggested treatments, and their reasons.

At this stage, the professor shows medical students the same educational slides before the lesson begins. The expectations are quite clear, which helps the students to orient their work knowing the goals.

Step 7: Evaluate

In the end, the professor can evaluate students' abilities individually or by dividing them into small groups. In this manner, the professor can determine the amount of learning. At this stage, the medical students discuss each presented slide as a problem. Because this experience allows the issue to be reconsidered, the students will be able to test their ability to deal with the diseases concerned.

Results

The statistical population studied in this study were 175 medical students who were introduced to the dermatology department of Sinai Educational and Medical Center from April to July 2022.

After teaching viral skin diseases in PBL style, the following information was obtained from 175 participating students according to [Table 1](#).

Before attending the viral skin diseases class, all students knew about the "problem-based learning" method. In addition, they were aware of the prerequisite background information.

96% of the students said the topic presented by the professor was in line with the educational curriculum designed by the Ministry of Health. 96.6% of the students found the initial explanations and objectives presented at the beginning of the session by the professor sufficient and valuable. Moreover, 96.6% of the students considered the number of diseases discussed during the training session sufficient. 94.9% of the students mentioned that the questions and answers exchanged between the professor and the students were useful. 94.9% of the students considered the introduced sources sufficient for studying. 96% of the students mentioned their background information as adequate and valuable in intergroup discussions. 97.1% of the students said the PBL teaching method was a new, passionate and motivating method. 92.6% of the students said that intergroup discussions had made

the knowledge meaningful and stable, and as a result, led to deep learning and were more lasting in their memory. 91.4% considered intergroup discussions to be the basis for realizing learning goals.

95.4% of the students believed that this method had increased the ability of cooperation and teamwork among students. 96% of the students said intergroup communication enhanced their clinical thinking. 94.3% considered intergroup communication effective in increasing communication skills.

For 95.4% of the students, intergroup communication had increased their problem-solving

abilities, and 99.4% thought the PBL method was effective in improving students' knowledge and awareness, accuracy, concentration, and logical thinking. 98.9% believed that the PBL method strengthened their confidence in expressing their opinions about diseases. As a result, they considered the role of the working group to be effective in increasing their confidence. 98.3% stated that this method allowed them to think about what and how they learned.

Table 1. The degree of satisfaction of students after the teaching of viral skin diseases by the PBL method

Questions related to teaching with the PBL method	Persons		
	Yes	No	To some degree
Is the presented subject consistent with the educational curriculum approved by the Ministry of Health?	168	0	7
Were the initial explanations and objectives provided by the professor at the beginning of the session sufficient?	169	1	5
Was the number of diseases discussed during the training session sufficient?	169	2	4
Were the questions and answers exchanged between professors and students sufficient?	166	3	6
Were the recommended sources sufficient?	166	2	7
Was the background information you had sufficient and valuable in group discussions?	168	2	5
Did intergroup discussions create an internal motivation to learn in you?	170	0	5
Did intergroup discussions make your knowledge meaningful and stable?	162	0	13
Did inter-group discussions make you realize your learning goals?	160	2	13
Were the proportions of the duration of intergroup discussions sufficient and valuable?	65	74	36
Were the proportions of the duration of discussions between professors and students sufficient and valuable?	128	40	7
Did cooperation and teamwork increase your ability to solve problems?	167	3	5
Did intergroup communication among students increase clinical thinking?	168	2	5
Did intergroup communication among students improve communication skills?	165	5	5
Did intergroup communications among the students increase their problem-solving abilities?	167	3	5
Was the PBL method effective in increasing students' knowledge and awareness, accuracy, concentration, and logical thinking?	174	0	1
Did PBL teaching strengthen the confidence of the students to express their opinions about diseases?	173	0	2
Did the method provide opportunities for students to think about what and how they are learning?	172	0	3
Did this method create a close relationship between the students and the professors?	165	3	7
Did the group activity created by the PBL method change the atmosphere of the class from boring to passionate and cheerful?	170	2	3
Was it easier to understand difficult, complex, and elusive topics in diagnosing diseases through the PBL method?	167	2	6
Did the self-assessments during training create a sense of empowerment and increased self-confidence in diagnosing and treating diseases?	171	2	2
Did this method create opportunities for students to provide and receive feedback on their opinions to reconsider their ideas?	168	3	4
Was the participation rate of withdrawn and isolated students increased with this method?	142	21	12
Do you think this method can be effective for teaching other subjects as well?	169	1	5

94.3% of the students considered this method effective in creating a close relationship between the students and the professor. 97.1% of the students said that the group activity component of the PBL method changed the atmosphere of the class from tedious to passionate, enthusiastic, and cheerful. 95.4% of the students believed that understanding difficult, complex, and hard-to-understand topics in diagnosing diseases became more understandable in the PBL teaching method. 97.7% of the students considered the self-evaluations during the

training very effective because it made them feel capable of diagnosing and treating diseases.

96% of the students stated that this method created opportunities for them to revise and learn the correct answer by receiving feedback on their answers. 81.1% of the students considered this method suitable for reclusive and isolated students. 12% of the students believed that the withdrawn students were still less talkative and inactive without the teachers' interventions, and 6.9% thought that this method was relatively effective in motivating such students.

96% of the students found this teaching method effective for teaching other skin diseases courses and requested implementation.

Among the concerns and criticisms made by the students, the long discussions between the students can be mentioned. 37.1% of the students considered the duration of intergroup discussions appropriate, 42.3% of the students mentioned that this duration was long and inappropriate, and 20.6% considered it to be relatively appropriate but believed that with timely interventions of the professors, the discussions could be controlled and necessary precautions could be taken to prevent them from going astray. 73.1% of the students were satisfied with the duration of the discussions between the professor and the students, 22.9% mentioned that it was inappropriate, and 4% considered this time relatively appropriate.

Discussion

Today, all countries and nations with any kind of advanced or developing political and social systems pay special attention to the issue of educational planning and reforms based on the latest academic, technical, and scientific methods in the world. This attention is comprehensive and universal and has priority over other initiatives (15). Most universities in the world seek to find educational methods that can expand and improve students' clinical decision-making capacities and self-centered learning (3). Students often forget the material they learn through traditional methods after a while because they are not given the opportunity to think, which is essential in learning (3). For this reason, experts in education science proposed another method called problem-based learning (PBL), which has been used by many universities in different countries in recent years (4). For many years, the traditional method of professor's lectures has been continued for teaching theoretical courses in medical sciences (16). The present study aimed to introduce the theoretical courses of skin diseases using the PBL method and seek the opinions of medical students of Tabriz University of Medical Sciences about this method. The findings of this study showed that PBL was effective in increasing students' knowledge and awareness, accuracy, concentration, and logical thinking, which is in line with the studies of Rasouli (2017), Kermaniyan (2008) and Jabari (2012), who showed that learning through the problem-solving method in comparison with learning through lectures significantly increased the knowledge of nursing and medical students (14, 17, 18). Kermaniyan has stated that in the learning method based on problem-solving, students are more guided toward thinking and avoid memorizing the material

(14). The results of studies abroad have also confirmed that the problem-based learning method can be very effective in improving learning. In a study in 2009 by Kocaman, it was found that this method made course subjects more interesting for students, and authors believed that the permanence of acquired knowledge increased (19). Chakravarthi's study in 2010 showed that this method improved learning through understanding the relationship between basic scientific concepts and medical expertise (20). Among the research focused on the present research results, we can mention the Meo study in 2014 (21). The studies of Niwa and his colleagues in 2016 also showed that applying a learning method based on problem-solving for two years can lead to prominent academic achievements for medical students. Improving academic achievement scores in basic and clinical sciences and increasing the amount of medical licensing were among the accomplishments of this study (22). In 2017, Marques investigated the effects of the PBL method focusing on clinical cases in a study. This method was implemented from 2012 to 2015 during each semester for the pathophysiology course of second-year nursing students in a Portuguese college. Since 2012, excellent results have been recorded. A high satisfaction level following students' personal learning was evaluated through an online questionnaire (23).

Our study also showed that problem-centered curricula and teaching methods, in addition to having theoretical support, have advantages in adapting the learners' resources, society, and course subjects, including creating internal motivation for learning, the meaningfulness and stability of knowledge, the realization of learning goals and the transfer of better learning, which is in line with Rasouli's studies in 2017. In Rasouli's study, the effect of two lectures and PBL methods on improving the knowledge of digestion and the performance of the examination of the digestive system, PBL, as an active teaching-learning method, was able to gain a significant advantage over lectures. According to the results of this study, PBL was shown to be more effective than lectures in improving awareness and performance (17).

In the present study, based on the intergroup communication of students regarding gathering information, giving information, and drawing conclusions from communication, it may be claimed that PBL was superior in terms of cooperation, clinical thinking, communication skills, and problem-solving, which is in line with Panjehpour's study in 2012 (24) and Peng's survey in 2021 (25). In the study of Panjehpour's and her colleagues, the use of the PBL method was

reported to be effective in creating and increasing motivation and interest among the biochemistry students, and its deeper learning effects was demonstrated (24). In their study of using virtual simulation with PBL learning for pediatric medical students in 2021, Peng and colleagues showed that students' mastery of pediatric knowledge (initiating communication, gathering information, giving information, understanding pediatric patients, and drawing conclusions from communication) in the study group was significantly higher than the control group (25).

In our study, the students proposed implementation of the PBL method in learning other courses as well similar to HajiBabae's study in 2019, which, based on the surveys conducted, indicated the effectiveness of the PBL learning method in nursing education and empowering students, and demanded its widespread acceptance and use in the education of nursing students, who expressed their satisfaction of this method (26).

Moreover, among the general skills and attitudes obtained in the present study, we can mention teamwork ability, acceptance of criticism, group leadership, self-directed learning and use of resources, listening, presentation skills, summarizing content, participation, and respect for others' opinions. It is consistent with the studies of Wood in 2003 (27).

Conclusion

The main explanation for the effectiveness of problem-based learning may be the notion that this type of learning depends on various principles of active learning, principles such as cooperation, feedback, and adaptation to students' learning preferences. Problem-centered curricula and teaching methods, in addition to theoretical support, have the advantages of adapting the learner's resources, the community, and the subjects, including creating internal motivation for learning, meaningfulness, and stability of knowledge, logical thinking, the realization of learning goals and better knowledge transfer. Problem-based learning assists students in learning the subject's basic principles in a context that highlights the need to solve problems. During problem-based learning, learners have the opportunity to practice, apply what they have learned, and use the processes of problem-solving skills, interpersonal communication, group formation, self-evaluation, the ability to adapt to change, etc. In addition, problem-based learning can be used in all subjects taught in classrooms.

Create effective PBL scenarios

- Problems should be appropriate to the stage of the curriculum and the levels of the student's understanding
- Scenarios should have sufficient intrinsic interest for the students or relevance in future practice
- Basic science should be presented in the context of a clinical scenario to encourage the integration of knowledge
- Scenarios should contain cues to stimulate discussion and encourage students to seek explanations for the presented issues.
- The problem should be sufficiently open so that discussion is not curtailed too early in the process.

Disadvantages of PBL

From the concerns and criticisms made by the students, we can mention the lengthy discussions between the students. In this study, only a few students considered the duration of intergroup discussions appropriate. Still, with the timely intervention of the professor, the discussions could be managed, and the necessary measure could be taken to prevent them from going astray.

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Comparing the Perspectives of Medical Graduates Concerning the Preference of Teaching Basic Science Lessons by Professors with MSc-PhD and MD-PhD Degrees

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Abstract

Background: Given that basic medical science lessons constitute the fundamental part of the professional doctorate course, and among the numerous factors influencing education quality, the teacher is considered one of the most crucial facets of education quality.

Objectives: The present research was conducted to determine the perspectives of medical graduates regarding teaching basic science lessons by professors with MSc-PhD degrees compared to professors with MD-PhD degrees.

Methods: This descriptive-analytical and cross-sectional study was carried out on 200 general practitioners working on their plans in Kerman. Data were collected through a researcher-made questionnaire and finally analyzed using the paired t-test and its non-parametric equivalent (Wilcoxon test) by SPSS 22 software.

Results: The mean score of graduates concerning teaching basic sciences by professors with MD-PhD degrees was significantly higher than that of professors with MSc-PhD degrees ($P = 0.01$); this score significantly increased with enhancing their work experience. In all basic science lessons, medical graduates mostly agreed to teach lessons by professors with MD-PhD degrees than professors with MSc-PhD degrees; however, the frequency of proponents of this issue was mostly different in histology (100%), physiology, anatomy, bacteriology (81%), and public health (99%) lessons, and the lowest disagreement was associated with biochemistry (53.5%) and parasitology (60%) lessons.

Conclusion: To reinforce and promote the education and learning level of medical students in the country and the health system, professors teaching basic sciences should have the required information and education regarding clinical applications of education, such as professors with MD-PhD degrees, and pay more attention to the clinical aspects in their teaching. It is suggested to hold postdoctoral programs or in-service training, workshops, etc. to achieve this goal.

Keywords: Perspectives of medical graduates, Basic sciences, Education, Professor, MD-PhD, Teaching

Background

Nowadays, scientific advancement in various fields needs specialists who can operate in a multidisciplinary manner (1). The field of medicine is no exception to this. Because the medical education system is directly involved in society's health, constant, quantitative, and

qualitative evaluation of the educational factors engaged in the upbringing of specialists in this field is also necessary. Nowadays, there is a growing concern around the world that medical education is not going well at the general level (2-4) because the curriculum in many universities is mostly divided into two basic and clinical

parts. The vast difference between these two parts can result in a profound gap between the theoretical and clinical educational content.

On the other hand, usability thinking is based on the needs of society, and being appropriate to professional needs has also culminated in changes in the content of medical education courses in many universities worldwide during the recent few decades, and medical education has been suggested and implemented based on the needs of society and education based on professional requirements (5). In line with these developments, medical education has also been changed in many universities worldwide, and new methods have been innovated and developed to promote the motivation of learning and persistence of learning, increase the power of data analysis, enhance the power of clinical decision-making, identify and meet the needs of society, and create a learning context (6). In this regard, the Liaison Committee on Medical Education (LCME) and the Council on Graduate Medical Education, as the two main accreditation institutions in the United States that supervise medical education in this country, have stressed teaching as a necessary skill and activity (7).

Medical students in Iran are educated classically for seven years involving four levels of basic sciences, physiopathology, internship, and apprenticeship to achieve these goals and acquire adequate skills to work in this career (8), and each course is expected to be the prerequisite for the next course. Thus, the materials provided in each course should be effective in the next courses and, finally, in their professional performance (9). Multiple studies have indicated that the relationship between basic and clinical stages is weak and ambiguous (10, 11), so that in previous studies in Iran, the most and the least amount of achievement of the educational goals of the four courses were related to the internship and basic science courses, respectively (12).

Faculty members believe that the basic science course is also an opportunity to encourage medical students to continue their education in specialized fields of basic sciences. Using the information acquired in this course, a medical student should proceed to solve clinical problems and make clinical decisions (13). However, general practitioners in the clinical course do not have favorable performance in remembering the methods and applying various basic science learnings in the medical course. The inconsistency in providing lessons appropriately and timely makes this problem more complicated (14). Hence, the discrepancy between basic and clinical sciences has created many problems so that it first weakens the relationship between theoretical

and practical knowledge, and consequently, students often do not intend to learn a lot of information in detail (15). Medical students are willing to acquire basic sciences at the bedside as applied. Therefore, a large number of medical schools have recently revised the training of the pre-clinical course to improve the relationship between the clinical and basic sciences and increase the recall of the materials learned in basic sciences by linking them to the bedside (16). In other words, integrating basic and clinical sciences is performed as a solution in many countries (17).

On the other hand, communication skills, good-looking appearance and sense of humor concerning the students, teaching style and oratorical skill, scientific capability, patience, ethics, the art of expression and the ability to explain the lesson, the individual and behavioral traits, personality traits, scientific information, the ability for class management, mastery of the lesson's subject, self-confidence, and having an intimate relationship with the student are some of the most important priorities and factors influencing the medical students' positive attitudes toward teaching basic science lessons by professors (18, 19). Also, strictness and extreme control of professors in classes and exams, gender, or being aware of the sociopolitical situation have no effect or very little effect on their evaluation from students' perspectives (20).

Although numerous studies have been conducted on the factors influencing the evaluation of basic science professors, no study has investigated the perspectives of medical graduates regarding the degree types of basic science professors with a medical background (professors with MSc-PhD degrees versus professors with MD-PhD degrees) (21). This question has always been raised by many doctors can basic science professors have a mutual understanding of the requirements of medical students when they have not completed the basic medical science course? In other words, professors who have first obtained their degree in general medicine and then entered the Ph.D. course will provide the basic science materials more appropriate for clinical services whose ultimate goal is to train doctors (22).

Given that the basic medical science lessons underlie the professional doctorate course and the professor and his/her traits are among the most important factors influencing the quality of education, and because of the interaction of basic and clinical sciences emphasized by the Ministry of Health and Medical Education, assessing the perspectives of graduates who have recently entered the profession of medicine and not much time has passed since the completion of their formal education in higher education institutions, can be an effective step in

recognizing the factors affecting professors' teaching in the field of medicine in the country.

Objectives

Hence, the present research was conducted to investigate the perspectives of general medicine graduates toward teaching basic science lessons by professors with MSc-PhD degrees compared to professors with a Ph.D. degree after obtaining a general doctorate. Identification and investigation of these factors can help in creating an efficient interaction between basic and clinical sciences in the country.

Methods

This descriptive-analytical and cross-sectional study was carried out to evaluate the perspectives of medical graduates regarding teaching basic science lessons by professors with MSc-PhD degrees and professors with MD-PhD degrees in Kerman in 2020. The research population consisted of medical graduates of Kerman University of Medical Sciences, who were passing the plan for beneficiaries of the law on physicians' services in Kerman. Two hundred doctors entered the research by a census method (95%). Medical graduates in Iran are obliged to provide medical services for a maximum of two years in universities of medical sciences. The inclusion criteria included providing services as mentioned and the homogeneity of selected doctors and easier access to them. Their phone numbers and places of service were obtained from the Office of Manpower Planning (the Deputy of University Resources and Management Development) and Kerman Medical Council. The medical council of each city is an independent guild institution under the supervision of the medical council. In these offices, all information about working doctors is accessible. One of the important duties of this institution is the issuance of doctors' medical education numbers and work permits.

A senior trained medical student first explained to the doctors how to fill out the data collection form and the questionnaire. Also, the information regarding the type of educational degrees was provided by the mentioned student to the participants. Entering the study was optional; informed consent was obtained from the participants, and they were assured of keeping all information anonymous and confidential.

The research tool involved a data collection form and a researcher-made questionnaire. The first part was a questionnaire consisting of 18 questions in the three areas of content, communication, and teaching method that investigated the perspectives of medical graduates regarding teaching basic science lessons by professors who had completed master's and doctoral programs in basic sciences (MSc-PhD) compared to professors who

had completed a specialized doctorate program (MD-PhD) after a professional doctorate in medicine, pharmacy, and veterinary medicine courses. The scoring of this questionnaire was on a five-point Likert scale, including completely agree = 4, agree = 3, disagree = 2, completely disagree = 1, and no idea = zero.

In order to determine the questionnaire's content validity, the questions were provided to seven professors with medical education degrees and the faculty members of the medical school. In order to determine the reliability, the questionnaire was provided to 30 medical graduates, and the reliability was obtained at 84.9 based on Cronbach's alpha coefficient.

In the current research, frequency and percentage were used to describe qualitative data, and the median and the interquartile range were used to describe quantitative data. Paired t-test and Pearson's correlation coefficient were also used for numerical data analysis. In the case of non-normality of data distribution, the non-parametric Wilcoxon test was used to analyze the qualitative data, such as grade point average (GPA) and median. The data were finally analyzed by SPSS software version 22 (IBM Corporation, Armonk, NY). A $P < 0.05$ was considered significant.

Results

All medical graduates ($n=200$) completed the questionnaire, of whom 20% had work experience of less than one year, 44% less than six months, 26% 6-18 months, 10% more than 18 months, and most of them (63%) had a B GPA (Table 1).

Table 1. The participants' characteristics according to their grade point average and work experience

Variable	Level	Number (%)
Work experience (year)	Less than 1	40 (20.0)
	1-6	88 (44.0)
	6-18	52 (26.0)
	18-24	20 (10.0)
Grade point average	A	31 (15.5)
	B	126 (63.0)
	C	34 (17.5)
	D	9 (4.5)

Professors with MSc-PhD degrees gained the highest scores on the "emphasis on theoretical materials" item, and the participants believed that there was no appropriate relationship between the materials taught by these professors and their application at the bedside. The highest mean score of the respondents to the professors with MD-PhD degrees was related to the aspects of "the professor had more willingness to the clinical aspect in teaching," "the professor established an appropriate relationship between basic and clinical sciences", and "the

professor clarified well the relationship between basic and clinical sciences" (Table 2).

There was a significant difference between the perspective scores of those with A, B, and C GPAs and the teaching of professors with MD-PhD degrees compared to professors with MSc-PhD degrees ($P = 0.001$), but the significance level was significant in those with D GPAs ($P = 0.008$).

The median and interquartile range of the perspective scores of medical graduates on teaching basic science lessons by professors with MD-PhD and MSc-PhD

degrees was 54 (52-60) and 41 (39-43), respectively, and the Wilcoxon test indicated this difference to be significant ($P = 0.001$). Moreover, the mean perspective score of medical graduates regarding teaching basic science lessons by MD-PhD professors (55.0 ± 5.4) was significantly higher than that of the MSc-PhD group (40.0 ± 9.3) ($P < 0.001$). The results also showed that the perspective scores of medical graduates with any work experience regarding teaching basic science lessons by MD-PhD professors were significantly higher than that of the MSc-PhD group ($P = 0.001$).

Table 2. Mean scores of medical graduates in each item regarding the teaching of professors with MSc-PhD and MD-PhD degrees

Aspects	MD-PhD Degree Mean (SD)	MSc-PhD Mean (SD)
The professor used students' participation while teaching.	3.1(0)	2.4(0)
The rate of teaching materials was appropriate.	3.4(0)	2.0(0)
The professor emphasized the key points of the lesson.	3.4(0)	1.8(0)
The professor explained the contents comprehensibly.	3.5(0)	2.2(0)
The professor emphasized the applied and practical points of the lesson.	3.5(0)	1.8(0)
The professor was more inclined to teach toward the clinical aspect.	3.7(0)	1.6(0)
The professor made the student interested in the topic being taught.	3.3(0.1)	2.5(0.1)
The professor established an adequate relationship with the student.	3.2(0.1)	2.5(0.1)
The professor considered the student's satisfaction with teaching.	3.2(0)	2.5(0.1)
The professor used teaching aids well.	3.1(0.1)	2.5(0.1)
The professor emphasized theoretical materials.	1.2(0)	3.7(0)
Learning was higher in the professor's class.	3.4(0)	1.9(0)
The professor established an appropriate relationship between basic and clinical sciences.	3.7(0)	1.5(0)
The professor clarified the relationship between basic and clinical sciences well.	3.7(0)	1.3(0)
The professor created a good relationship between previous knowledge and new topics.	3.4(0)	2.4(0)
There was no appropriate relationship between teaching and its application in the hospital.	1.2(0)	3.6(0)
The professor performed an appropriate evaluation.	3.0(0.1)	2.3(0.1)
The professor reinforced investigative thinking in students.	2.6(0.1)	2.4(0.1)

As the participants' work experience increased, the perspective scores for MD-PhD professors increased, and for MSc-PhD professors decreased (Table 3).

Table 4 shows the results of the participants' willingness regarding the teaching of professors with MD-PhD and MSc-PhD degrees by lesson and denotes that medical graduates significantly agreed with the teaching of lessons by professors with MD-PhD degrees more than that by the MSc-PhD group so that the highest disagreement was observed in physiology, anatomy, and bacteriology lessons (81% MD-PhD and 19% MSc-PhD). In histology and immunology, the disagreement was also significantly different ($P < 0.050$). There was no significant difference in biochemistry and parasitology lessons. In histology and public health, 99-100% agreed to teach professors with MD-PhD degrees. The participants' mean inclination to use professors with MD-PhD degrees (median = 54) was significantly higher ($P < 0.001$) than the MSc-PhD group (median = 42).

Discussion

The basic medical science lessons underlie the professional doctorate course, and the interaction between the two basic, and clinical science courses are greatly important. The results of the current research indicated that professors with MSc-PhD degrees emphasized more on theoretical materials, while no appropriate relationship was reported between the materials taught by them and their application at the bedside. Professors with MD-PhD degrees were more willing to use the clinical aspect of the materials and established an appropriate relationship between basic and clinical sciences. Teaching by professors with MD-PhD and MSc-PhD degrees indicated a significant difference regarding GPA and work experience. The inclination to teach by MD-PhD professors was significantly higher in all basic science lessons and no significant difference was observed only in biochemistry and parasitology lessons.

Efforts have been made in many countries to merge basic sciences and medical sciences, and programs have

also been developed to attract general doctoral graduates in MD-PhD courses as an effort to increase researchers in the medical field (23, 24). In countries such as Iran, the US, Canada, and England, candidates of these programs first complete their professional doctorate

courses after passing alternating courses in basic and clinical sciences. Then, in order to complete their education, they will enter Ph.D. courses and obtain their specialized doctorate degree.

Table 3. The perspective scores of the participants regarding teaching basic science lessons by professors with MD-PhD and MSc-PhD degrees according to their work experience

Work Experience (Month)	MD-PhD Degree		MSc-PhD Degree		P
	Mean (SD)	Median (Range)	Mean (SD)	Median (Range)	
Less than 1	48.7(0.4)	49 (48-50)	43.4(0.4)	43 (42-44)	0.001
1-6	54.0(0.4)	54 (54-55)	41.6(0.3)	41 (41-43)	
6-18	60.0(0.5)	60 (57-63)	39.2(0.5)	39 (36-42)	
18-24	63.4(0.3)	63 (62-64)	36.5(0.4)	36 (35-37)	

Table 4. The frequency of the participants' perspectives regarding the agreement to the teaching of professors with MD-PhD and MSc-PhD degrees based on the lesson type

Lesson Type	Type of Degree	
	MD-PhD	MSc-PhD
	N (%)	
Physiology*	162 (81.0)	38 (19.0)
Anatomy*	162 (81.0)	38 (19.0)
Biochemistry	107 (53.5)	93 (46.5)
Bacteriology*	162 (81.0)	38 (19.0)
Parasitology	120 (60.0)	80 (40.0)
Pathology*	200 (100)	0 (0)
Histology**	142 (71.0)	58 (29.0)
Immunology*	142 (71.0)	58 (29.0)
Public health**	198 (99.0)	2 (1.0)

*P<0.050, **P<0.001

These courses have greatly attracted the attention of governments in developed countries, and they are strongly supported (25).

Experts with MD-PhD degrees mostly work as faculty members in educational and research activities of educational and academic organizations. Thus, MD-PhD graduates who have completed both general doctorates and specialized doctorate courses are apparently more effective in nurturing and preparing medical students because they first teach them scientific thinking, which is a prerequisite for performing successful research, and then provide these concepts in an understandable and plain language for treating their patients (26). The professor and his/her traits are among the factors affecting the success of education. Thus, the current study assessed teaching basic science lessons by professors with MD-PhD and MSc-PhD degrees, and the results indicated that the perspective scores regarding professors with MD-PhD degrees (55.0 ± 5.4) were significantly higher than the MSc-PhD professors (40.0 ± 9.3). Masoumi et al. examined how to provide basic science lessons to achieve clinical goals, and the highest score was related to the relationships between final exam questions and comprehensive examination and lesson subjects, while the lowest score belonged to

applying basic science lessons at the bedside. Doctors showed a significant inclination to the importance of basic science courses being applied at the bedside (27). In the present research, also, the participants' perspectives were not consistent with teaching basic science lessons by professors with MSc-PhD degrees, and the score obtained by professors with MD-PhD degrees was higher than that obtained by professors with MSc-PhD degrees (the mean perspective score of doctors regarding teaching basic science lessons by professors with MD-PhD degrees was 55.0 ± 5.4 and in the professors with MSc-PhD degrees group was 40.0 ± 9.3).

Evaluating the teaching quality of basic medical science professors by medical graduates considering the method of obtaining specialty (MD-PhD versus MSc-PhD) was the focus of the current research because evaluating their performance after the course completion and its results can lead to improving the quality of education in a basic science course (28). Khadem Rezayian et al. stressed the recruitment of instructors with MD-PhD degrees in medical and dental schools (29), which was in line with the findings of the current study. In the study by Abedini Baltork et al., the professor's mastery of the subject was also proposed as

one of the ten factors affecting efficient teaching in medical education (30). The teacher's behavior as a function of his personality and his passion for the subject that develops during education is considered to be one of the effective indicators of teaching (31). Match and O'Brien concluded that if the feedback resulting from the students' evaluation results in terms of the professors' method of obtaining specialty accompanied consultation and appropriate policy-making, it would be effective in promoting the educational quality level (32).

One of the most effective and helpful components of the medical students' education is the faculty member professors, and their performance and behavior are reflected more than anything else in their teaching methods (17). Professors' method for gaining expertise in a basic science course is associated with their performance in the teaching-learning process (33).

The evaluation of the students' perspectives regarding the professors' specialty is one of the crucial components in educational activities and allows specifying the pros and cons of the education process according to its results so that by reinforcing the positive facets and eliminating the defects, appropriate steps are taken in transforming and modifying the workflow (33). The students' criticisms and perspectives are the main sources of evaluating the efficiency of the educational system, underlining the professor's effective role in the student's level of learning, along with teaching aids (34). Evaluating professors by students in terms of their specialty provides the officials of the educational system with beneficial results for substantial decision-making, such as diagnostic feedback to faculties regarding professors' performance, selection and election of prominent professors, and the use of the information obtained to guide students in choosing lessons with professors having scientific competence (28, 35-37).

Consistent with these results, this study obviously emphasized the main findings of Khadem Rezayian et al. (2016) on the recruitment of MD-PhD lecturers in medical and dental schools (27). Also, the professor's behavior, which is shaped during his/her education as a function stemming from his/her personality and the enthusiasm he/she shows for the lesson subject, is considered one of the effective teaching indices (29). Match et al. revealed that if the feedback resulting from the results of students' evaluation according to the professors' method for gaining specialty is accompanied by consultation and appropriate policy-making, it would be effective in promoting the educational quality level (28).

Because professors with MD-PhD degrees have completed the general doctorate basic medical science courses, they have a more mutual understanding of

medical students at this level compared to professors with MSc-PhD degrees. On the other hand, because of their acquaintance and personal perception of the clinical setting, they can be more successful in transferring the concepts of clinical lessons compared to the basic science professors and establish better interaction with their learners through mutual understanding.

Practical applications and clinical relationships of the topics provided in basic science education constantly attract the attention of medical students and educational programs (38). Previous studies have reported that lessons, such as physiology, bacteriology, anatomy, and pathology are most applicable in clinical settings, and clinical education is formed around these topics (39-41). In line with approving this important subject, the participants of the present study were also significantly more inclined to use professors with MD-PhD degrees in teaching pathology, public health, anatomy, and physiology lessons compared to professors with MSc-PhD degrees, which can result from more application of these lessons in the clinical courses (20).

Conclusion

Medical graduates showed significantly more willingness for professors with MD-PhD degrees in teaching pathology, public health, anatomy, and physiology lessons compared to professors with MSc-PhD degrees. Therefore, in order to promote the education and learning level of medical students in the country and the health system, basic science professors should have the required information and education regarding the clinical applications of these lessons at the bedside (such as professors with MD-PhD degrees) and pay more attention to the clinical aspects in their teaching. It is suggested to hold postdoctoral programs or in-service training, etc., to achieve this important goal.

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

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The Effect of Cultural Competence Training on Empathy of Medical Residents

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Abstract

Background: Cultural competence is a core skill for the healthcare team that reputable medical organizations and associations have always emphasized. Its components are essential in reducing health inequalities, increasing patient satisfaction, and improving health outcomes.

Objectives: Considering that competency improvement will affect other skills and abilities, this study attempted to identify the effect of cultural competence training on the medical residents' empathy.

Methods: This quasi-experimental study was conducted among 44 medical residents randomly divided into two groups (control and experimental). The participants were from various medical disciplines (internal medicine, pediatrics, psychiatry, surgery, pathology, and anesthesia). Cultural Competence was taught to the experimental group in a workshop. Then they were sent short educational messages based on the elements of the cultural competence model of Campinha-Bacote for a month. Data were collected using Jefferson's empathy questionnaire and analyzed using SPSS16.

Results: In this study, forty-four residents were randomly divided into two groups of 22 people. There was no significant difference between the scores of participants in the two groups before the cultural competency course ($P>0.05$). However, there was a substantial difference between the scores of the two groups after the intervention ($P<0.05$). The empathy score was higher in the intervention group.

Conclusion: According to the current study, cultural competence training enhances learners' empathy in clinical settings. It is recommended to be integrated into educational planning and new revisions of curriculums.

Keywords: Cultural Competence, Teaching, Empathy, Residents, Education, Medical

Background

The ultimate goal of educating physicians is to improve people's physical, psychological and social conditions. Therefore, their education should be so that they become competent when they graduate. They should understand social needs, help people solve their personal and social problems, and adapt to changing societal expectations and advances in medical sciences. To fulfill the defined requirements, they should be competent in various fields. Cultural competence is an essential topic in medical education (1) as its elements have a critical role in reducing health inequalities and improving health outcomes (2). Cultural care based on

the patient's values and beliefs increases the patient's compliance with treatment and care orders. The lack of cultural competence in health professions may lead to patients' dissatisfaction (3).

Cultural Competence: There are several definitions for cultural competence. Cultural competence is generally defined as knowledge, attitudes, and behaviors. They are used together and enable personnel to work effectively in different cultural settings (4). The standard of the importance of cultural competence was set by Liaison Committee on Medical Education (LCME) in 2000. This standard is related to the faculty members and medical students. It emphasizes that the

professors and students should demonstrate an understanding of how people of different cultures and belief systems perceive health and illness and perceive various symptoms, diseases, and treatments (5). Therefore, cultural communication and empowerment of students to respect cultural diversity are critical in the medical sciences providing culturally-relevant care (6).

Empathy: Empathy is one of the elements of communication skills that play a critical role in the communication between patients and medical residents. It is the art of understanding peoples' feelings without showing sympathy in speaking or behavior. In addition, cultural competence includes empathy, curiosity, and respect (7). Many literature reviews demonstrated the importance of physician empathy training (8). For example, several studies demonstrated that physicians' empathy leads to many benefits, such as reducing patient anxiety and stress, patient satisfaction, and improving patients' quality of life (9-13). Despite the importance of empathy and high emphasis on its learning, some studies noted a decline in the empathy level among medical students during their clinical studies; its reasons need to be investigated and discussed (14).

Pourahmadi et al. reported that empathy was vital in overcoming COVID-19 challenges and improving relationships between physicians and patients. It led to the increased voluntary engagement of medical students in caring for COVID-19 patients (15). Aziz and Ali's study indicated that empathy remains a relatively fixed trait in residency training programs (16).

However, Kusz et al. identified that empathy scores were higher at the end of the internal medicine residency program. The researchers attributed this to their targeted curricula. They included behavioral science and geriatric medicine curricula (17).

Relationship between Cultural Competency and Empathy: Many studies were conducted on empathy learning and cultural competence training in various clinical settings. The results of some studies demonstrated that empathy is not only dependent on individual characteristics but is also acquired by training (18). Most studies showed cultural competence training significantly impacts the development of individuals' knowledge, attitude, and skills, including communication skills. Several studies demonstrated that cultural competency training could improve patients' care and advance favorable outcomes (19).

Since there is a positive association between cultural competence and empathy (20), it depends on showing empathy, respect, and other key factors to provide adequate services to patients.

Importance of Cultural Competency and Empathy in

Iran: Historically, Iran has been the land of various tribes and religions with diversity and subcultures in lifestyle, language, livelihood, traditions, and customs. In a style of classification, eleven ethnic entities were identified in Iran. In addition, Iran is one of the major destinations for immigration and refugee integration in the world, and foreign immigrants (mainly from Afghans and Iraq) are part of the country's population (4). Another critical issue is the existence of different religious minorities in this country. Due to the cultural diversity in the country, many vital organizations face several challenges, including community health organizations that deal with patients from various cultures. Some studies have demonstrated that people's perceptions of health and disease are influenced by cultural factors (6).

Cultural competence training is not included in Iran's medical curriculum. According to the study of Heidari et al., cultural diversity in the community requires the involvement of health organizations to provide appropriate cultural and language services. Understanding patients' and families' beliefs and respecting their religions and needs leads to a deeper human dimension in the relationship between healthcare staff and patients. When health personnel does not aim to recognize the barriers to intercultural communication, the consequence can be inequality in care (21).

Empathy and its importance have also been noted in Iranian studies. For example, Elyasi et al. indicated that the psychiatry residents obtained a higher mean empathy score (113.4 ± 16.24). They observed that empathy levels improved by using different training methods. They suggested assessing empathy during educational courses for medical students. In this case, it can provide valuable guides and data for improving students' mental health and good relationship with patients (22).

Mosalanejad demonstrated a correlation between empathy and some communication skills subdomains and ethical codes. This research highlighted that it is necessary to teach empathy in workshop programs (23). Karimi Aliabadi et al. also observed a positive relationship between empathy and spiritual intelligence during the COVID-19 pandemic ($P < 0.05$). This study found an association between academic degree and empathy score (24).

The study of Shahini et al. demonstrated significant differences between three residential groups (psychiatric, internal medicine, surgery) in the total empathy score ($p = 0.001$). They proposed the integration of empathy training in Iranian curricula (25).

Objectives

According to the concepts mentioned above, it is expected that many abilities, such as communication skills and empathy, can be improved in medical students after cultural competence training. Therefore, the purpose of the current study was to investigate the effect of cultural competence education on residents' empathy.

Methods

The current research was a quasi-experimental study with a control group (pre-test and post-test). The study population was composed of medical residents. After obtaining the ethical code, the residents were invited to participate in the study. The sample size was calculated based on the average formula and a similar study ($\alpha=0.05$), which allocated 15 people to each group.

Totally, 46 residents expressed their willingness to participate in the study. Two residents withdrew before the start of the study. Participants were systematically and randomly divided into two groups (an experimental group and a control group). In this manner, the list of residents of each level was prepared, and people were selected from each level with a simple ratio (K: 2). They were from various medical disciplines (internal medicine, pediatric, psychiatry, surgery, pathology, and anesthesiology).

Study design: Researchers first conducted the two groups' pre-test (empathy questionnaire). Then, an educational workshop was held for the experimental group. The average workshop time was approximately 6 hours. In this workshop, cultural competence was taught based on components that were emphasized in the Campinha-Bacote framework. It includes five components: cultural desire, awareness, knowledge, skill, and encounters (26). In many studies, this model

was used for training and assessment of cultural competence. Cultural competence definitions and components and the necessity of its teaching were explained in the workshop. Then, the clinical experiences of the trainees were discussed. Therefore, they had the opportunity to express their clinical experiences of interactions with patients from different cultures, their communication problems, and solutions.

Then, the residents were divided into two small groups of 11 students and used several clinical cases as teamwork projects. Each small group discussed three cases based on the guidance of Bacote's cultural competence framework. These cases can cause intercultural problems that physicians may face in dealing with patients who have different languages (1 case), religions (1 case), and unique customs and norms (1 case). Instructors were also facilitators for the groups. After presenting the results of the team projects, they were given feedback by the other group and the workshop instructors.

Subsequently, mobile learning was used for the experimental group to continue the teaching process. Therefore, short educational messages were sent to the residents for a month. They were developed based on the components of Bacote's cultural competence framework, a literature review, and consultation with experts in the field.

Fifteen educational short messages on cultural competence were sent to the residents. The main emphasis of these messages was on raising learners' awareness about cultural competence and its components, its effects, and how to promote it to motivate residents to further study and provide guidance for self-centered learning (Table 1).

Table 1. Educational messages about cultural competence

Messages
From today, we will learn and practice the components of cultural competence every two days.
No. 1: Keep in mind that cultural competence combines patient-centered care principles with cultural and social influences; therefore, interaction with clients with different cultural backgrounds is one of its main elements.
No. 2: Keep in mind that cultural competence is aimed at eliminating inequality in providing health care services and having fair access to health services in the community.
No. 3: Keep in mind that one of the most effective ways to improve our cultural awareness is to be aware of resources related to patients' ethnic and religious beliefs. Therefore, we must strengthen our studies in this regard. (So, if you have such patients, try to improve your awareness and studies about your patients' ethnic beliefs, convictions, and ethnic norms.)
No. 4: Keep in mind that cultural factors also influence patterns of health and disease of individuals.
No. 5: Keep in mind that the most crucial factor in cultural competence and patient-centered care is our desire. Cultural desire is the first step in moving towards cultural competence.
No. 6: Keep in mind that cultural skills include the ability to gather cultural information related to the current problem of clients and the proper implementation of health and treatment activities based on the client's culture. (So, if you have such patients, adapt your care concerning the culture of your clients.)
No. 7: Keep in mind that another critical component of effective cultural communication is our communication skills capabilities, so proper communication with patients lead to a decrease in patient dissatisfaction.
No. 8: Keep in mind that speaking in patients' language and, if necessary, using a translator is another step forward in establishing an effective cultural connection. (So if you have such patients, you can use a trusted translator who can speak your patients' language)
No. 9: Keep in mind that empathy with patients and understanding their concerns can lead to effective cultural communication. (So today, we are trying to empathize with our patients)
No. 10: Today, we will try to pay attention to patients' ethnic and religious beliefs during care and apply what we read in message 3.
No. 11: Keep in mind that awareness of the symbols of verbal and nonverbal communication of different cultures plays a vital role in our communication.

- No. 12: Keep in mind that wherever we serve as a member of our country's health team, having a good understanding of the norms of that community and ethnic group (such as Mazeni, Baluchi, Kurdish, etc.) can help us communicate more effectively.
- No. 13: Today, we will introduce a website about cultural diversity and studies that you can use. Iran Cultural Revolution Council website (<https://sccr.ir/products/انتشارات>)
- No. 14: Understand the consequence of considering your culture a superior culture (cultural self-centeredness) because it distances you from your patients.
- No. 15: Keep in mind that each person's cultural competence is the ability to work in the context of cultural beliefs, behaviors, and needs of patients and society. (By improving this competence, we can prepare ourselves to provide patient-centered care and help to strengthen our country's health system).

Cultural competence training was not provided for the second group. After completing the training (a month), a post-test (empathy questionnaire) was conducted to determine the effect of cultural competence training on empathy promotion.

Instruments & Data Analysis: In this study, the Persian version of Jefferson's Empathy Scale was used to measure empathy before and after the implementation of the educational program. This scale was designed by Swansea and consisted of 90 items that are designed based on literature and psychological experiences. In 1995, this tool was reviewed by a group of researchers, and the final scale was designed with 20 items. This is a self-report tool with 5-point Likert scale [strongly agree (5) to disagree strongly (1)]. Higher scores indicate a higher level of empathy. Hashemipour and Karami reported a Cronbach's alpha of over 0.7 for the questionnaire (19). SPSS16 and descriptive statistics (mean and standard deviation) were used to analyze the current study's data.

Results

Forty-four residents were randomly divided into two groups of 22 people. 13 were male (30%), and thirty-one (70%) were female. The average age of the residents in both groups was 31 ± 7.08 . There were 25 (57%) residents in year 3, and 19 (43%) people in year 4. Most of them were internal medicine residents (32%) (Table 2).

Table 2. Demographic characteristics of the participants

Characteristics	Group	
	Experimental	Control
Gender		
Male	6	7
Female	16	15
Residency level		
3 rd year	13	12
4 th year	9	10
Discipline		
Internal medicine	6	8
Pediatric	3	2
Psychiatry	3	4
Surgery	5	4
Pathology	2	1
Anesthesiology	3	3

The Kolmogorov-Smirnov test indicated that the distribution of the data was normal. Therefore,

independent t-test was used to compare the mean scores of the two groups (experimental group and control group) before and after the training.

As shown in Table 3, there was no significant statistical difference between the empathy scores of residents in the two groups before the cultural competence training ($P > 0.05$). However, there were significant differences between the scores of the residents in the two groups after the intervention ($P < 0.05$) in the experimental group.

Table 3. Difference between the two groups before and after training

	Group	Mean	SD	T-test	P
Pre-test	Experimental group	68.86	6.96	-0.77	0.552
	Control group	70.59	7.88		
Post-test	Experimental group	86.59	5.45	7.25	0.02
	Control group	71.31	8.25		

Findings showed no significant statistical difference between the empathy scores of residents based on sex before and after the intervention ($P > 0.05$) (Table 4).

Table 4. Difference between males and females before and after intervention

	Group	Mean	SD	T-test	P
Pre-test	Male	72.07	7.47	1.37	0.176
	Female	68.74	7.26		
Post-test	Male	81.15	6.68	7.25	0.36
	Female	78.03	11.53		

Paired t-test analysis and pre-test and post-test scores were compared in each group to determine whether there were any changes in residents' empathy scores after the intervention. As seen in the Table 4, the average residents' post-test score significantly increased in the experimental group ($p > 0.05$) (Table 5).

Discussion

The purpose of the current research was to investigate the effect of cultural competence training on the promotion of empathy in a group of medical residents. The findings demonstrated that cultural competence training led to an increase in empathy score.

The existing studies have emphasized the association between empathy and cultural competence. Even in a number of developed models of cultural competence, empathy was seen as an important

element. For example, Marian Stuart model has been developed to create a good cultural environment for patients and clients.

Table 5. Paired t-test to compare the pre-test and post-test difference

	Group	Mean	SD	T-test	P
Experimental group	Pre-test	68.86	6.96	-10.51	0.001
	Post-test	86.59	5.43		
Control group	Pre-test	70.59	7.88	-0.29	0.769
	Post-test	71.31	8.25		

Cultural competence includes a number of principles that are related to communication between patients and service providers. In this model, empathy was identified as an important element (27).

One study concluded that five personality traits (cultural empathy, emotional stability, social initiative, open-mindedness, and flexibility) are related to good performance across cultures (28). This literature review indicated that the result of this study is consistent with other existing studies, such as the study of Baek et al. (29) and Cho et al.

Based on Iranian studies and global experiences, the most meaningful solutions or strategies for developing empathy or its culture among the residents include integrating teaching empathy in the official curriculum, role modeling, and role-playing and simulations. These strategies emphasized different methods and activities for teaching empathy, which can be used for Iranian residents according to the country's context. For example, According to Heyes, empathy can be strengthened by new experiences, redirected by novel experiences, or broken by social changes (30). An effective way or tool for building empathy is role-taking or a tool for empathy-building. It is an experiential therapy that emerged in the 40s and 50s (31).

Han and Pappas studied the need for improving empathy training among surgical residents. This study spotlighted some evidence related to decreased empathy level of residents during the years of clinical training. This decrease was mainly attributed to the nature of their duties and work and the current lack of official training during the residency program. They emphasized that empathy can be taught through role-playing and simulations, didactics, and apprenticeship alongside role models (32). Research of Schiefer et al. study showed statistically significant improvements in the empathy of family medicine residents in a longitudinal family medicine curriculum (33).

A study by Shahini et al. demonstrated significant differences between the total empathy score in three residency disciplines (psychiatric, internal medicine, and surgery). They suggested that more of the

curriculum should be devoted to teaching empathy and communication skills (25). Yazdi et al. suggested that clinical faculty role-modeling should be considered to develop clinical empathy skills (34).

Rawal et al. examined the subject of empathy and its challenges among paediatric residents. This study found that empathy increased in senior residents. Residents stated that empathy could be improved by increasing independence and accountability and exposure to long-term patient care. This study emphasized the formation of a curriculum development committee and the need for more attention to this issue (35).

Research by Aziz and Ali indicated that there were statistically significant gender-based differences in the empathy scores ($p = 0.012$). The results also demonstrated that empathy, as a relatively fixed personal trait, does not alter during the residency programs (16).

Therefore, most studies used education to promote empathy in medical residents as the level of residents' empathy decreases during the clinical years for various reasons. However, some studies demonstrated that empathy did not change and even increased during clinical years. In most of these studies, there was a preplanned training program for teaching empathy.

One limitation of this research was the lack of opportunity for monitoring and practice in clinical fields. These limitations could be considered and used to guide further studies in this field. At the end of the study (after post-test), a gift was presented to the residents for appreciation.

Conclusion

According to this study, more attention should be paid to teaching or training and promotion of empathy and cultural competence simultaneously with clinical training programs so that residents can have the opportunity to practice, receive feedback and rehearse. Further research needs to apply instructional design and practice under the supervision of a teacher in the clinical fields of education.

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Social Presence in Distance Education Among Medical Students During COVID-19 Pandemic

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Abstract

Background: Online social presence is one of the main contributors which has a significant impact on student's academic performance.

Objectives: The present study aimed to assess the online social presence among medical students using the Persian Version of the Online Social Presence Questionnaire (OSPQ) after determining its psychometric properties.

Methods: A cross-sectional study was conducted on 303 medical students at Kerman University of Medical Sciences in 2021. The participants were selected through quota sampling. A two-part online questionnaire containing demographic data and the Persian version of the Online Social Presence Questionnaire (OSPQ) was used for data collection. Exploratory and Confirmatory factor analysis was conducted using SPSS version 20.0 and LISREL version 8.80. Internal consistency of the Persian version was determined. ANOVA, Independent T-test, and multiple linear regression were also used. The significance level was considered as 0.05.

Results: Out of 303 medical students, 63.7 percent were female with a mean age of 22.83 ± 2.84 years. The mean score of the social identity subscale ($P = 0.001$) and the total score ($P = 0.03$) was significantly higher in females. Also, the mean of the intimacy subscale was significantly higher in interns and basic sciences students compared to pre-clinical students. ($P = 0.006$) The Cronbach alpha coefficient ranged from 0.70 to 0.93 for the whole scale and its subscales. The factor loading of all items was at an acceptable level ranging from 0.4 to 0.95. Almost all of the goodness of fit indices had excellent levels.

Conclusion: Our study revealed that the Persian version of OSPQ is a simple, valid, and reliable tool to assess medical students' sense of social presence in an online environment.

Keywords: Social Presence, Online Learning, Distance Education, Medical Students, Iran

Background

As a result of the COVID-19 pandemic, all educational systems were forced to move rapidly toward virtual education, which was referred to as "emergency remote teaching," implying that this transition was temporary in nature (1, 2). But it seems that the flexibility and learning possibilities of virtual education lead the educational systems not to return fully to previous training conditions in the post-corona era (1, 3, 4). Therefore, to provide quality online education, different aspects of this method should be considered by educational planners and policymakers. Barbara found nine dimensions including "modality, student-instructor ratio, instructor and student role in online education, pacing, pedagogy, online

communication synchrony, the role of online assessments, and source of feedback" (5).

One of the important issues related to students in an online learning environment is the social presence which assesses the learner's sense of being connected with the instructor and other students in an online learning environment and is often misunderstood or ignored (6, 7).

Some researchers believe that an online learning environment compared to face-to-face education provides less social presence due to a lack of nonverbal communication (8).

Aldheleai and colleagues found a significant relationship between students' academic performance and all aspects of online social presence (9). Other

literature in this regard shows that social presence has a remarkable impact on students' satisfaction, interactive behaviors, development of the virtual world, and community in an online learning environment (8). Due to the importance of social presence in online learning, various tools have been introduced to measure it such as The Social Presence and Privacy Questionnaire (SPPQ), IPO Social Presence Questionnaire (IPO-SPQ), and Online Social Presence Questionnaire (OSPQ) (8).

Almost all training in medical education was held virtually during the Covid era and it has been specified that social presence in distance education is an important factor for students' learning and satisfaction, their interactive behaviors, and the development of the virtual community in an online learning environment. Therefore, our educational system must assess the social presence of distance education among medical students.

Objectives

Given that the OSPQ had appropriate psychometric properties in the previous study (6, 9) and since the psychometric properties of the Persian version of the questionnaire have not been reviewed, the current study aimed to assess the social presence in distance education among medical students after determining its psychometric properties.

Methods

A cross-sectional study was conducted on 303 medical students who were studying at Kerman University of Medical Sciences in the academic year 2020-21 (second semester). The participants were selected through the quota sampling method. Given that the main purpose of the study was to assess the Psychometric Properties of an instrument, the sample size was considered to be 15 times per item of the tool (10). Inclusion criteria were studying at Kerman University of Medical Sciences as a student during the study period and willingness to participate. Leaving more than 10% of questions unanswered will result in the questionnaire being excluded.

Data was collected using a two-part self-administered questionnaire in which the first part contained demographic information including age, gender, residence, marital status, student's educational stage (Basic sciences, Introductory to clinical sciences, Clerkship, and Internship), and parents' educational level and the second part was the Persian version of the Online Social Presence Questionnaire (OSPQ). This questionnaire has 19 questions with five subscales: social respect, social sharing, open mind, social identity, and intimacy which assesses the learner's sense of being connected with the instructor and other students in an

online learning environment. Response to each item is rated on a 5-point Likert scale (1 = very little, 5 = very much) (6). The total score and the score of each subscale were then transformed into a score between zero and 100 for better comparison. The higher the score in each area, the better the situation in that subscale.

To provide the Persian version of OSPQ, after obtaining permission to use the questionnaire, the forward and back-translation method was used. The instrument was adapted culturally by an expert panel. Through an expert panel including five community medicine and two medical education specialists, the face and content validity of the instrument was evaluated, and accordingly, the Content validity index (CVI) of the whole questionnaire was determined as 0.86.

To design an electronic questionnaire, the "Porsline" Platform was used through <https://porsline.ir/> and its link was shared with the students. The participants completed the questionnaire voluntarily and anonymously. The study was approved by the ethics committee at the Kerman University of Medical Sciences (IR.KMU.REC.1400.085).

Data were analyzed by LISREL version 8.80 (Scientific Software International, Chicago, IL, USA) and SPSS version 20.0 (SPSS Inc., Chicago, IL, USA). In a pilot study on 35 medical students, the internal consistency of the Persian version was determined by the Cronbach Alfa coefficient. These students then entered the study. Exploratory and Confirmatory factor analyses were conducted for construct validity. Furthermore, ANOVA (The comparison of the total score of social presence and its subscales based on students' educational stage, parents' educational level, and residence) and Independent T-test (The comparison of the total score of social presence and its subscales based on gender and marital status), and multiple linear regression (the variables which had $P < 0.2$ in univariate analysis) were used. The significance level was considered as 0.05.

Results

Out of the 303 medical students who participated in the study, 63.7 percent were female with a mean age of 22.83 ± 2.84 years. Most of them (67.3%) were in the clinical stages.

Table 1 shows the central and dispersion parameters of the total score of social presence and its subscales. In the comparison of the total score of social presence and its subscales based on students' characteristics, the mean score of the social identity subscale ($P = 0.001$) and social presence total score ($P = 0.03$) was significantly higher in females.

Table 1. Central and dispersion parameters of the total score of social presence and its subscales

	Number of items	Mean (SD)	Min	Max
Social respect	5	16.20 (3.70)	5	25
Social sharing	5	18.40 (3.68)	5	25
Open mind	3	10.73 (2.26)	3	15
Social identity	4	12.79 (3.09)	4	20
Intimacy	2	6.34 (1.64)	2	10
Total	19	64.49 (12.29)	19	95

Also, the mean of the intimacy subscale was significantly higher in interns and basic sciences students compared to pre-clinical students. ($P = 0.006$). No statistically significant difference was found in the rest of the comparisons based on the students' characteristics ($P > 0.05$) (Table 2).

Table 3 shows the Cronbach alpha coefficient of the Persian version of the OSPQ and its subscales indicating excellent internal consistency for all subscales and the whole questionnaire.

In construct validity analysis, Bartlett's test of sphericity was statistically significant ($P = 0.001$, $\chi^2 = 3564.94$, $df = 171$) and Kaiser-Meyer-Olkin (KMO) measure was 0.93, indicating the proper sample size and suitability of factor analysis (10). Table 2 shows the exploratory factor loading of the scale. Almost all of the goodness of fit indices had an excellent level in confirmatory factor analysis, ($\chi^2 / df = 2.69$, RMSEA = 0.07, SRMR = 0.04, GFI = 0.90, AGFI = 0.84, NFI = 0.96, IFI = 0.98, and IFI = 0.98).

In multiple linear regression, none of the students' characteristics could significantly predict the social presence score.

Discussion

The current study aimed to assess the online social presence among medical students using the Persian

Version of the Online Social Presence Questionnaire (OSPQ) and it was revealed that the Persian version of OSPQ had appropriate psychometric properties. The internal consistency of the instrument and its subscales had an excellent level based on the Cronbach alpha coefficient (11) which is consistent with similar studies. Sung and Mayer report that Cronbach's alpha ranged from 0.847 to 0.863 (4). In a study conducted by Aldheai on tertiary education students in Malaysia, the Cronbach alpha coefficient was reported between 0.78 and 0.93 (9). Kovari found a Cronbach's alpha of 0.93 in a study on the students of the University of Pannonia, Hungary (12).

The construct validity of OSPQ was confirmed by factor analysis. The factor loading of all items was at an acceptable level ranging from 0.4 to 0.95 which has concordance with Sung and Mayer and Aldheai that showed the factor loading between 0.5 and 0.79 and 0.74 to 0.97, respectively (6, 9).

In the current study, almost all goodness of fit indices yielded excellent results in confirmatory factor analysis, indicating the instrument's five-item model is valid. This model was confirmed in similar studies in different populations in Malaysia and South Korea (6, 9).

Table 2. The comparison of the total score of social presence and its subscales based on students' characteristics

	Social respect	Social sharing	Open mind	Social identity	Intimacy	Total
Gender						
Female	57.43(17.9)	68.18(17.1)	65.19(17.9)	57.73(18.9)	55.37(19.6)	61.33(15.2)
Male	53.54(19.3)	65.04(20.4)	63.18(20.4)	50.11(19.1)	52.50(21.8)	57.26(17.4)
P	0.08	0.15	0.37	0.001**	0.24	0.03**
Marital status						
Single	55.92(18.7)	66.58(18.3)	63.70(19.1)	53.70(19.0)	53.30(20.5)	59.21(16.3)
Married	56.34(17.9)	69.71(18.7)	68.42(17.7)	60.45(19.6)	59.13(19.8)	62.93(15.1)
P	0.88	0.26	0.10	0.02**	0.06	0.13
Educational stage						
BS	55.76(19.7)	65.86(19.5)	62.79(20.8)	53.60(20.9)	55.18(20.0)	59.01(17.3)
ICS	56.90(23.9)	58.57(20.9)	60.32(19.7)	51.79(19.7)	41.07(21.7)	55.14(19.7)
Clerkship	54.60(19.0)	70.60(18.1)	67.44(17.9)	52.25(18.5)	52.33(21.5)	60.11(15.6)
Internship	57.08(15.9)	67.31(16.7)	64.74(17.3)	58.74(17.8)	57.52(19.0)	61.38(14.5)
P	0.83	0.05	0.29	0.08	0.006**	0.38
Residence						
With parents	56.61(17.5)	66.94(18.3)	64.16(18.6)	54.54(19.4)	54.17(20.0)	59.83(15.7)
Own home	55.43(18.6)	68.50(17.9)	66.31(19.4)	58.75(19.0)	57.68(19.3)	61.52(15.4)
Dormitory	54.70(21.8)	65.40(19.6)	63.00(19.1)	51.25(18.9)	50.25(23.3)	57.63(18.5)

P	0.77	0.65	0.60	0.09	0.14	0.43
Father education						
Under diploma	58.00(17.3)	71.83(19.1)	68.61(16.6)	56.04(20.5)	55.42(24.5)	62.63(15.2)
Diploma	50.94(16.7)	65.94(18.3)	63.05(16.7)	51.77(18.9)	53.30(19.3)	57.22(16.2)
Academic	56.98(19.0)	66.66(18.4)	64.24(19.6)	55.60(19.3)	54.43(20.3)	60.11(16.3)
P	0.08	0.31	0.41	0.41	0.89	0.31
Mother education						
Under diploma	57.07(20.2)	70.00(22.4)	66.67(20.9)	57.54(21.4)	55.60(23.8)	61.93(18.2)
Diploma	51.88(19.3)	66.23(17.6)	63.53(18.0)	52.60(20.9)	51.14(22.7)	57.57(17.3)
Academic	57.49(17.8)	66.93(18.2)	64.51(19.0)	55.52(18.4)	55.39(19.0)	60.45(15.4)
P	0.07	0.63	0.74	0.40	0.28	0.32

The values: Mean (SD), BS: Basic sciences, ICS: Introductory to clinical sciences

*P<0.05

Table 3. Internal consistency and factor loading of the Persian version of the OSPQ items

Num	Subscale	Items	Cronbach alpha coefficient	Factor loading
1	Social respect	Express of appreciating	0.70	0.40
2		Acknowledgment		0.66
3		Timely response		0.82
4		Use humor		0.81
5		Strike up communication		0.62
6	Social sharing	Social relationship	0.91	0.76
7		Sharing learning information		0.76
8		Express belief or value		0.67
9		Social motivate facilitator		0.63
10		Close relationship		0.68
11	Open mind	Express agreement	0.91	0.72
12		Express positive view		0.72
13		Self-disclosure		0.68
14	Social identity	Use greetings title	0.82	0.64
15		Address learner by team name		0.68
16		Learner's characteristic		0.70
17		Address learner by name		0.70
18	Intimacy	Express personal's stories	0.84	0.77
19		Express emotion or feeling		0.85
The whole questionnaire (Cronbach alpha coefficient)			0.93	

Therefore, it can be concluded that the Persian version of OSPQ had excellent validity and reliability and can be used to assess medical students' sense of social presence when virtual/distance learning has almost completely replaced traditional education in the COVID-19 era. Even though the training has returned to face-to-face mode after the corona pandemic subsided, surely the experience of virtual training in this era has made at least part of the training to be presented in virtual form. Since social presence is considered an important aspect of online learning, our educators and education planners should take into account the facilitators and barriers of social presence in the virtual environment. This approach helps medical students trust each other and have a sense of connection with the educators and other students (13). Aldosari found that for improving social presence in online higher education, students and instructors must be competent in technology (14).

Our study revealed that social presence was significantly higher in females compared to males which

are consistent with some similar studies and not consistent with others (15, 16). For instance, Kovari et al found that among the students of the University of Pannonia, the proportion of high scores of social presence was higher in the females (12), meanwhile showed that no significant differences in students' sense of social presence based on gender among postgraduate students in one of the Malaysian public universities (16). Kear and colleagues emphasized the role of personal profiles which helps online learners to feel connected with others (17).

Therefore, it seems necessary that other factors such as online learning self-efficacy, students' interest and satisfaction with online education, as well as their skills in using Information and Communications Technology, etc. should be considered by the educational systems to improve the sense of social presence among students.

Limitation: The current study was cross-sectional with its potential limitations and also was limited to medical students, so the results should be generalized with caution. The study tool was an electronic

questionnaire, the accuracy of its completion may not have been observed. Considering that the previous experience of the students or their parents in the field of virtual education can affect the sense of social presence in an online environment, it would be better to investigate this relationship as well.

Conclusion

The Persian version of OSPQ is a simple, valid, and reliable tool to assess the sense of social presence in an online environment among medical students. Also, we found that none of the students' characteristics could significantly predict the social presence score. Therefore, it is suggested that other factors be considered in future studies.

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Assessing the Quality of Electronic Exams During the COVID-19 Pandemic

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Abstract

Background: Due to the widespread utilization of electronic exams, neglecting their quality is a major threat. Assessing the quality of electronic exams plays a decisive role in determining the efficacy of electronic learning.

Objectives: This study aimed to assess the quality of electronic exams held at the beginning of the coronavirus disease 2019 outbreak.

Methods: Following a cross-sectional design, this study included all electronic exams of the electronic test center of Birjand University of Medical Sciences during the academic year of 2020. Reliability, discrimination index (DI), and difficulty index (DIF) of exams were used to assess the quality. Descriptive statistics and frequency distributions were used to describe the data.

Results: Out of 101 E-exams, 59.4% had appropriate DIF, 61.4% had low DI, and 66.3% had unfavorable reliability. Also, 38.6% of exams had high DIF (easy questions). For all exams, the mean of DIF, DI, and reliability was 0.66 ± 0.14 , 0.28 ± 0.08 , and 0.56 ± 0.31 , respectively. The mean of DI ($P = 0.30$) and reliability ($P = 0.09$) was not significantly different based on faculty. The mean of DIF was significantly different according to the faculty ($P = 0.03$).

Conclusion: Concerning the quality of e-exams, most problems are related to the DI and reliability. It is recommended to hold empowerment workshops on how to design exam questions for faculty members to get them acquainted with strategies to increase the reliability and discrimination index of the exam.

Keywords: Assessment, Electronic, Quality, Evaluation, Analysis

Background

Utilization of educational technologies by universities has significantly increased in the last few years due to its potential to enhance learning and teaching outcomes, which in turn results in several benefits for teaching and learning. Electronic exams (E-exams) are computer-based exams. E-exams are considered a major transformation for education in universities (1). E-exam has several advantages, including the easiness to use, getting instant results, ability to provide answers at the end, better interpretation and analysis of the results, multiple capabilities in using text, images, audio, and video, save on paper, and ability to improve the assessment quality. Electronic tests provide the possibility of cooperation between universities (2-7).

Assessing the quality of electronic exams plays a decisive role in determining the efficacy of electronic learning, which has attracted insufficient attention. Regrading increasing inclination toward e-exams, neglecting their quality is a major threat (8). There are different definitions for quality. Some have mentioned

quality as a subjective issue that can be elicited from the audience's point of view and their level of satisfaction. On the other hand, some believe that quality is associated with objectivity and have used quantitative criteria and relevant standards to assess quality. Reliability, discrimination index (DI), and difficulty index (DIF) are among the quantitative criteria developed for evaluating the quality of electronic tests (8-10). For example, some studies have evaluated the quality of e-exams by subjective methods (based on students' questionnaires) (6, 8). Several studies have used objective item analysis (e.g., DIF and DI items) to evaluate the quality of paper-based exams (11-14). Only a few studies have evaluated the quality of e-exams based on objective items (DIF and DI items) (10). Noteworthy, these few studies have mostly focused on the quality of online e-exams, and insufficient attention has been paid to the evaluation of the quality of isolated (campus-based) e-exams.

Therefore, due to the widespread use of electronic exams, this study aimed to assess the quality of

electronic exams held during the COVID-19 pandemic at the electronic exam center of Birjand University of Medical Sciences (BUMS).

Objectives

This study aimed to assess the quality of electronic exams held at the beginning of the coronavirus disease 2019 outbreak.

Methods

Following a cross-sectional design, this study included all e-exams of the electronic test center of BUMS. The study was confirmed by the ethical committee (ethical number: IR.BUMS.REC.1399.076). The sampling method was census. E-exams with multiple-choice questions (MCQ) were included in this study. The exclusion criteria were paper-based exams, exams held in other universities, exams held outside the electronic exam center of BUMS, exams held on academic years other than 2019-2020, and other types of exams except for MCQ.

To evaluate the quality of exams, we assessed the mean DIF, the mean DI, and reliability of tests performed during the academic year of 2019-2020. All of this information was extracted from the database of the Electronic Exam Center of BUMS.

The DI determines the strength of the item in distinguishing between the strong group and the weak group of students, which is a number between -1 to +1. The higher this index, the more desirable it is. The analysis of the descriptive discrimination index in the Electronic Exam Center system of the university was such that discrimination index greater than 0.3 was considered "appropriate" and less than 0.3 as "low". Obviously, the closer the value of this index to +1, the more powerful the test items are for distinguishing between strong and weak students (9).

The DIF indicates the percentage of correct answers, which ranges from zero to +1. A difficulty index of 0.3-0.7 indicates the appropriateness of the item or exam. Meanwhile, a value less than 0.3 indicates "difficulty", and a value higher than 0.7 shows "easiness" of the item or exam (9).

Reliability refers to the accuracy, stability, or repeatability of test results, which is usually determined by Cronbach's alpha; the closer the number to one, the greater the internal correlation among items, indicating higher homogeneity of the items of a test (9). The reliability of the tests in the University Electronic Exam Center system was calculated by calculating Cronbach's alpha. Cronbach suggested a reliability coefficient of 0.45 as "low", 0.75 as "average, and acceptable" and 0.95 as "high" (9). According to the University Electronic Exam Center system, values higher than 0.7 were considered favorable.

Due to the low number of exams held in the two faculties of Nursing and Midwifery and Paramedical, we merged the exams of these two faculties. The collected and analysis data were administered by SPSS version 16, descriptive statistics and frequency distributions, for example the mean and standard deviation were used to describe the data.

Results

In this study, 101 e-exams held in the Electronic Exams Center of the university in the academic year of 2019-2020 were reviewed. The highest number of e-exams was related to the medical school (n=71; 70.3%), followed by the dentistry school (n=19; 18.81%). On the other hand, the lowest number of exams was related to the paramedical school (n=1; 0.99%) and nursing and midwifery schools (n=2; 1.98%). Eight exams (7.92%) were held in the Faculty of Public Health.

For all exams, the mean value of DI, DIF, and reliability of the exams was, respectively, 0.28 ± 0.08 , 0.66 ± 0.14 , and 0.56 ± 0.31 . Table 1 shows the mean value of DIs, DIF and reliability of exams held by schools of the BUMS. The mean value of DI of the exams held by Schools of Nursing and Midwifery, Paramedical, and Public Health was appropriate. While schools of Medicine and Dentistry obtained 'inappropriate' values for this index. The highest value of DI was related to exams held by the School of Public Health, and the lowest value belonged to the School of Dentistry.

Table 1. The mean discrimination indexes, difficulty indexes, and reliability of exams held by different faculties

School	Item	Discrimination index		Difficulty index		Reliability	
		Mean (SD)	Description	Mean (SD)	Description	Mean (SD)	Description
Medical		0.28 (0.88)	Low	0.64 (0.15)	Appropriate	0.59 (0.24)	Low
Dentistry		0.26 (0.05)	Low	0.66 (0.09)	Appropriate	0.54 (0.27)	Low
Health		0.32 (0.09)	Appropriate	0.79 (0.13)	Easy	0.31 (0.69)	Low
Nursing and Midwifery+ Paramedical		0.30 (0.08)	Appropriate	0.66 (0.09)	Appropriate	0.76 (0.28)	Appropriate

The mean DIF of the exams was appropriate in all schools, except for the School of Public Health, which

the items were considered 'easy' according to the DIF. The highest DIF of exams (easiness of items and

exams) was related to the School of Public Health and, the lowest value (i.e., higher difficulty of items and exams) was related to the School of Nursing and Midwifery and School of Paramedical.

The mean reliability of the exams was favorable for the School of Paramedical and School of Nursing and Midwifery. On the other hand, it was unfavorable for other schools. The highest mean reliability of exams was related to the School of Paramedical and School of Nursing and Midwifery. Meanwhile, the lowest mean reliability was related to the School of Public Health.

DI of 39 exams (38.6%) was "appropriate", and the mean DI of 62 exams (61.4%) was "low". For 60 exams (59.4%), the DI was "appropriate", "easy" for 39 exams (38.6%), and "difficult" for two exams (2%). The reliability of 34 exams (33.7%) was "favorable", and the reliability of 67 exams (66.3%) was "unfavorable".

Table 2 presents the situation of exams held by various schools, separated by different categories of DI, DIF, and reliability.

Table 2. Frequency of exams of schools in different categories of discrimination index, difficulty index, and reliability

School	Item	Number of exams N (%)	Discrimination index		Difficulty index			Reliability	
			Appropriate N (%)	Low N (%)	Easy N (%)	Appropriate N (%)	Difficult N (%)	Favorable N (%)	Unfavorable N (%)
Medical		71 (70.3)	28 (39.4)	43 (60.6)	27 (38)	42 (59.2)	2 (2.8)	27 (38)	44 (62)
Dentistry		19 (18.81)	5 (26.3)	14 (73.7)	6 (31.6)	13 (68.4)	0 (0)	4 (21.1)	15 (78.9)
Health		8 (7.92)	4 (50)	4 (50)	5 (62.5)	3 (37.5)	0(0)	1 (12.5)	7 (87.5)
Nursing and Midwifery + Paramedical		3 (2.97)	2 (66.7)	1 (33.3)	1 (33.3)	2 (66.7)	0 (0)	2 (66.7)	1 (33.3)

Discussion

This study aimed to assess the quality of electronic exams held at the beginning of the coronavirus disease 2019 outbreak. DIF, DI, and reliability were considered to assess the quality of e-exams. For e-exams that were held in the electronic exam center of BUMS, the mean DI of all exams was low. The mean DI of all exams was appropriate. The mean reliability of all exams was unfavorable. Abualrob et al. (2019), which intended to assess the quality of electronic tests at Arab American University Palestine (AAUP), reported insufficient assessment of exams' quality (6). In their study, students gave a moderate score to the quality of e-exams.

In the study by Pourafshar et al. (2020), DIF of face-to-face and online tests were, respectively, 0.62 and 0.68 (10). These findings are consistent with our finding, which DI of face-to-face and online tests was, respectively, 0.30 and 0.33. Although DI of their study is similar to our study; to some extent, there is no agreement between our findings and their findings because by definition, DI of their study is "appropriate", while in our study it was "low". This inconsistency can be attributed to the higher ability of university professors of the Kerman University of Medical Sciences in designing exam's items than their counterparts at BUMS. They concluded that since face-to-face and online tests were considered appropriate, based on DI and DIF criteria, it appears that e-tests may be an appropriate alternative for face-to-face tests.

In a study by Musa et al. (2018) on physiology multiple choice question (MCQ) tests at Khartoum University, the mean DIF index was 0.56 and the majority of items had acceptable difficulty (11). In this respect, their findings are in line with this study. With respect to DI, 90.1% of items were acceptable.

Also, there is a discrepancy between the findings of the present study and their study, which can be attributed to designing strongly difficult/easy items by university professors of BUMS, which led to a relatively low DI of the exams. Ganji Arjenaki (2017) reported a positive and significant association between students' satisfaction and the quality of e-exams (8).

To assess the quality of e-exams, they evaluated the quality of the evaluation criteria, the quality of counter-fraud, the quality of learning, the quality of using new learning methods, and the quality of providing information on all aspects of the test. There was a positive and significant association between all items (except for the quality of counter-fraud) and student satisfaction. Noteworthy, in comparison to our study, they used different criteria to assess the quality of e-exams; hence, the findings of the two studies are not comparable.

In a study by Taib and Yusoff (2014) on MCQ in paper-based exams of fourth-year medical students, MCQ's DIFs ranged from 0.67 to 0.79 (the level was appropriate). This finding is in line with our results, except that they investigated paper exams. MCQs showed high DI (0.58-0.76), which implied its higher appropriateness for discrimination among students

(12). In the present study, the DI was low and ranged from 0.22 to 0.35. The results of our study do not match their results, which can be attributed to the higher ability of teachers to design standard items in their study. On the other hand, the nature of the two studies is different, i.e., we investigated e-exams.

Boopathiraj and Chellamani (2013) performed a study to assess items of an exam in the education field and showed that most of the items had proper DIF and DI. However, some items were not accepted because of inappropriate DI (13). Our results are in line with their results in the sense that in both studies, the weakness is mainly observed in the DI of items rather than the DI.

In a study by Mahjabeen et al. (2017), according to DIF, out of total 65 exams, 81% of MCQs were acceptable, 2% low DIF, and 17% had high DIF (14).

According to DI, 62% had very good DI; 23%, 8%, and 17% had good, acceptable, and poor DI, respectively. In our study, 59.4% of e-exams had appropriate DIF, which due to the fact that they had a higher percentage, compared to easy and difficult items, is in accordance with their result. In our study, 61.4% of e-exams had low DI, which contradicts the findings of their study and shows a significant difference with their result. The cause of this difference is the ability of teachers to design standard items in the two studies; that is, the higher ability of their teachers in designing items. Of course, it should not be overlooked that the nature of the two studies is somewhat different because we investigated electronic tests and they analyzed paper tests.

It is necessary to mention some limitations and biases of our study, including not comparing the quality of paper-based and e-exams. Hence, further studies should compare the quality of paper-based and e-exams using a similar sample of students. Another limitation is not comparing the quality of on-campus (isolated) e-exams and home-based (non-isolated) e-exams, which is suggested to include in future studies due to the extensive use of online exams. Another limitation of this study is the small number of e-exams held in some schools; hence, the authors recommend performing future studies on larger sample size (more e-exams).

It is suggested to hold faculty development programs for faculty members to improve their skills on how to design standard items with appropriate discrimination index and reliability.

Conclusion

In general, major problems in the quality of electronic exams are associated with DI and reliability

of exams; the DIF is generally appropriate. E-exam should be monitored continuously, and feedback should be provided to faculty members.

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Conflict of interests: We have no conflict of interest.

Ethical approval

This study has been approved by the ethical committee of BUMS (code: IR.BUMS.REC.1399.076).

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Iranian Measure of Operating Theatre Educational Climate (IMOTEC): Validity and Reliability Study

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Abstract

Background: In modern medical education, the emphasis on student-centered learning and task-based learning has made the role of a learning environment more highlighted. In curriculum development, aligning educational objectives, teaching methods, and assessment methods with the educational environment is emphasized. In the process of evaluating curriculum components, along with the assessment of the other parts, assessing the educational environment through a valid and reliable tool is essential.

Objectives: The purpose of this study was to develop a psychometric and localized version of the Surgical Theatre Educational Environment Measure (STEEM) tool for surgical technologists in Iran.

Methods: The present study was a descriptive and analytical study that was conducted cross-sectionally in 2021. After obtaining permission from the developer of the standard questionnaire, following the principles of localization, the stages of translation and re-translation of the STEEM tool were done. The validity of its face and content was then assessed. In order to determine construct validity, the questionnaire was distributed among 201 surgical technology students. The construct validity of the instrument and its reliability was investigated using exploratory factor analysis, and Cronbach's alpha and intra-cluster correlation coefficient, respectively. Data were analyzed using SPSS 19.

Results: The study of face, content, and construct validity resulted in providing a STEEM questionnaire with 5 subscales and 30 questions covering 55.6% of the total variance. The reliability of the whole questionnaire (Cronbach's alpha) was 0.845.

Conclusion: Based on the findings of this study, the Iranian version of STEEM, entitled Iranian Measure of Operating Theatre Educational Climate (IMOTEC) has appropriate validity and reliability, and can effectively measure operating theatre educational climate from the perspective of undergraduate surgical technology students.

Keywords: Psychometrics, Assessment, Education Environment, Operating Room, Surgical Technologist

Background

The main and primary goal of clinical education is to prepare students for the implementation of clinical skills in different healthcare situations (1) whereas a significant part of learning and teaching occurs in the clinical environment (2). It is necessary to recognize factors that affect it (3). Factors such as having a structured educational program, effective teaching method, and appropriate assessment tool (4). One of the

important ways to achieve this goal is evaluation for these factors in the clinical environment (5).

Measuring the quantity and the quality of the educational environment and atmosphere plays a key role in creating and improving the optimal educational environment in medical schools and clinical settings (6). On the contrary, inappropriate evaluation may prevent achieving the goals of the educational system (7). One of these unique clinical environments is the operating

room where teaching and learning happen in complex situations and interaction with others (8).

Studies show that the operating room provides an opportunity for students to develop and enhance their clinical skills associated with peri-operative care, and integrate their theoretical and practical knowledge (9). Fortunately, in recent years, many studies have focused on measuring the educational environment (10). This improvement in the appropriate and accurate evaluation of the educational environment is the result of developing efficient measuring instruments in this area (11).

Applying the appropriate instrument for assessing the clinical educational environment improves the environment, as well as makes it possible to apply changes to it. These instruments were developed in different environments of clinical education. For example, Anesthesia Theatre Learning Environment Measure (ATEEM) Surgical Theatre Educational Environment Measure (STEEM), or Postgraduate Hospital Educational Environment Measure (PHEEM) (12).

As mentioned above, one of these instruments is the Surgical Theatre Educational Environment Measure (STEEM) which was first developed by Kevin Cassar in 2004 for surgical residents (13). In the following years, STEEM was implemented and localized in some countries such as Canada that entitled OREEM or AMOTEC in Australia and OTEEM in Nigeria (14-16). Given that Cassar performed psychometric tests on this tool by evaluating postgraduate students, Nagraj introduced another tool called Mini STEEM in 2007, which was designed for undergraduate students, and validated it. Mini STEEM contains 14 items and 3 subscales (17). In the literature review, various factors have been stated in the learning experience of operating room students. In this case, Vesalim et al. 2020, after a literature review and thematic analysis, point to 26 structures in 5 areas (18). Also, Jahangir et al. (2021) stated that the experience of medical students is unique and differs from the resident's perspective on the educational atmosphere of the operating room, but they did not confirm the content validity of Mini-STEEM for all undergraduate students and believed that not all aspects of students' educational experience were considered in the Mini-STEEM (19). So, he and colleagues developed another new tool for medical students named SOREEM (Surgical Operating Room Educational Experience measure for Medical Students), which consists of 50 items (20).

According to studies conducted in Iran, various clinical educational environments such as ambulatory care and inpatient learning educational environments, have been assessed using appropriate tools. However,

the educational environment of operating rooms has not been evaluated through proper tools.

Objectives

Following other studies about the development of new or localized instruments for undergraduate students and considering the difference between surgical technologists and other undergraduate or postgraduate students in comparison of the internship period, teaching methods, and their role in the surgical team, the researchers decided to develop a psychometric and localized version of the (STEEM) tool for surgical technologists in Iran.

Methods

This cross-sectional descriptive-analytic study was conducted in 2021 to develop the psychometric scale Surgical Theater Educational Environment Measure (STEEM) tool.

The main tool used in this study is the STEEM standard questionnaire in English which consists of two parts. The first part was related to recording demographic information (age, sex, and semester). The second part, the STEEM questionnaire (Surgical Theater Educational Environment Measurement) consisted of 40 items in 4 subscales under the following titles: trainees' perceptions of their trainer and training (13 items), trainees' perceptions of learning opportunities (11 items), trainees' perceptions of the atmosphere in the operating theatre (8 items), and trainees' perceptions of supervision, workload, and support (8 items). A 5-point Likert scale with 1-5 coding was used as follows: Strongly agree (5), Agree (4), Unsure (3), Disagree (2), and strongly disagree (1).

Nineteen Items (8, 11, 14, 16, 19, 22, 23, 26, 27, 28, 30, 31, 33, 34, 35, 36, 37, 38, and 40) consist of negative statements and are coded as negative. The maximum score would be 200 (13).

Research samples consisted of undergraduate students in surgical technology from the Iran University of Medical Sciences and Alborz University of Medical Sciences, who were selected through the census sampling method based on inclusion criteria. The research sample consisted of 201 students, which was considered to be 5 times the number of questionnaire items.

The stages of questionnaire development according to Figure 1 were as follows:

Translation of the questionnaire into Persian: At first, in accordance with the standards of psychometric evaluation and localizing tools, the necessary permit was obtained from the original developer of the English version of the Surgical Theatre Educational

Environment Measure (STEEM) questionnaire, Kevin Cassar, University of Aberdeen, Scotland, in order to implement and translate the questionnaire. After obtaining the permit, the questionnaire was translated from English into Persian by 3 translators. Then the Persian version was back-translated by 2 English speakers who were also fluent in Persian and the result was compared with the original questionnaire. During a session with translators and researchers, the differences between the two English versions were revised and the final version of the back-translation was agreed upon.

In order to determine the content and face validity of the questionnaire, ten professors familiar with training in surgical technology were provided with the questionnaires. The content validity of the questionnaire was evaluated from two aspects: content validity ratio (CVR) and content validity index (CVI).

Determine the content validity ratio: In calculating the content validity ratio, the necessity and usefulness of each item were assessed. The following formula was used to calculate the content validity ratio:

$$CVR = \frac{N_e - N/2}{N/2}$$

In this formula, N_e is the number of experts rating an item as *Essential* and N is the total number of experts rating the items. If the calculated CVR value for each item is greater than the critical value of 0.62, the content validity of that item will be approved (21).

Determine the content validity index: CVI was calculated according to Waltz and Bausell's (22) content validity index which determines the amount of relevance, simplicity, and clarity of each item in the questionnaire on a 4-point Likert scale for each item. For example, for "relevance" the following points are used: "completely relevant", "relevant", "somehow irrelevant", and "incompletely irrelevant" (23). In this study, the content validity index was calculated for each item by dividing the number of panelists scoring 3 and 4 by the total number of panelists (24). According to Hyrkas et al, a score of 0.79 and higher was considered for the confirmation of items according to CVI (25). Then the mean score of the content validity index was calculated for each item and also for the whole items.

Determine reliability: After calculating content validity and developing a questionnaire with acceptable CVI and CVR, reliability was evaluated by measuring

internal consistency and also the test-retest method. In order to measure internal consistency, Cronbach's alpha coefficient was calculated for 30 samples. For evaluating the reliability of the questionnaire, the test-retest method was implemented by distributing the questionnaire at a two-week interval among qualified candidates. The intraclass correlation (ICC) was calculated. Values higher than 0.8 are acceptable for approving the reliability of the tool (26). Then the final questionnaire was distributed among the research population and the results were analyzed using SPSS 19 software.

Determine construct validity: For evaluating construct validity, exploratory factor analysis was performed at the following stages:

1. The assessment of sample adequacy was performed by the Kaiser-Meyer-Olkin test. KMO higher than 0.7 was defined to confirm sampling adequacy.
2. Examining the correlation matrix of variables by using Bartlett's test of sphericity for factor analysis.
If Bartlett's test value was significant at a level of less than 0.05, then there was a significant relationship between the variables and it was possible to discover a new structure in the data.
3. Factor extraction by implementing the principal components analysis method
4. Rotating factors by applying Varimax rotation (27)

Results

201 undergraduate students of surgical technology participated in this study, 67% of whom were female and 33% male. The mean age of participants was 22 (20-25) years and they were in semesters 3 to 8. All the samples had the experience of presence in the surgical theater for at least two semesters.

After examining the face validity by the expert's panel, in the first validation phase, questions 31, 33, and 34 were omitted.

According to the results of the content validity examination in the 37-item questionnaire, and also considering the average content validity ratio of 0.57 and the content validity index of 0.92, a new 35-item questionnaire was developed after the following changes:

- Items No.1, 2, 5, 6, 8, 17, 18, 19, 20, 22, 25, 27, 30, 36, and 39 were approved after being modified.
- Items No.1, 10, 28, 37, 38, and 40 were omitted and replaced.
- Items No.21 and 24 were omitted and the rest were approved.

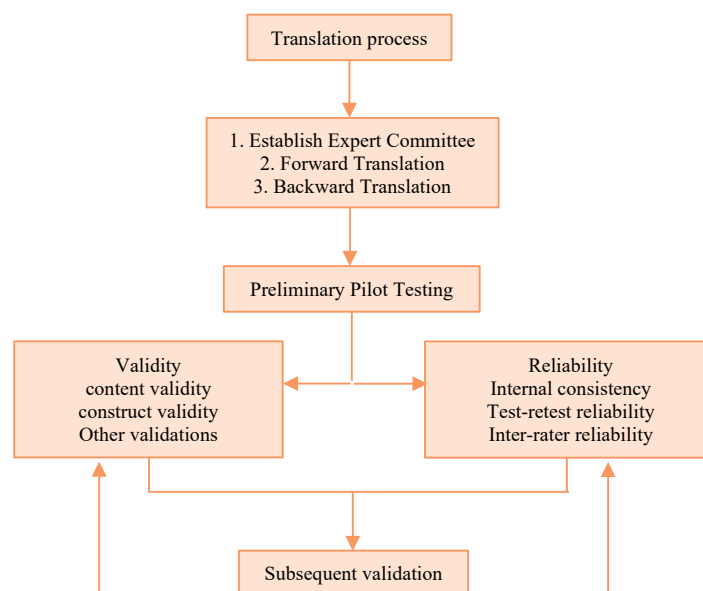


Figure 1. questionnaire development steps

In the stage of assessing the completion of the questionnaire by the students of surgical technology, the overall mean score of the questionnaire was calculated 89 out of 175. The highest mean score belonged to the first subscale, i.e. trainees' perceptions of their trainer and training (26.8). The lowest mean score belonged to the subscale trainees' perceptions of supervision, workload, and support (17.3). More detailed information can be found in [Table 1](#).

The results of examinations regarding the reliability of the original 40-item questionnaire and the secondary 35-item questionnaire approved the reliability of the tool in both stages (The Intra Class Correlation (ICC) > 0.9).

The examination of construct validity by the Kaiser-Meyer-Olkin (KMO) test approved the adequacy of the sample size (KMO = 0.88). Bartlett's test also showed a level of significance ($P \leq 0.0001$).

During calculating construct validity and factor analysis, in the secondary 35-item questionnaire, 5 items (The equivalent of items No.15, 16, 22, 26, and 36 in the 40-item questionnaire) with a factor loading of less than 0.4 were omitted. Factors were extracted by performing principal component analysis on the main components with an eigenvalue of more than 1, which led to the identification of seven factors that explained 62.6% of the total variance. However, researchers chose the first five factors that accounted for 55.6% of the total variance. Thus, the final questionnaire, called IMOTEC (Iran Measure of Operating Theater Educational Climate), was obtained with 30 items and 5 subscales ([Appendix](#)).

The names of some factors and the axis of some items changed. Due to the nature of the items, new

domains were identified and named. [Table 2](#) shows the factor rotation matrix. This matrix indicates the items associated with each factor. As seen in this table, item No.22 was loaded on two factors (3 and 5). Researchers chose domain 3 for this item. Finally, no other factor rotation was more appropriate in separating components than varimax rotation. Therefore, the results were interpreted based on this rotation.

Changes made to the domains were as follows:

- Item 11 from domains 1 to 5
- Items 34 and 35 from domains 4 to 1
- Item 14 from domains 2 to 5
- Items 17, 18, and 20 from domains 2 to 4
- Items 19 and 22 from domains 2 to 3
- Items 23, 24, 26, 27, and 30 from domains 3 to 2
- Items 29 and 33 from domains 4 to 3
- Item 31 from domains 4 to 5

After performing factor analysis and obtaining domains, Cronbach's alpha was again calculated to examine the reliability of the questionnaire. Results are shown in [Table 3](#). As seen in the table, the highest reliability is associated with domain training. The total reliability of the questionnaire (Cronbach's alpha) was calculated at 0.845.

Discussion

The psychometric evaluation of the Iranian version of STEEM was performed by modifying items 1, 2, 5, 6, 8, 11, 16, 17, 18, 19, 20, 22, 25, 27, 30, 36, and 39, removing and replacing items 10, 28, 37, 38 and 40, and removing items 21, 24, 31, 33 and 34. The results show that this tool was a valid, reliable, and practical tool for evaluating the educational environment of operating rooms for undergraduate trainees in Iran.

Similar to other studies conducted by Nagraj, Mahoney, Ibrahim, Binsaleh, Soomro, Majbar, and Ahmad Cronbach's alpha coefficient for the modified questionnaire was calculated to be higher than 0.7 ($= 0.845$) in this study, which approves the internal consistency and reliability of the tool (13-17, 19, 28-30).

Also, by the comparison of different subscales of the questionnaire regarding the students' gender, no significant difference was found between female and

male students in any of the subscales, which was in line with the study of Cassar (Scotland, 2004). However, by taking into account the academic term, in the subscales of learning opportunities and workloads, a significant difference was found in the scores of students of different semesters, which was consistent with the results of Cassar's study of the subscale of learning opportunities (13).

Table 1. Central indices and dispersion of subscale scores in 4 domains of initial questionnaire

Subscale	N	Score		Mean (SD)
		Lowest	Highest	
Trainees' perceptions of their trainer and training	199	13	65	26.84 (10.0)
Trainees' perceptions of learning opportunities	198	11	41	26.79 (4.24)
Trainees' perceptions of the atmosphere in the operating theatre	201	7	28	18.29 (4.10)
Trainees' perceptions of supervision, workload, and support	201	8	24	17.33 (2.74)
Total	196	44	145	89.34 (15.13)

Table 2. Rotated components matrix

	Component				
	1	2	3	4	5
Q1	0.69				
Q2	0.77				
Q3	0.78				
Q4	0.81				
Q5	0.65				
Q6	0.76				
Q7	0.72			0.33	
Q8	0.73				
Q9	0.71				
Q10	0.66				
Q11					0.49
Q12	0.68				
Q13	0.62		-0.35		0.35
Q14					0.72
Q17	0.33	0.30		0.54	
Q18				0.66	
Q19			0.74		
Q20				0.62	
Q22			0.46		0.40
Q23		0.64			
Q24	0.33	0.57			
Q26		0.63			
Q27		0.71			
Q28			0.66		
Q29	-0.33		0.58	0.34	
Q30		0.60			
Q31			0.32		0.55
Q33			0.58		
Q34	0.63		-0.30		
Q35	0.64		-0.32		

In this study, similar to Mahoney and Nagraj's studies, the STEEM tool underwent modifications for the validity to enhance and match the educational environment of Iran. For example, regarding the validity of their data, Mahoney et al stated that Cassar's original subscales were not supported by the data of their research. Instead of four subscales with equal importance, one specific subscale covers up to 32% of the total variance which focuses on the trainer's skills

and behavior and has an internal consistency of higher than 0.9. Besides, it identifies up to 5 subscales, which were named according to their items as 'Supervisor Facilitation of Learning Opportunities', 'Characteristics of the Surgical List', 'Interaction with Non-Surgical Staff', and 'Distractions from Operating Theatre Learning'. All of these subscales had an internal consistency of more than 0.7 and the total internal consistency of 0.91 (15).

In the current study, performing exploratory factor analysis (KMO = 0.88) and extracting factors with an eigenvalue greater than one through principal component analysis resulted in the identification of seven factors, which accounted for 62.6% of the total variance. However, in the final evaluations, the first five factors were chosen, which explained 55.6% of the total variance. Based on covering relevant items, these five subscales are named as follows: teaching and training, interaction with theatre staff, learning opportunity, workload, and support and supervision. In Ahmad's study, 5 subscales including structured learning process, psychological management and training, organizational support, quality of faculty & training, and students' self-regulation and participation were identified in factor loading, which is aligned with the present study (20).

Additionally, the factor analysis output in Nagraj's study consisted of three factors explaining 56% of the total variance and indicating that there are 3 subscales, which were named due to their relevant items as follows: good surgical operating experience, friendly atmosphere in theatre, and discrimination against me. In this study, after performing exploratory factor analysis (KMO = 0.770), 13 factors were found to count for 73.2% of the total variance, and according to this fact, the 40-item STEEM questionnaire was condensed to a 14-item questionnaire (17).

It should be noted that in order to enhance the suitability of the STEEM questionnaire for Nigerian educational environments, Ibrahim reduced the number of items to 33 by removing items associated with gender and racial discrimination and time limitations before distributing them.

Similarly, in this study 10 items were excluded according to face and content validity (6 items) and the results of exploratory factor analysis (5 items with factor

loadings less than 0.4). Therefore, a shorter questionnaire with 30 items was presented to the respondents (16).

Similar to the Mahoney study in which 1 item in relation to private patients was added to Cassar's 40-item questionnaire (15), in the present study, 5 questions were replaced as a substitute for a number of excluded questions, added to the questionnaire.

Table 3. Data distribution and Cronbach's alpha coefficient of each domain after factor analysis

Subscale	Cronbach's Alpha	Number of items	% Of the explained variance
Training	0.937	14	25.561
Interaction with surgical staff	0.734	5	8.975
Learning opportunities	0.686	5	8.893
Workload	0.564	3	6.733
Support	0.532	3	5.437
Total	0.845	30	

One of the important points criticized in the evaluation of the STEEM questionnaire is its Likert scale. A study entitled Surgical Theatre (Operating Room) Measure STEEM (OREEM) Scoring Overestimates Educational Environment: the 1-to-5 Bias, which was conducted by Dimoliatis (2013) in Greece, states that the questionnaires of DREEM, ATEEM, PHEEM use a 5-point Likert scale scoring with a 0-4 coding, and criticized the 1-5 scoring of 5-point Likert scale in STEEM, OREEM, and Mini STEEM. Dimoliatis believes that this scoring method reduces the value of this precious tool because whenever we express a number as a percentage, we expect it to fall within a 0-100 range so that the scores will be interpreted as follows:

- Very poor - if the score lies between 0 and 24.9
- Poor - if it lies between 25 and 49.9
- Good if it lies between 50 and 74.9
- Very good if it lies between 75 and 100

However, if the items are coded from 1 to 5 in a 5-point Likert score, it might result in errors, as happens in STEEM, OREEM, and Mini STEEM, and is likely to distort respondents' perceptions. For instance, when the total mean score is 148 out of 200, we expect it to be equal to 74% in the 0-100 range. However, this is not the case, and the given score falls within the 20-100 range. As a result, this method of scoring the questionnaire items from 1 to 5 will lead to a 20% overestimation of the actual percentage of the results, which reduces the usefulness of this tool. The obtained percentage would be equivalent to the total mean score only if the lower limit is zero. In other words, the quotient is a pseudo-percentage, not a percentage (0-based) (31). Therefore, the present study was based on the STEEM questionnaire, and the calculations and assessments were done according to the 5-point Likert

scale with a 1-5 coding, however, in order to increase the accuracy and efficiency of the tool and avoid computational errors while estimating the obtained scores, the final modified questionnaire of this study will use the 5-point Likert scale with a 0-4 coding, and according to the final 30-item questionnaire, the scores would be interpreted as follows:

- Very unfavorable: If the score is in the first zone, that is 0-29.9.
- Unfavorable: If the score is in the second zone, which is 30-59.9.
- Favorable: If the score is in the third zone, that is 60-89.9.
- Very favorable: if the score is in the fourth zone, that is 90-120.

In addition, the scoring should be reversed for negative statements: 11, 14, 17, 19, 24, 25, 27, and 28.

Conclusion

According to the findings, the localized Iranian version of the STEEM questionnaire, called IMOTEC (Iran Measure of Operating Theater Educational Climate), is a reliable and valid tool that can be implemented for the assessment of the educational environment from the viewpoint of undergraduate students and can be used for educational, research and practical purposes to evaluate the educational environment of surgical theatres in Iran.

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Ethical approval: The present study was conducted with code of ethics IR.IUMS.FMD.REC 1396.9511101008.

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Your participation in this questionnaire will be anonymous. Please read the following questions carefully and respond to them according to the 5 options. Your answers should reflect the educational climate in the operating room at your current post.

Thank you for your cooperation.

Age:

Sex:

Semester:

Hospital:

Appendix. The localized Iranian STEEM questionnaire (IMOTEC)

	Strongly disagree	Disagree	Unsure	Agree	Strongly agree
1. My trainer follows my training program dutifully.					
2. My trainer has a good deal with me.					
3. My trainer is enthusiastic about teaching					
4. My trainer has a genuine interest in my progress.					
5. My trainer teaches based on my level of understanding and learning.					
6. My trainer has adequate clinical skills.					
7. My trainer gives me time to practise surgical skills in theatre					
8. My trainer teaches me the correct and safe principles of using surgical instruments.					
9. Before the operation my trainer discusses the surgical technique planned					
10. My trainer helps to reduce my stress when working.					
11. My trainer expects me to be as good as him/her in my assigned tasks.*					
12. My trainer gives me feedback on my performance.					
13. My trainer's criticism is constructive.					
14. On this unit the type of operations performed are too complex for my level.*					
15. I have enough time to practice clinical skills in the operating room.					
16. The number of internship sessions in each semester is sufficient for me to gain experience.					
17. The simultaneous attendance of senior trainees in the operating room spoils my learning opportunities.*					
18. The number of procedures is sufficient for me to gain good experience in this area.					
19. Due to time constraints, I lose a lot of learning experiences in operating room.*					
20. The operating room staff provide my trainer with adequate time to be able to teach me during procedures.					
21. Educational climate of operating room provides me with sufficient incentive to choose this job in the future.					
22. There is a coordination between my educational objectives and the surgical and anesthetic team's expectations.					
23. The theatre staff are friendly.					
24. I feel that learning opportunities in the operating room are not provided equally to students.*					
25. I feel that my trainer does not assess students using a balanced perspective.*					
26. I feel part of a team in theatre.					
27. I am so stressed in theatre that I do not learn as much as I could.*					
28. During surgery, there is nobody to explain to me.*					
29. My trainer evaluates me based on the lesson plan by using the correct assessment tools and methods (checklist, logbook, etc.).					
30. My trainer supervise my performance directly and indirectly.					

*It should be noted that questions 11, 14, 17, 19, 24, 25, 27 and 28 have a negative meaning and should be calculated inversely in the scoring.

Investigating the Relationship between Research Anxiety and Academic Self-Concept in Master's and Doctoral Students

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Abstract

Background: Research anxiety and academic self-concept are among the factors that can be effective in improving the level of students' capabilities in research in the field of medical education.

Objectives: The present study was conducted to determine the relationship between research anxiety and academic self-concept in master's and doctoral students of Shahrekord University of Medical Sciences.

Methods: This cross-sectional descriptive-analytical research was conducted on 102 graduate students of Shahrekord University of Medical Sciences in the master's and doctoral degrees in 2019. Sampling was performed using a convenience method. The data collection tool included the Higgins Research Anxiety Inventory and the Academic Self-Concept Questionnaire (ASCQ). The data were analyzed by calculating the mean and standard deviation, the independent t-test, and the Pearson correlation coefficient in SPSS software.

Results: In master's students, research anxiety was inversely and significantly correlated with academic self-concept ($r = -0.339$, $P = 0.002$) and academic self-confidence ($r = -0.425$, $P < 0.001$). Also, academic self-concept was directly and significantly associated with academic self-confidence ($r = 0.876$, $P < 0.001$) and academic effort ($r = 0.821$, $P < 0.001$). In doctoral students, academic self-concept also showed a direct and significant association with academic self-confidence ($r = 0.835$, $P < 0.001$) and academic effort ($r = -0.753$, $P < 0.001$).

Conclusion: Research anxiety was associated with academic self-concept in master's students of Shahrekord University of Medical Sciences, but such a relationship was not found in doctoral students.

Keywords: Research, Self-Concept, Students

Background

Today, researchers face many challenges in the way of research, which impose a lot of stress and anxiety on them and may even affect their jobs, family responsibilities, and even health (1). Research anxiety refers to the characteristics during which the student feels uncomfortable, and this feeling is to the extent that lowers his/her efficiency (2).

Another factor that plays an important role in the development of research is self-concept. Academic self-concept refers to an individual's self-assessment regarding specific academic aspects or his/her abilities in this field (3). Academic self-concept refers to the comprehensive perception or idea of one's competence concerning learning, which simultaneously both affects and is affected by the individual's academic progress (4).

Regarding the importance of academic self-concept, it should be said that this notion is seriously one of the determinants of self-efficacy and encouraging motives to gain academic achievements (5). Also, it can be helpful in giving structural feedback and expanding students' capabilities (6) and academic progress at higher levels (7).

Given the mentioned materials, evaluating research anxiety and academic self-concept and solving related problems can play an important role in the development of scientific skills and the academic progress of students. Therefore, the present research was conducted to investigate the relationship between research anxiety and academic self-concept in master's and doctoral students of Shahrekord University of Medical Sciences.

Objectives

The present study was conducted to determine the relationship between research anxiety and academic self-concept in master's and doctoral students of Shahrekord University of Medical Sciences.

Methods

This cross-sectional descriptive-analytical study was conducted on all master's and doctoral students of Shahrekord University of Medical Sciences in 2019. The samples were selected through the convenience sampling method. One hundred and forty-six students were studying in the master's degree, and 26 were studying in the doctoral degree at Shahrekord University of Medical Sciences, of which 102 people agreed to cooperate. All master's and doctoral students who were doing a research project or their theses and were willing to participate in the study were included. The exclusion criterion included students' unwillingness to participate in the research.

The data collection tool was a three-part questionnaire, the first part of which was a demographic questionnaire.

The second part of the questionnaire was the research anxiety inventory first designed and used by Higgins and Kotrlík in 2006 (2). This scale includes 15 items on a 5-point Likert scale from "very disagree" (score 1) to "very agree" (score 5). Scoring in this questionnaire is reversed in questions 6, 12, 13, 14, and 15. This tool has good validity and reliability, and its Cronbach's alpha coefficient was found to be 0.85 in Rezaei et al.'s study (8).

The third part of the questionnaire was an academic self-concept measurement tool. This tool was first used by Liu and Wang in 2005 (9) with two subscales of academic self-confidence and academic effort, each of which includes 10 questions involving positive and negative spectrums and prevents uniform response from the respondents. Academic self-confidence includes questions 1, 3, 5, 7, 9, 11, 13, 15, 17, and 19, and academic effort involves questions 2, 4, 6, 8, 10, 12, 14, 16, 18, and 20. This questionnaire has a 5-point Likert scale from "completely disagree" (score 1) to "completely agree" (score 5). The validity and reliability of the mentioned scale were validated by Matovu on university students in Malaysia, which had acceptable validity and reliability (10).

The data were analyzed by calculating the mean and standard deviation and the independent t-test to compare the mean scores of research anxiety and academic self-concept and its dimensions in two groups of students and the Pearson correlation coefficient to

investigate the relationship of research anxiety to academic self-concept and its dimensions using SPSS software version 18 (version 18, SPSS Inc., Chicago, IL). The mentioned tests were used due to the normal distribution of the data. In the current study, the confidence coefficient was 95%, and $P < 0.05$ was considered the significant level.

Results

This study was conducted on 102 graduate students, of whom 82 were master's and 20 were doctoral students. The mean age of master's and doctoral students was 30.40 ± 5.85 and 31.60 ± 4.37 , respectively.

According to Table 1, the mean score of research anxiety in doctoral students was significantly higher than that in master's students ($P = 0.013$). Also, the mean score of academic self-concept in master's students was reported to be higher than that in doctoral students ($P = 0.041$). The dimensions of academic self-concept, including academic self-confidence and academic effort, were higher in master's students than in doctoral students, but this difference was not statistically significant ($P > 0.050$).

According to the results of the correlation coefficient matrix (Table 2), research anxiety was inversely and significantly correlated with academic self-concept ($r = -0.339$, $P = 0.002$) and academic self-confidence ($r = -0.425$, $P < 0.001$) in master's students. Academic self-concept also showed a direct and significant association with academic self-confidence ($r = 0.876$, $P < 0.001$) and academic effort ($r = 0.821$, $P < 0.001$). In the current research, age had no significant association with research anxiety and academic self-concept and its dimensions ($P > 0.050$).

Based on the results of the correlation coefficient matrix (Table 2) in doctoral students, no correlation was observed between research anxiety and academic self-concept and academic self-confidence. Academic self-concept also was directly and significantly associated with academic self-confidence ($r = 0.835$, $P < 0.001$) and academic effort ($r = 0.753$, $P < 0.001$). In the present study, age showed an inverse and significant correlation with academic self-concept ($r = -0.511$, $P = 0.021$) and academic effort ($r = -0.493$, $P = 0.027$).

Discussion

The present study was conducted to determine the relationship between research anxiety and academic self-concept in master's and doctorate students of Shahrekord University of Medical Sciences.

Accordingly, research anxiety was inversely and significantly correlated with academic self-concept and academic self-confidence in master's students.

Table 1. Comparison of the mean scores of research anxiety, academic self-concept, and its dimensions (academic self-confidence and academic effort)

Variable	Master	Doctoral	t	Mean Difference	95% Confidence Interval		P-Value
	Mean (SD)	Mean (SD)			Lower limit	Upper limit	
Research anxiety	40.06 (7.77)	45.10 (8.96)	-2.52	-5.03	-9	-1.07	0.013
Academic self-concept	44.64 (8.35)	40.50 (6.43)	2.07	4.14	0.17	8.11	0.041
Academic self-confidence	21.21 (5.32)	18.70 (4.39)	1.95	2.51	-0.03	5.07	0.053
Academic effort	23.42 (4.50)	21.80 (3.67)	1.49	1.62	-0.52	3.78	0.138

Table 2. Correlation coefficient matrix of age, research anxiety, and academic self-concept and its dimensions in master's and doctoral students

Group	Variable	Pearson Correlation Coefficient	Statistical Significance (p-value)
Research anxiety	Master	-0.339**	0.000
Academic self-concept	Doctoral	-0.343	0.139
Research anxiety	Master	-0.425**	0.000
Academic self-confidence	Doctoral	-0.331	0.154
Research anxiety	Master	-0.126	0.258
Academic effort	Doctoral	-0.205	0.386
Research anxiety	Master	0.146	0.190
Age	Doctoral	0.212	0.370
Academic self-concept	Master	0.876**	0.000
Academic self-confidence	Doctoral	0.835**	0.000
Academic self-concept	Master	0.821**	0.000
Academic effort	Doctoral	0.753**	0.000
Academic self-concept	Master	0.087	0.534
Age	Doctoral	-0.511*	0.021
Academic self-confidence	Master	0.444**	0.000
Academic effort	Doctoral	0.267	0.256
Academic self-concept	Master	0.78	0.484
Age	Doctoral	-0.336	0.148
Academic effort	Master	0.070	0.533
Age	Doctoral	-0.493*	0.027

**significant at the 0.01 level, *significant at the 0.05 level

The results of a study conducted to examine research anxiety among faculty members of Isfahan University of Medical Sciences showed that the mean score of research anxiety among faculty members was higher than the average so that the level of research anxiety was evaluated as 3.270 ± 0.536 and this issue needs to be addressed by the officials in this regard (1).

In the current study, research anxiety was not found to correlate with academic self-concept and academic self-confidence in doctoral students ($P > 0.050$). In this regard, the results of Rezaei et al.'s study showed that the mean score of research anxiety in master's and doctoral students was at an average level, and no significant relationship was found between students' research anxiety and self-efficacy (8). The mean score of academic research anxiety in doctoral students was significantly higher than that in master's students ($P = 0.013$).

In the current research, no relationship was found between gender and the dimensions of self-efficacy and research anxiety, but the results of some studies conducted to investigate gender differences in academic self-concept showed that boys had more self-concept regarding mathematics and science, while

in girls, academic self-concept was more in English language course (11).

In the present research, the mean score of academic research anxiety in doctoral students was significantly higher than that in master's students ($P = 0.013$), but the mean score of academic self-concept in master's students was reported to be higher than that in doctoral students. In this regard, Wouters et al.'s study showed that academic self-concept was one of the main determinants of the learners' academic progress. They concluded that academic compatibility and success in higher education depended on higher academic self-concept (7).

Conclusion

Research anxiety was related to academic self-concept in master's students of Shahrekord University of Medical Sciences, but no such association was found in doctoral students. Therefore, it is suggested to take measures to reduce the anxiety of master's students. The results of the present study can be used in developing and formulating better policies and policymaking in the research and education department of the University of Medical Sciences.

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The Relation of Dental Students' Learning Styles to Their Satisfaction with E-Learning

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Abstract

Background: E-learning is often covered in university curricula.

Objectives: The purpose of this research was to identify the learning style of students and to look at the connection between learning styles and satisfaction with e-learning.

Methods: All first- through third-year dentistry students at Kerman University of Medical Sciences participated in this descriptive cross-sectional survey in 2022. Four key portions of a 50-question electronic survey were addressed: 1) Demographic questions, 2) Kolb learning style inventory, 3) the e-learning survey, and 4) satisfaction with the e-learning questionnaire. The Kolmogorov-Smirnov test was used to check the normality of the data. Descriptive statistics (mean, standard deviation, frequency, percentage) and analytical (Kruskal-Wallis test, chi-square test, Fisher's exact test) were used to analyze the data in SPSS software. A significance level of $P > 0.05$ was considered.

Results: The questionnaire was filled out by 120 students in total (88% response rate). Divergent learning styles substantially increased students' satisfaction with e-learning compared to other learning styles ($P = 0.048$). The demographic variable and learning style did not significantly correlate (age-gender-semester- mean score). Additionally, e-learning had a middle-of-the-road average satisfaction score (78.32).

Conclusion: This research indicated a considerable relationship between dental students' learning style and their satisfaction with e-learning.

Keywords: Learning Style, Satisfaction, Students, E-Learning, Dental Student

Background

Due to the internet's rise to prominence as an educational instrument, the learning environment for medical science today differs from that of previous decades (1). These students often engage in experiential learning and logic-based approaches, and they frequently make use of cutting-edge teaching techniques like e-learning (2, 3). E-learning is as efficient as classroom instruction. E-learning differs from traditional educational models in several important ways, including its promotion of self-directed learning, upkeep of content with the most recent evidence-based material, and encouragement of medical students to take charge of their education through the adaptability of its materials. Through online assessments, instructors may objectively evaluate students' skills in such models, allowing them to get personalized feedback on their

development (4). E-learning is essential to the medical sciences, which include medicine, dentistry, nursing, and other fields. Several scholars have successfully examined the efficacy and acceptability of e-learning in dentistry education (5, 6). An engaging and dynamic learning environment that has been well-received by dentistry students has been made possible by the creation of novel teaching techniques using cutting-edge technology (7). With e-learning, students may attend courses whenever and wherever they choose to utilize smart devices. Additionally, it is important to encourage students to do their research outside of academic journals and internet sites (webinars, clinical videos, etc.) (8). Additionally, dental students said that online modules helped them better comprehend the course's topics and apply them to actual dentistry circumstances. In other words, online courses improve students'

knowledge of fundamental scientific concepts and their capacity to apply that knowledge in challenging clinical scenarios (9). The function of the student in the online learning system is crucial. Placing learners at the center of pedagogy is one of the aspects that influence e-learning (10). Learning styles may also influence how successful e-learning is (11). Learning style refers to a student's chosen method of learning. In adaptable e-learning systems, learning style might be crucial (12). By providing useful insights into students' strengths and limitations throughout the educational process, understanding learning styles may help dental students perform better and have a better educational experience. The literature has documented a number of learning style models, including the Felder and Solomon learning style, the VARK learning style, the Kolb learning style, etc. (2, 13, 14). The most well-known and often used learning style theory is Kolb's, however. Student satisfaction is a key element that influences e-learning (15). A useful indicator of academic success, such as successful graduation, dedication to academic objectives, general life satisfaction, and academic growth, is the degree of happiness with education (16). Students' satisfaction with e-learning is influenced by a variety of factors (17). The field of dentistry is a combination of cognitive subjects and practical cases that require maximum satisfaction and participation of students in the learning process. Therefore, educators must identify the preferred learning styles of undergraduate dental students. On the other hand, less research has been done on this group of students.

Objectives

The purpose of this research was to determine the learning style of Kerman University of Medical Sciences dentistry students and to ascertain if these styles and the students' satisfaction with e-learning are related.

Methods

Study design and ethics: This cross-sectional and descriptive research aimed to ascertain the connection between dentistry students' preferred learning styles and their level of e-learning satisfaction. Undergraduate dentistry students were mostly taught online during the Covid-19 epidemic. In this research, learning styles and demographic factors (age, gender, semester, and mean score) were independent variables, while satisfaction with e-learning was a dependent variable. The ethics committee of Kerman University of Medical Sciences has authorized this work (ethical code: IR.KMU.REC.1400.464).

Participants: This research included 136 participants, who were all first- to third-year dental students

(pre-clinical dentistry students) at Kerman University of Medical Sciences in 2021. Students were given access to a 50-question electronic survey that was divided into four sections: demographic questions, the Kolb learning style inventory, an e-learning survey, and satisfaction with the e-learning survey. 120 students in total willingly completed the computerized survey.

Collecting data: The groups of dentistry students were contacted by WhatsApp and Telegram multiple times (from November 2021 to January 2022) with an electronic questionnaire. Kolb's Learning Style Inventory is a tool that Kolb created to evaluate different learning preferences (18). The LSI is made up of 12 sentences, each of which has four phrases. The first phrase is an objective experience (CE), the second is reflective observation (RO), the third is abstract conceptualization (AC), and the fourth is active experimentation (AE). Each phrase exemplifies one of the four learning processes. Students give phrases that fit their learning styles a score between four and one (entirely, somewhat, slightly, and very low). There are four possible scores for statements that represent four learning modes. These modes (AC-CE) and (AE-RO) are subtracted pairwise to yield two scores on the two coordinate axes. Active experimentation is represented on the horizontal axis on the left, reflective observation on the right, objective experience on the vertical axis at the top, and abstract conceptualization at the bottom. Each of the four quadrants formed by these two coordinate axes represents a different learning style (19). The four types of learners among students can be explained as follows: Convergers Learn through thinking about topics and doing those activities in a practical way, accommodation learn by experiencing and doing. Third, divergers tend to observe and are aspiring to new experiences when learning. Fourth, assimilationists are logical thinkers and observers, they learn more by thinking and looking deeply (14). The reliability of the Kolb Cognitive Styles Questionnaire has been evaluated and confirmed in several studies, including Gholipour, which reported a Cronbach's alpha coefficient between (0.71 and 0.82) (19). In our study, Cronbach's alpha coefficients for objective experience, reflective observation, abstract conceptualization, and active experiment were studied as (0.90- 0.93- 0.91 - 0.94), respectively.

Students' views and levels of satisfaction with e-learning were gathered using a questionnaire created by the researcher (20). Eight questions regarding online courses and 26 questions regarding Satisfaction with e-learning that using a 5-point Likert scale from 5 to 1 (strongly agree - agree-medium - disagree- strongly disagree). The range of the total scores is 26 to 130. Low

contentment was defined as a score under 45.5, medium satisfaction as a score between 45.5 and 90, and high satisfaction as a score between 130 and 91. All final questions had a CVR ≥ 0.6 , and any items with a low CVR were eliminated. The mean for this questionnaire was (0.92), which was higher than the permissible CVI mean of (0.79). The content validity and reliability of this tool have been confirmed. In the prior research, the questionnaire's Cronbach's alpha level was determined to be (0.94) (21); in the present investigation, Cronbach's alpha level was assessed to be (0.97).

Data analysis: Version 26 of the SPSS statistical analysis program was used in the study. The impact of students' learning preferences on their satisfaction with e-learning was determined using Fisher's exact test. Additionally, in order to investigate the association between learning style and demographic factors, we utilized the Kruskal-Wallis, Chi-square, and Fisher's exact test. We deemed a probability value of P 0.05 to be significant.

Results

One hundred twenty students (with an 88% response rate) completed the questionnaire, including 42 (35% of boys) and 78 (65% of girls). These students had an average age of 21.5 ± 2.8 and a mean score of 16.78 ± 1.47 . Diverger learners made up the biggest group of the 120 pupils, accounting for 46.7% of them ($n = 56$). The other students made up 32.5% ($n = 39$), 11.7% ($n = 14$), and 9.2% ($n = 11$) of the converger, accommodator, and assimilator groups, respectively. Additionally, the findings indicated no statistically significant difference was found in learning style based on age, gender, and grade point average (Table 1).

Student survey results: According to the findings, 17.5% of students solely used offline e-learning, 29.2% of students used online e-learning exclusively, and 53.3% used both online and offline e-learning. Additionally, 33.3% of students liked online education, 30.8% offline education, and 35.8% did not like e-learning. The data also show that the most significant drivers of students' interest in e-learning are flexibility of teaching time (69.2%) and flexibility of teaching environment (51.7%). The most serious issues with e-learning are: The lack of interaction with the teacher (55.8%) - Internet connection problems (53.3%) - Inability to meet classmates (38.3%) - Internet costs (34.2%) - Lack of auxiliary activities in Curriculum (26.7%) - Other Problems (20%)

Satisfaction with e-learning: The average score for e-learning satisfaction was 78.3 ± 30.1 . In accordance with the findings, 50.8% of students reported medium satisfaction with their use of e-learning, 34.2% reported high satisfaction, and 15% reported low satisfaction. The correlation between student's preferred learning methods and their level of e-learning satisfaction was assessed using Fisher's exact test. The majority of students with divergent learning styles (46.4%), convergent learning styles (64.1%), and assimilating learning styles (54.5%) expressed medium satisfaction with e-learning, according to data analysis using Fisher's exact test (P-value = 0.04). Divergent style learners were the most satisfied with e-learning (39.3%), followed by convergent style (30.8%), accommodating style (28.2%), and assimilation style (27.3%). And the lowest satisfaction with e-learning was associated with accommodating (42.9%), assimilation (18.2%), divergent (14.3%), and convergent (5.1%) styles, respectively (Table 2).

Discussion

Using Kolb's LSI, our research revealed that the divergent learning style is the most prevalent (46.7%). According to the findings of Zarabian's research, a divergent learning style is the most prevalent among e-learning students (22). Wang et al. reported in their study that the majority of dental students' learning styles were convergent and assimilating (14). Reginald et al. reported that the assimilation learning method was the most prevalent among pre-clinical and clinical dentistry students (23). According to Farhang et al research, the most prevalent learning method among dentistry students was assimilating (24). In addition, our findings revealed no correlation between learning style and age, gender, mean score, or semester. This outcome aligns with the results of a number of studies (2, 19, 25). Our research revealed that students' satisfaction with e-learning was impacted by their learning styles. Divergent learning styles had the greatest degree of satisfaction with e-learning (39.3%), whereas accommodating learning styles had the lowest level of satisfaction (42.9%). These findings are consistent with previous research indicating that students' satisfaction with e-learning is influenced by their learning style (26, 27). In addition, research by Zarabian has shown that different learning styles are associated with e-learning satisfaction (22).

Table 1. Comparison of learning styles by the students' demographic variables

Variable		Learning styles				P
		Mean (SD)				
		Diverging	Converging	Assimilating	Accommodating	
Age		21.36(2.97)	21.79(2.66)	21.27(1.42)	21.71(3.87)	0.71
Grade point average		16.98(1.43)	16.46(1.29)	16.81(1.32)	16.84(2.10)	0.27
N (%)						
Gender	Male	21(50)	14(33.3)	1(2.4)	6(14.3)	0.27
	Female	35(44.9)	25(32.1)	10(12.8)	8 (10.3)	
Semester		18(15)	10(8.3)	2(1.7)	5(4.2)	0.85
1		8(6.7)	5(4.2)	1(0.8)	2(1.7)	
2		11(9.2)	10(8.3)	2(1.7)	4(3.3)	
3		5 (4.2)	2(1.7)	2(1.7)	0(0)	
4		11(9.2)	8(6.7)	1(0.8)	2(1.7)	
5		3(2.5)	4(3.3)	3(2.5)	1(0.8)	
6		18(15)	10(8.3)	2(1.7)	5(4.2)	

Table 2. Comparison of satisfaction with e-learning by learning style

Satisfaction	High	Medium	Low	<i>P</i>
Learning style	N (%)			
Diverging	8(14.3)	26(46.4)	22(39.3)	0.04
Converging	2(5.1)	25(64.1)	12(30.8)	
Assimilating	2(18.2)	6(54.5)	3(27.3)	
Accommodating	6(42.9)	4(28.6)	4(28.6)	

To examine these data, we discuss learning style attributes; Divergers learn through sensing and seeing; they often choose to observe situations rather than act in response to them. They like problem-solving scenarios that need the deployment of original thought. Accommodators also come from a combination of objective and active experimentation. People with this personality like executing plans and tackling difficult tasks. These individuals favor practical analysis over logical analysis (19). In this investigation, pre-clinical dentistry students were analyzed. The majority of pre-clinical courses consist of online lectures, films, e-books, etc. (lack of active experience). Maybe this is why e-learning is enjoyable for learners with diverse learning styles but not for those with accommodating types.

On the other hand, several studies have shown a weak correlation between the learning styles of students and their usage or satisfaction with e-learning (28, 29). In this context, Gholipour et al. reported that there was no difference in satisfaction with e-learning and LMS amongst students with various learning styles, but there was a substantial difference in satisfaction with electronic material (19).

According to this study's findings, 64.1% of students enjoyed e-learning. According to the satisfaction score for e-learning, just 15% of students were dissatisfied, meaning the majority of students were pleased. According to the findings of a number of studies, students had a good attitude toward e-learning and were somewhat satisfied with it (5, 30, 31). The findings of this research showed that the flexibility of the time and

location of instruction was the primary factor in students' interest in online learning. The most significant drawbacks of e-learning were the lack of interaction with the teacher and connectivity issues to the Internet. Other studies have observed similar problems. For instance, some students lacked access to Wi-Fi and didn't have enough storage to download large-scale PowerPoint presentations or instructional DVDs. Students didn't have access to laptops or computers at home, particularly in rural regions (32,33). The insufficient connection between instructors and students, and a lack of essential facilities and resources (34). The most frequent issues with e-learning were a lack of attentive attention to students' educational requirements, a high number of courses, active teaching approaches, and frequent internet disconnections during online sessions (35). Although individual user characteristics had little bearing on user satisfaction, the platform's accessibility had the most influence (17, 36).

Although e-learning is popular among dentistry students, it cannot be recommended for a particular student level. As an example, Turkyilmaz et al. (6) showed that e-learning could be successfully used in the dental school curriculum to improve students' understanding of fundamental concepts and empower students to apply this knowledge in clinical cases. Some studies have shown that different groups of students have different views on e-learning. However, Van Doren et al. (37) showed that although the clinical course does not replace practical training, the pre-clinical practice develops critical thinking. Azab et al. (38) came to precisely the opposite conclusion, noting that clinical dentistry students were substantially more open to e-learning than non-clinical students. Therefore, since it can satisfy the majority of students, blended learning is advised. This finding was supported by some studies (39-42).

The lack of direct access to students, which made it difficult for them to cooperate in filling out

questionnaires, is a weakness of this research. Measuring the degree of satisfaction with all the various courses and lecturers was another barrier. Student satisfaction may also be impacted by the diverse courses, instructional methods, personality quirks, and social backgrounds of the professors.

Conclusion

According to our findings, the majority of participants were divergent style and convergent style. Additionally, there was no connection between students' age, gender, mean scores, or semester and learning style. The findings revealed a substantial connection between students' learning styles and their satisfaction with e-learning. Divergent learning styles reported the greatest levels of satisfaction with e-learning (39.3%), while adaptive learning styles reported the lowest levels of satisfaction (42.9%). Students generally felt that e-learning met their needs. Therefore, based on our research, we conclude that improving Internet connection issues and fostering closer relationships between teachers and students may boost students' satisfaction with online learning. flexibility of time and place was the most important feature of the virtual environment for all groups of dental students with different learning styles.

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Talented and Gifted Mentors for the Promotion of Motivation, Educational, and Research Activities of Nursing Students

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Abstract

Background: Having a mentor affects nursing students' academic achievement and motivation.

Objectives: This study aimed to investigate the effects of the mentoring program delivered by talented and gifted postgraduate students on motivation, academic achievement, and research activities of undergraduate nursing students of Kashan University of Medical Sciences in 2020.

Methods: In this formal mentoring program designed as quasi-experimental pre-post-test design research, 29 out of 37 eligible undergraduate nursing students with a low-grade point average (GPA) enrolled voluntarily. After completing the Science Motivation Questionnaire (SMQ), 21 students with low or moderate motivation entered the study as part of either mentee (n=10) or the control group (n=11). Five talented master's degree students were selected as mentors, each joining with two mentees and leading them through specific programs during one semester. At the beginning and end of the semester, students' academic motivation, the number of research activities, and educational performance were evaluated and analyzed by covariance (ANCOVA) and paired t-tests.

Results: The students in the mentee group had higher academic motivation than the control group ($P = 0.05$); 80% of mentees had more than one research activity, while the controls had no research activities ($P < 0.001$), and there was no significant difference between the two groups in the Grade Point Average (GPA) ($P = 0.110$).

Conclusion: Talented students could play the role of mentors well, and applying a mentoring program enhanced undergraduate nursing students' academic motivation and research activities and prevented a decline in their GPAs.

Keywords: Nursing Students, Mentoring, Motivation, Academic Achievement, Research

Background

Nurses play a critical role in the health system (1). To train capable nurses, students must have the necessary ability in education, research and communication skills. Individual and environmental factors affect students' academic achievement, including age, gender, ethnicity, personality traits, academic motivation, curricula, and academic climate (2). The results of surveys in this field indicate that many nursing students have the low academic motivation and are anxious at the beginning of the clerkship period (3, 4).

One of the factors affecting academic motivation is having a mentor. Mentoring is an effective teaching method to minimize students' anxiety, promote their active learning, create responsibility, and improve their self-confidence. Mentors can provide emotional, professional, and research support and have professional experience and network connections (3).

In most studies conducted in nursing mentoring, undergraduate nursing students of higher academic rank have been selected as mentors. In these studies, only the educational and psychological goals were

considered as outcomes (4, 5). Talented and gifted master's degree students, who had successfully obtained their bachelor's degree and were studying at a higher education level with sufficient motivation and high educational performance, can be suitable candidates for mentorship. In a literature review, no study was found about the implementation of the mentoring program by talented mentors and the impact of the mentoring program on the research activities of nursing students.

Based on the nursing curriculum in Iran, special courses (including internal surgery, mothers, infants and children, and research methodology) are offered in the 3rd and 4th semesters. According to the available evidence (executive experience, review of SAMA educational software, and literature review), many students suffer from anxiety and academic failure in these semesters (6, 7).

Objectives

The present study aimed to investigate the effects of a mentoring program delivered by talented and gifted postgraduate students on research activities, motivation, and academic achievements of undergraduate nursing students in the 3rd and 4th semesters at Kashan University of Medical Sciences (KAUMS) in 2020.

Methods

The present study was a quasi-experimental research (a pretest-posttest control group). It was conducted at Kashan University of Medical Sciences and Health Services in the first semester of the 2019-2020 academic year.

Mentor selection: For the selection of the mentors, 19 master's degree students were identified as gifted and talented students and had at least one ongoing research project and one published article according to the official regulations (8). The executors held a meeting to explain the goals and benefits of participating in this project. Ten of them expressed their interest in participating in the study. The executors also interviewed them for other inclusion criteria such as high academic motivation, critical thinking, patience, interest in the teaching-learning process, responsibility, and being an active listener. Finally, five students were selected and entered the study as mentors.

Mentee candidates selection: 3rd or 4th-semester nursing students with a total Grade Point Average (GPA) of less than 17 were identified (through SAMA educational software) and selected as mentees or the control groups. A briefing session was held explaining the goals and method of study. Of 37 eligible individuals, 29 students consented to participate and completed the Science Motivation Questionnaire (SMQ) (7). Of the

students with low or moderate academic motivation scores, 21 were selected to participate in the study. (Figure 1)

Mentor-mentee and control group formation: A researcher-made form was provided for a better match between the mentee and mentor. Demographic information and preferences were obtained regarding sex, religion, cultural status, place of residence, how to meet and the number of hours of contact with the other partner, and the mentor's field of study (the last item was only for mentees). Then, based on those data, out of 21 mentee candidates, two were assigned to each mentor. The remaining 11 subjects were assigned to the control group. For internal validity and to avoid compensatory competition, the control group was promised they would have a mentor next semester. The student's reluctance to continue participating in the study or mentor-mentee sessions was considered an exclusion criterion.

Intervention: Before the commencement of the semester, two sessions were held to explain the mentees' and mentors' rights and duties. Also, the participants were given an educational pamphlet and a podcast about the interactive methods, effective communication, anger management, and mutual respect. The groups were asked to focus on increasing their motivation and grade point averages, improving practical skills, and conducting research activities for the mentees. At the beginning of the semester, mentees and mentors communicated through various methods (virtual or face-to-face). Mentors guided mentees in study planning, proper studying methods and the importance of lessons, relevant educational resources, and solving sample test questions. Mentors tried to reduce mentees' anxiety in clinical settings in various ways, including saying soothing sentences, teaching procedures in the skill lab, and accompanying mentees in the first few days of hospital stay in performing procedures. In addition, the mentors taught their research knowledge to the mentees, encouraged them to participate in the research workshops, involved them in research projects, and taught them how to perform research projects from proposal writing to article submission. Each mentor-mentee group had to submit a monthly performance report form.

The supervision of the mentee mentor groups was done by the University Talented Office and a medical education specialist. The executors tried to identify and address the program's shortcomings through telephone follow-up monitoring of the groups. The mentor-mentee performance report form was checked monthly,

and appropriate feedback was given to them by the medical education specialist.

In the control group, students studied according to the routine faculty program.

Assessments: The expected outcomes of the mentoring program included students' academic motivation, academic achievement, and research activities, which were assessed in a pretest-posttest format.

The Science Motivation Questionnaire II (SMQ II), developed by Shawn M. Glynn in 2011, was used to assess students' academic motivation. The questionnaire has 25 questions and includes five subscales of motivation: intrinsic motivation, self-determination, self-efficacy, career motivation, and grade motivation. Each component is measured with 5 separate items.

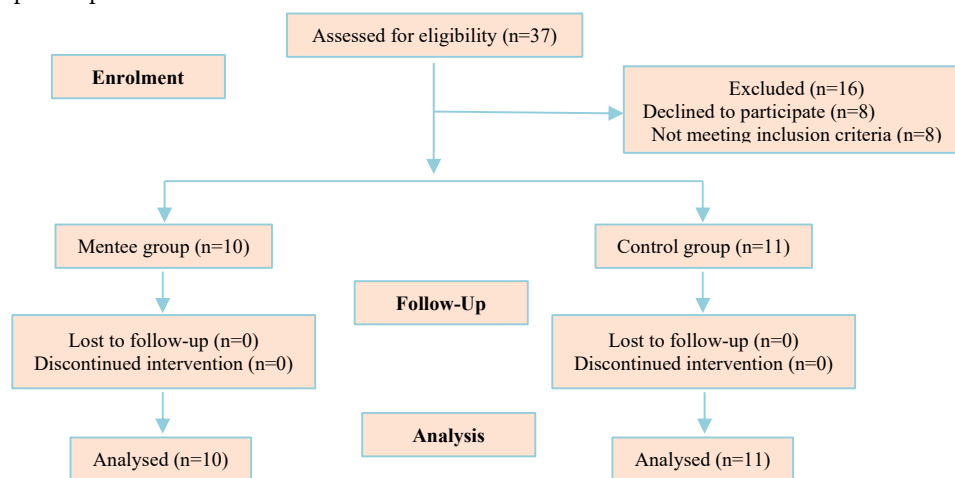


Figure 1. Consort diagram

In this questionnaire, the subject responds on a 5-point Likert scale (from 0: never to 4: always). The obtained scores range from 0 to 100 (above 85: high academic motivation, 50-85: moderate academic motivation, and below 50: low academic motivation) (9). In a study carried out at Shiraz University, the content validity of this questionnaire was confirmed using factor analysis (76.69% variance), and Cronbach's alpha coefficient was estimated to be 0.97 for the whole questionnaire and ranged from 0.90 to 0.93 for each subscale, indicating its acceptable reliability (6).

The GPA of the students in the same academic semester, which demonstrated their knowledge in theoretical and their skills in practical courses, was considered to evaluate academic achievement. GPAs were extracted through the SAMA educational system.

The database of the Vice Chancellor for Technology Research was used for measuring students' research activities. The number of cases of participation or lectures in research workshops, number of approved research proposals, conference abstract presentations, or published articles of students were extracted.

At the end of the study, the mentors and mentees were questioned with three open-ended questions about the program's strengths and weaknesses and their suggestions.

The follow-up of the groups after half a year of study was impossible because the mentoring program was

welcomed by the nursing faculty officials and was widely implemented in the faculty with the help of the Talented Office.

Data Analysis: The SPSS 24 software was applied for data analysis. Due to the normal distribution of motivation and GPA based on the Shapiro-Wilk test and the Q-Q plot, parametric statistical tests were used. Measures of central tendency and dispersion for quantitative variables, and absolute and relative frequencies for classified variables were used. Since the present study was a pretest-posttest control group one, analysis of covariance (pre-test variable as a covariate) and paired t-test were used. In addition, Fisher's exact test was applied to assess the effect of mentoring programs on the number of the students' research activities.

Results

In the present study, 21 undergraduate nursing students, (10 persons in the mentee group (8 females) and 11 persons in the control group (4 females)) participated, and no significant gender differences were observed between the two groups ($p = 0.115$).

After the implementation of the mentoring program, the findings indicated that the average score of academic motivation obtained for the mentee group (84.10 ± 80.30) was significantly higher than the same value in the control group (75.45 ± 11.44) ($p = 0.05$), indicating

that mentoring program had significantly influenced the students' academic motivation. Also, among the motivation components, only career motivation in the mentee group had a significant increase compared to the controls ($p=0.018$) (Table 1).

At the end of the semester, no significant difference was observed between the mentee (15.2 ± 22.02) and control (13.59 ± 1.48) groups in the mean score of educational performance (the GPA) ($p = 0.110$), indicating that the mentoring program did not significantly affect students' educational performance (Table 2).

Regarding research activities, none of the subjects had any research activity in the pre-test. In the post-test, in the mentee group, 80% of the students had more than one research activity, while the same value was zero in the control group ($p < 0.001$), indicating that the mentoring program had a significant effect on the student's research activities (Table 3).

The results of the surveys showed that the mentees were satisfied with the program and an effective communication was established between them and the mentors, and they were willing to continue this program.

Table 1. Investigating the effect of mentoring program implementation on academic motivation

Variable	Time	Group		p-value*	Effect size(η^2)
		Mentee (Mean \pm SD)	Control (Mean \pm SD)		
Intrinsic motivation	Pre-test	13.70 \pm 1.64	11.18 \pm 1.78	0.219	0.083
	Post-test	15.9 \pm 2.33	12.00 \pm 2.49		
	Mean Difference (95%CI)	2.20 (1.32-3.08)	0.82 (-0.26-1.89)		
	p-value**	<0.001	0.121		
Self-determination	Pre-test	15.40 \pm 1.78	15.45 \pm 2.81	0.134	0.120
	Post-test	16.80 \pm 2.39	15.82 \pm 3.22		
	Mean Difference (95%CI)	1.40 (-0.08-2.88)	0.27 (-0.40-0.95)		
	p-value**	0.061	0.391		
Self-efficacy	Pre-test	15.70 \pm 1.57	15.00 \pm 2.97	0.140	0.117
	Post-test	17.60 \pm 1.95	16.00 \pm 3.03		
	Mean Difference (95%CI)	1.90 (1.11-2.69)	1 (-0.08-2.08)		
	p-value**	<0.001	0.067		
Career motivation	Pre-test	16.80 \pm 2.25	18.45 \pm 1.69	0.018	0.274
	Post-test	18.20 \pm 1.99	18.18 \pm 1.94		
	Mean Difference (95%CI)	1.40 (0.49-2.30)	-0.27 (-0.95-0.40)		
	p-value**	0.007	0.391		
Grade motivation	Pre-test	14.50 \pm 1.43	11.91 \pm 1.22	0.675	0.010
	Post-test	16.30 \pm 2.41	13.45 \pm 2.07		
	Mean Difference (95%CI)	1.80 (0.64-2.96)	1.54 (0.58-2.51)		
	p-value**	0.007	0.005		
Academic motivation (Total score)	Pre-test	76.10 \pm 7.62	72.09 \pm 9.62	0.050	0.197
	Post-test	84.80 \pm 10.30	75.45 \pm 11.44		
	Mean Difference (95%CI)	8.70 (4.82-12.57)	3.36 (0.082-6.64)		
	p-value**	0.001	0.045		

*ANCOVA, **Paired t-test

The mentors criticized the program on some issues, such as the lack of attendance of some mentees in the online or face- to-face meetings, and their own lack of knowledge in answering some of the mentees' questions. The mentors suggested participating in workshops on the future of the field, especially on the topic of continuing education in postgraduate studies, and launching student publications to promote the research motivations of undergraduate students.

Discussion

The present study aimed to determine the effects of mentoring programs on motivation, academic achievement, and research activities of undergraduate

nursing students of KAUMS. Academic achievement is one of the most important measures applied to assess students' ability to complete university education, reach the final stage of graduation, and predict their future status in terms of necessary qualifications and scientific and practical skills. Today, many nursing students have insufficient academic achievements and are not interested in improving their scientific level (3). Their demotivation and low scientific level can adversely influence the community's health (1). Demotivation can lead to emotional and behavioral problems, and thereby pessimism, anxiety, depression, mental disorders, and dramatic decline in personal, academic, social, and occupational performance (10).

In the present study, talented and gifted master's degree nursing students, who had successfully obtained their bachelor's degree and were studying at a higher education level with sufficient motivation and high educational performance, were tasked to guide, counsel, and be role models for undergraduate nursing students who were demotivated and had a poor academic performance. In contrast, in previous studies in the field of nursing mentoring, undergraduate nursing students (students of the same or higher semester) were selected

as peer mentors and often guided mentees only in clinical courses (3-5).

Despite the established importance of mentorship, mentoring relationships can be challenging to develop and sustain. Cultural differences, differences in communication styles, implicit bias, and assumptions about others may act as barriers or adversely affect mentoring relationships (2).

Table 2. The effect of mentoring program implementation on students on educational performance

Variable	Time	Group		p- value*	Effect size(η^2)
		Mentee (Mean \pm SD)	Control (Mean \pm SD)		
Grade Point Average (GPA)	Pre-test	15.53 \pm 1.24	14.79 \pm 1.44	0.110	0.136
	Post-test	15.22 \pm 2.02	13.59 \pm 1.48		
	Mean Difference (95%CI)	-0.31 (-1.33-0.70)	-1.20 (-1.79--0.62)		
	p-value**	0.506	0.001		

*ANCOVA, **Paired t-test

Table 3. Investigating the effect of mentoring program on the number of students' research activities

Variable	Group	Mentee N(%)	Control N(%)	p-value*
Number of research activities in the post-test	0	0	2 (18.2)	<0.001
	1	2 (20)	9 (81.8)	
	>1	8 (80)	0	

*Fisher's exact test

In this study, to improve the quality of mentor-mentee relationships, various criteria were considered in selecting the mentors, including being a talented and gifted student, availability, persistence, interest in teaching, and diverse social relations. In addition, for matching the mentees with the mentors, the personal matching method was used based on similarity in gender, residence, culture, age, and field of interest (7).

In this study, initial briefing sessions were held before the intervention, and the program's goals were explained. Various interactive methods, effective communication, anger management, and mutual respect were also taught to determine appropriate expectations between the mentor and the mentee. Manuel's article in 2021 outlines the key to the success of mentoring training programs: training mentees to explain their needs to mentors, assisting mentors to perform their duties, being loyal and appreciative, asking for feedback, and creating a mentorship network (10).

Mentoring program significantly influenced the students' academic motivation after one semester. Numerous factors influence the motivation of nursing students during their study period. Socio-cultural issues

related to this field (reduced level of dignity and the society's lack of right understanding of the field of nursing), relevant educational issues (high volume training and difficulty of courses, gap between theory and practice in nursing, lack of interest in some courses), compatibility of student personality with this field, faculty management, students' living conditions, work experiences in hospital wards, doctors' dominance over nurses, the possibility of getting sick, experiencing patients' problems in the workplace, and being away from family can reduce the motivation of nursing student (6). Doing research along with educational activities and having a mentor are mentioned as factors playing an influential role in enhancing undergraduate nursing students' motivation (2). In the present study, the mentee group students showed higher motivation than the control group. Considering the relative stability of educational, cultural, etc., conditions of students in the two mentorship and control groups, it may be concluded that in the mentorship group, the presence of motivated mentors can be considered as the reason for the enhanced motivation of the low-motivated nursing undergraduate students. The results of O'Keefe's study confirm this conclusion (11).

After implementing the mentoring program during one semester in this study, students' GPA did not change significantly in the mentee group. This result is inconsistent with Nora et al.'s study on 200 students, who indicated that students' knowledge and educational performance enhanced after implementing a mentoring program for two years. This inconsistency can be attributed to the difference between the present study and their study's duration of intervention and

monitoring (six months vs. two years) (12). Based on the nursing curriculum, the third and fourth semesters are the beginning of the clerkship period, and the exams are both written and practical. In multiple studies, GPA was used as the performance assessment criteria in educational interventions (13). Therefore, it can be asserted that students' GPA score demonstrates their knowledge in theoretical courses and their skills in practical ones. In the present study, the scores of theoretical and practical exams were not extracted separately. Therefore, it cannot be clarified that the lack of GPA improvement in the mentee group was caused by which category of courses.

The research activities of undergraduate students were also considered in this study. At the end of the study, the mentee group had significantly higher research activities (including frequency of attendance or number of lectures in research method workshops, number of approved proposals, number of articles and abstracts submitted or being published) compared to the control group. In other words, the mentoring program significantly affected students' research activities. According to a literature review, there is no study evaluating the effect of the mentoring program in research in nursing education (4, 5). Daneshmandi (2017) and Mitchell (2009) have achieved similar results in their studies on faculty and teachers. According to them, the mentoring program promotes research activities and helps to build groups to carry out research activities, including writing research projects and activities, attendance in conferences and seminars, and participating in research projects and similar activities (14, 15).

Conclusion

Talented and gifted master's degree nursing students in the role of mentors can promote academic motivation, prevent academic failure, and improve the research status of undergraduate nursing students.

It is recommended that the mentorship program be continued for a longer period to allow a better assessment of its impacts on academic achievement. Due to the COVID-19 epidemic and the development of e-learning, implementing a virtual mentoring program is recommended. Evaluation of the motivation and academic achievement and research activities of the mentors also is recommended.

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Relationship Between Perception of Constructivism Learning-based Approaches and Self-actualization in Nursing Students

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Abstract

Background: For successful clinical education in a suitable environment and condition, nursing students can be assisted in acquiring the necessary knowledge and skills.

Objectives: The present study investigated the relationship between the understanding of the learning environment based on constructivism and self-actualization in Kerman University of Medical Sciences nursing students in 2021.

Methods: This cross-sectional study utilized a descriptive-analytical method. The study subjects consisted of 160 undergraduate nursing students selected by the census. The information was collected using a demographic profile questionnaire, social constructivist learning environment perception questionnaire, and Ahvaz Self-Actualization Inventory (ASAI). The data were analyzed using Pearson correlation, linear regression, and chi-square tests in SPSS software.

Results: The mean score of understanding the environment based on constructivism and its dimensions was reported as 191.88 ± 30.50 , and that of self-actualization was 81.23 ± 12.99 . There was a significant positive relationship between understanding the environment based on self-actualization and constructivism and also between all dimensions of understanding the environment based on constructivism and self-actualization ($P < 0.050$).

Conclusion: The total score of the constructivist-based learning environment predicted self-actualization in nursing students. Self-actualization may change with a change in the dimensions of this approach. The constructivist approach can improve the self-actualization of nursing students, promote their active participation in building knowledge, and increase their interactions, enhancing abilities, talents, and self-actualization. The constructivist learning environment can lead to the growth and development of nursing students in educational environments and increase their interest in academic achievements in education, research, and employment.

Keywords: Understanding, Learning Environment, Self-actualization, Constructivism, Nursing Students

Background

Learning is a relatively stable change in potential behavior defined as reinforced practice (1). In this definition, learning involves practice and experience that can be influenced by teaching quality, motivational goals, prior knowledge, preparedness, talent, and learning environment (2). The learning environment has five characteristics, "connection with life, uncertainty, critical expression, joint supervision, and negotiation with students" based on the constructivist approach (3).

The constructivist learning theory is based on the scientific and philosophical theories of scientists such as

Piaget, Vygotsky, Bruner, and John Dewey, who highlighted the learner's active role in understanding and accumulating knowledge and science (4). This theory emphasizes situational learning, indicating that knowledge depends on related situations, objectives, and assignments. This teaching approach, which includes the learner's active participation, highlights the teacher's role as a facilitator and emphasizes practical and objective learning situations and authentic experiences (5-7). The situational learning concept, which is also stressed in the constructivist theory, claims that knowledge cannot be separated from practice, and

if this is neglected, knowledge will be separated from the context (8, 9). According to this approach, education should be conducted in natural and original environments (10-12). The constructivism theory is very popular in nursing education as an alternative approach to traditional learning (4).

In modern psychology, self-actualization is defined as the accomplishment of potential inner abilities and talents (13). This concept is elaborated in detail in Abraham Maslow's theory which argues that self-actualization is the highest level of needs and can be fulfilled if lower-level needs are fulfilled (14). When the basic needs are fulfilled to some extent, self-actualization needs can be addressed (15). Maslow believed that only one percent of society could achieve self-actualization. This contradicts the findings of later research demonstrating that this can be achieved by a greater proportion of people (16). Based on the research findings, Neto stated that self-actualization is the highest need of learners and is related to realizing their potential talents (17). Without a doubt, medical schools are the main responsible bodies for training competent human resources to address the needs and expand health systems (18), and their main objective is to empower the alumni to fulfill the needs of the health systems; to realize this, they should learn required knowledge and skills (8).

In their study on training based on a constructivist approach in midwifery externs and interns, Nili Ahmedabadi and Mustafazadeh realized that in midwifery clinical training (internships), this approach could improve the scientific standing, satisfaction, and self-confidence of the students and led to deep and permanent learning and self-efficiency (19).

Haghyeghi and Karshki, in a study on the role of the constructivist learning environment on the components of the student's progress goals, realized that this learning environment had a significant positive effect on the components of the progress goals and a role in the student's progress objectives (20). Shipunova et al. investigated the role of students' self-actualization in adapting to the e-learning environment and concluded that the low mean self-actualization level they observed highlighted the need for monitoring first-year students in choosing their educational path in an online environment (21).

Having investigated Turkish nursing students' understanding of the clinical learning environment and its relationship with academic motivation and decision-making, Akta and Karabulut concluded that nursing students' academic motivation increased in a high-quality clinical learning environment (22). In research on the relationship between self-actualization obstacles

and choice of career among nursing students of Atatürk University, Ay and Yurttas found that addressing self-actualization obstacles increased their desire to choose their jobs (23).

The constructivist approach and related methods are of great importance in the education of healthcare professionals. The nature and atmosphere of the education of these professionals emphasize the need for constructivist approaches that consider the situation and application of authentic scenarios. Moreover, this approach, which includes in-depth information processing, improves learning and can lead to self-actualization. Nonetheless, research in this field regarding nursing education is sparse.

Objectives

Therefore, the present study investigated the relationship between understanding the constructivist learning environment and self-actualization in a cohort of nursing students.

Methods

This cross-sectional study was carried out in 2021 using a descriptive-analytical method. The learning environment was the Faculty of Nursing and Midwifery of Kerman University of Medical Sciences. Sampling was performed by the census, and all students were included. The sample size was 217, but 57 dropped out, giving a response rate of 74%. Totally, 160 people completed the questionnaire, and their data were analyzed. The inclusion criteria included completing at least one internship semester and being willing to participate. Any transfer or leave during the study and unwillingness to cooperate were considered exclusion criteria. This research was conducted after obtaining ethical approval (with the code of IR.KMU.REC.1400.309) from the Research and Technology Deputy of Kerman University, and all ethical principles were strictly followed.

The instruments included a demographic characteristics questionnaire and the Ahvaz Self-Actualization Inventory (ASAI). Due to the COVID-19 pandemic and the limited availability of all students for data collection, the questionnaire was designed on the Porsline website, and data collection was conducted electronically (<https://survey.porsline.ir/>).

Perception of the social constructivist learning environment questionnaire: This questionnaire contains 45 questions in eight components, including "conferring the learning process to the learner, encouraging teamwork, and exchange of ideas between people, authentic learning, emphasis on previous learning, considering different viewpoints, self-evaluation,

problem-oriented approach, and the facilitating role of the teacher" scored on a five-point Likert scale of "never, rarely, sometimes, often, and almost always" rated 1 to 5, respectively. Cronbach's Alpha coefficient for the whole questionnaire was reported as 0.94, and retest reliability was 0.90, indicating its appropriate internal consistency and reliability (20).

ASAI: This scale has 25 questions on a four-point Likert scale (never = 1, rarely = 2, sometimes = 3, often = 4) scored based on the students' self-actualization and awareness level with a minimum score of 25 and a maximum score of 100. Its Cronbach's alpha coefficient has been calculated as 0.92 (15).

The Kolmogorov-Smirnov test was used to check the normality of data distribution. The mean and standard deviation were calculated for quantitative variables such as age and scores. Pearson's correlation coefficient was used to assess the relationship between self-actualization and understanding of the learning environment, and linear regression was used to predict self-actualization through understanding the learning environment based on constructivism. Moreover, the chi-square test was used to determine the relationship between qualitative variables.

Ultimately, data were analyzed using SPSS version 26 software (IBM Corporation, Armonk, NY). The confidence level of 95% and the significance level of $P < 0.05$ were considered in all tests.

Results

The results demonstrated that the mean age of the students was 21.5 ± 2.2 years and their mean grade point average was 16.6 ± 1.5 . Most respondents were single (93.8%), female (80.6%), and dormitory residents (75.0%). For the assessment of the understanding of the learning environment and self-actualization, the mean scores were calculated, which are presented in Tables 1.

Table 1. The Mean scores understanding of constructivism environment and its dimensions in nursing students

Dimensions	Mean (SD)	Max	Min
Possession	47.46 (6.92)	60	21
Teamwork	33.14 (7.86)	48	12
Authentic learning	23.30 (5.93)	36	9
Former	20.16 (4.87)	30	11
Different view	17.25 (4.33)	24	6
Self-assessment	17.85 (3.92)	24	9
Problem-orientating	16.25 (3.90)	24	9
Education	16.68 (3.56)	24	9
Cumulative constructivism	191.88 (30.50)	250	130

Pearson's correlation coefficient was used to assess the relationship between the understanding of the

learning environment based on constructivism and self-actualization, which showed a significant positive relationship in all dimensions ($P < 0.001$) (Table 2).

The results demonstrated a significant positive relationship between the variable of constructivism-based understanding of the environment and self-actualization in nursing students. The results of linear regression to predict self-actualization variables according to the understanding of the learning environment based on constructivism indicated that the total score of the understanding of the learning environment according to constructivism could predict self-actualization in nursing students. Based on this, the constructivist-based learning environment perception variable could predict 30% of the variance in self-actualization (Table 3).

Regarding the relationship between the individual characteristics of the research participants and the understanding of the learning environment based on constructivism and self-improvement, no statistically significant difference was observed ($P < 0.05$).

Discussion

The present study of Kerman University of Medical Sciences nursing students demonstrated that the mean score of understanding of the learning environment according to constructivism and the dimensions of "learning, possession of the learning process, encouraging teamwork and exchange of ideas, authentic learning, emphasis on previous learning, considering different viewpoints, self-evaluation, and the teacher's role as a facilitator" was higher than the moderate level, which indicates that the students had a high understanding of the learning environment based on constructivism. This averages about the problem-oriented approach were below average in problem solving. In the literature search, no similar study on nursing students was found. Therefore, comparisons are made in other fields. Our results are consistent with Karsheki et al.'s research on non-medical students of Ferdowsi University of Mashhad (24).

In the study of Gherissi et al. in Tunisia on midwifery and women's health students, the surveys highlighted the constructivist model and declared it an efficient approach to women's health services (25).

Table 2. Correlation between Self-actualization and understanding of constructivism environment and its dimensions in nursing students

Self-actualization	Statistical indicator	
	Correlation Coefficient	P
Comprehension of the constructionist-learning environment	0.54	< 0.001
Possession of learning to the learner	0.44	
Encouraging teamwork and exchange of ideas	0.39	
Authentic learning	0.52	
Emphasis on previous learning	0.31	
Considering different views	0.27	
Self-assessment	0.38	
Problem-based approach	0.45	
Facilitator role of the educator	0.50	

Table 3. The Results of Linear Regression self-actualization through of understanding the learning environment based on constructivism

Predictive variable	B	Standard error	Beta	T	P value
Constant variable	36.46	5.51	-	6.61	< 0.001
Comprehension of a constructionist working environment	0.23	0.02	0.54	8.22	
R = 0.54, R ² = 0.30, ADJ R ² = 0.29					

Moreover, Tadesse et al., in their study on Ethiopian students, emphasized the importance of a constructivist environment and believed that it facilitated academic progress (26). As nursing students need to have high problem-solving and critical thinking capacities, student-centered approaches based on problem-solving should be employed in training methods, first in simulated and then in real environments, to expand their abilities. The results of Karami and Silaneh's research to design internship training environments from chaotic to constructivist demonstrated that with a constructivist and holistic approach to creating learning environments, the focus of internship activities would be on real working environment tasks and projects, and the current environments may move towards constructivism (27).

The self-actualization mean scores in the present study demonstrated high capacities of self-actualization among Kerman University of Medical Sciences nursing students. In their research on Golestan University of Medical Sciences students, Sanagoo et al. observed that students' self-actualization was at good and excellent levels (28), which is consistent with the present study. In another study, Shafipour Mutlaq and Mulla Ahmadi reported the moderate self-actualization level of middle school teachers in Isfahan (29), which contradicts our results. This would be expected considering the differences between the studied populations. Moreover, Ay and Yurttas in Turkey introduced self-actualization obstacles as influencing factors in the choice of nursing students' field (23). Furthermore, Hosseini Dolatabadi et al. mentioned self-actualization as an effective coping strategy in their research among Gilan University students (14).

In this research, we investigated the relationship between personal and academic characteristics and the level of understanding of the environment based on constructivism and self-actualization. The independent t-test showed no significant difference in the mean scores of self-actualization and understanding of the environment based on constructivism according to demographic characteristics. In the study of Sanagoo et al., the level of self-actualization of Golestan University of Medical Sciences students was higher in female and dormitory students (28). The difference in research population and the number of study subjects could explain the difference in the results; also, they included all the students of the University in their study (28). This has remained obscure regarding the relationship between the understanding of the learning environment and individual characteristics in the research conducted in this field.

The present study demonstrated a significant relationship between environment perception based on constructivism and self-actualization in nursing students. Shipunova et al. highlighted the role of self-actualization in adapting to the e-learning environment (21). Akta and Karabulut concluded that students' understanding of the clinical learning environment relates to academic motivation and clinical decision-making (22). Nili Ahmedabadi and Mostafazadeh showed that in midwifery clinical education (internship), the constructivist approach promoted the scientific standing, satisfaction, and self-confidence of midwifery students, resulting in profound and lasting learning and independence. Based on the constructivist approach, midwifery training should be based on real environments with practical instruments, and students'

active and participatory role should be highlighted, besides the role of instructors as facilitators (13). Considering the similarities between nursing and midwifery education, the results of Nili Ahmadabadi and Mustafazadeh's study (19) can be aligned with the objectives of the present study. Moreover, the Barzegar Bafroi et al. study demonstrated that the constructivist learning environment leads to academic progress and education effectiveness (3), which can be considered in line with the results of the present study in terms of positive outcomes.

The present study indicated that student-centered learning methods take advantage of practical applications, objective training, learners' active participation, the facilitator role of the teacher instead of the mere information transfer role, and the use of real projects, which can play an essential role in creating a constructivist environment; because of the development of critical thinking, it also leads to self-actualization. The present research was conducted on nursing students. It is suggested that similar research be conducted on other health sciences students. Also, it would be recommended to seek the tutors' opinions about the constructivist learning environment, students' self-actualization, and related factors.

Conclusion

The nature of nursing education demands a curriculum that can engage students with a real learning environment and assist, guide, and support them to achieve independence. This has been considered in current curricula. However, teachers can facilitate such endeavors and design and implement projects based on the creative mind. Constructivist environments can create a cooperative atmosphere among students, promote problem-solving skills, and enhance reasoning and creativity for the flexible establishment of a targeted and efficient learning internship environment. The present study demonstrated that the total score of the constructivist-based learning environment could predict self-actualization in nursing students. Therefore, it is expected that the constructivist learning environment can stimulate the growth and development of nursing students in educational environments and generate interest in academic progress and career choice.

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Inter-professional Education: A Solution to the Challenges of Nursing and Medicine

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Dear Editor,

In the third millennium, the most important mission of educational organizations in the health field is to meet the various and variable health-related needs of the public. In 1973, The World Health Organization (WHO) warned about the incapability of graduates in various medical fields to provide efficient team care. Accordingly, the WHO offered multi-professional education programs to improve healthcare quality. Then in 1988, it introduced the inter-professional education as the most effective strategy for providing efficient team care and delivering strong performance in healthcare settings by adopting a patient-oriented approach (1). Inter-professional education indeed occurs only when two or more professionals cooperate closely in learning about each other and from each other, which not only promotes the quality of services via increased cooperation but does also lead to increased problem-solving and clinical decision-making skills, improved healthcare quality, patient safety, improved communication skills, and enhanced understanding of each other's roles in healthcare settings (2).

From among the health sciences having close interactions in all clinical wards, nursing and medical fields are the oldest, the most challenging and, simultaneously, the most necessary sciences that enjoy close inter-professional relations in the health system, so that their interaction's positive and negative consequences affect the patients' safety and care quality

directly and/or indirectly. Such interactions and cooperation are very close, particularly in special wards (ICU, CCU) and the operating room; this cooperation, however, is less observable in general wards, such as surgery, internal, pediatrics, and maternity wards. Although a close interactive cooperation is an absolute requirement for meeting the patient's health needs and creating positive attitudes among nursing and medical students (3), the inter-professional cooperation is still faced with major barriers created by the authoritative viewpoint towards the medical profession and field prevailed in the clinical setting and educational hospitals. Given the significant role of medical specialists as exemplars for medical students, this authoritative viewpoint leads to creation of different attitudes and perceptions among medical students toward nurses as simply administrators of the doctor's orders while, in effect, nurses play more crucial roles in decision-making processes, roles that are not still appreciated by doctors with traditional attitude. These doctors still consider themselves as the ones who assign the duties for the nurses, which leads to nurses' job dissatisfaction and increases the incidence of conflicts between doctors and nurses in clinical wards. A sociological study by Mehrabi et al (2016) on professional relationships between nurses and doctors indicated that any problematic relationship between these two groups negatively affected the patients' safe care (4). Several studies have suggested that the medical professors have positive attitudes (5); however, a limited

number of studies have investigated the medical professors' attitudes toward inter-professional cooperation and recognition of the nurses' duties and roles. The doctors' authoritative behaviors and attitudes toward nurses as major barriers can negatively affect the successful implementation of inter-professional education, creation of change, and stabilization of attitudes toward medical students' education concerning inter-professional cooperation.

Given that the fast and extensive changes in society have forced healthcare provider and organizations to get prepared for present and future challenges in order for providing health care with patients' complicated and extensive needs, the capability of the health providers to meet these needs is the most significant determinant of the patients' health quality and safety; furthermore, it is essential to train a new generation of health providers capable of appreciating each other's roles and abilities as well as making necessary preparations for dealing with upcoming challenges by changing and benefitting from modern educational approaches toward team-oriented care. To this end, the doctors and nurses – medical and nursing professors, in particular – should adopt new attitude toward the modern approach of inter-professional education and change the attitude of medical authoritative viewpoint, which can crucially contribute to modifying and changing the traditional attitude, forming interaction and inter-professional cooperation among medical and nursing students and, ultimately, promoting the quality of health services.

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Education Support System for First-year Residents in the General Surgery Program

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Dear Editor,

Fostering and training proficient and capable surgeons have long been one of the challenges of the surgical profession (1). The student support system is a combination of various academic and non-academic services designed and administered to meet educational, cognitive, social, and emotional needs, the result of which can enhance the student academic output (2). Recent definitions of professional competence highlight the necessity of clinical skills, including cognitive proficiency, emotional competence, and reflective capacity (3). Support is a critical component in the development of residency proficiency. Such support may be incorporated into the curriculum or occur informally on various occasions during education. It also plays an important role in professional development (4).

In an experimental study, Designer (2008) investigated the methods to solve educational issues and evaluated the student academic progress due to counseling services in several American universities. The findings of this study indicated that counseling significantly contributed to achieving and promoting a positive self-concept, increasing social skills, and facilitating students' academic progress (5). Given the above discussion as well as the important role played by residents in medical education, developing an efficient

education support system for residents takes on an added importance. This study, therefore, aimed to design an effective system for surgical residents' academic support.

In the surgical ward of Afzalipour Medical Education Center (hospital) affiliated with the University of Medical Sciences, interviews with experienced professors and higher-year residents of the education support comprehensive program for surgical residents were carried out based on the residency curriculum. Then the "Academic Counseling Checklist for Surgical Ward Residents" consisting of the items to determine the residents' initial status was developed in the program's first phase. The experts' opinions about the medical education field and surgery ward experts were collected to determine the content validity of this program. In this program, the most crucial areas regarding the performance of surgical residents were evaluated and classified as follows:

- Residents' educational performance, including intra-ward grades, morning reports, holding conferences, investigating ward files, and implementing educational programs for interns (medical interns) and medical trainees;
- Evaluation of residents, including logbook, DOPS, and resident disciplinary evaluation;
- Providing necessary feedback to eliminate residents' weaknesses;

- Describing potentials, professional strengths, and communication skills appropriate to various groups.

The residents' performance in each of the above areas was scored on a Likert scale: Poor (0-15), moderate (16-20), good (21-25), and excellent (26-30). The given checklist was completed for each of the surgical residents from the first year of entrance into the residency course over a three-month period, and their academic progress during this period was evaluated; when an academic failure or a dissatisfaction with the resident's performance was observed, s/he was advised and guided academically by the group members and attempts were made to eliminate the barriers.

Evaluation of the surgical residents' skills has been found necessary. The results produced after addressing this issue can be used for developing a tool for evaluation. It is worth mentioning that different tools have already been introduced by researchers in various countries. Since developing these tools and identifying these skills are totally context-dependent, the localization of the tool employed by Kerman University of Medical Sciences was likely the first step toward better management of the residency course at this university. Therefore, a decision was reached to develop an evaluation tool for this program and its effectiveness in our next study.

In order to reduce the medical errors, promote the patient safety, and improve the non-technical skills along with technical skills, it was recommended that the curriculum designers in the study fields relevant to surgery should assign the highest priority to training and evaluation of these skills in the educational programs. Residents play a special role in operating the educational and medical systems of universities, and also have a key position in the health system. Therefore, their transformation and improvement are among the serious concerns of administrative officials and experts (6). Residents are regarded as the key pillars in promoting and improving the performance of the educational and medical systems, and are

responsible for the patients' round-the-clock treatment in medical science educational centers. Our study results, in this regard, may have been effective in promoting the quality of surgical residents' education.

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Changing the Educational System Processes Toward the Mission-orientation and Accountability in a University Educational Hospital

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Dear Editor,

Education and evaluation are pillars of the educational system, and education is not effective without evaluation and feedback (1, 2). Furthermore, the management has been widely affected and changed by, first, the need to increase the quality of educational programs (e.g., morning reports, clinical rounds, etc.) and other programs implemented in an educational medical center and, second, new requirements for accountability toward the accreditations in educational medical centers. Change refers to transformation and shifting from one state to another, which is constantly observed in the universal phenomena. Some experts have discussed targeted changes caused by individuals willfully and purposefully (3). In a study at the University of Madison, New Jersey, Wentworth et al (2018) attempted to implement and institutionalize a new system in which the investigation of the new system replaced a widely used system having been already

implemented for over twenty years without any change but been extensively criticized by faculty members and students (4).

By performing educational management appropriately to create changes in educational settings, a favorable and efficient environment is created. This environment enjoys sensitive characteristics, including a sense of belonging to the educational environment, mutual trust among individuals, participation in educational decision-making, work-related information provision, and attention to the faculty members' suggestions (5). The educational medical centers generally lack this environment, particularly in terms of a collaborative culture creation. Change is based on dynamism; therefore, any changes in educational organization also requires the dynamism of the educational system. The presence of an effective clinical environment is indeed one of the characteristics of favorable clinical education, which requires the standardization of educational processes in clinical

education (6). This study aimed to change the educational system processes toward mission orientation and accountability in an educational medical center.

The need for changes in the ongoing educational and research procedures followed at Afzalipoor Medical Education Center affiliated with Kerman University of Medical Sciences was first expressed and highlighted by the faculty members, residents, interns, and trainees. As the result, a team consisting of the members from the educational departments of the educational medical center was formed. The team members included the center's educational vice-chancellor, research vice chancellor, medical education development manager, and other team members (e.g., representatives of all clinical education departments, who, in turn, constituted the coalition; then the members of this group attempted to achieve the specified goals through effective interaction and teamwork. In the next stage, the members held regular meetings and determined a proper perspective according to the goals in attempt to reform all events associated with the promotion of the education and research system performance, including the improvement of the processes occurred in the mission-oriented and responsive education system in the center's medical and paramedical fields, the center's clinical and applied research excellence, improvement of performance and empowerment of faculty members, and development of educational, research, and welfare infrastructures to promote the learners' performance.

In the following stage, sharing insights was remarkably important. The departments' representatives had an essential role in this step in which the required information was shared in their groups as soon as possible, and they were assigned to important responsibilities for providing educational and evaluation opportunities. Formal and informal feedback from professors, management, and staff indicated that these reports played a crucial role in implementing change in an educational system.

The next step was institutionalizing the approach, which involved stabilizing the change and ensuring that it became part of a developing system. Monitoring the various sectors' performance regularly, holding various meetings, making efforts to stabilize it in Afzalipoor Hospital of Kerman, and generalizing this change to other educational medical centers of Kerman University of Medical Sciences were among the goals of institutionalizing this approach.

Communication was also a principal factor contributing to the change. Various communication channels were used to ensure that all individuals were aware of the changes as well as understand the new system and the reason for choosing it. A specific website was created for the staff, faculty members, and students to use. Moreover, staff provided explanations and education to faculty members through monthly updates.

In our case, the new system for collecting students' feedback regarding professors' teaching was found extremely effective during the process. According to the potential consequences, it was normal to be concerned about the changes. The implementation process largely occurred during the coronavirus disease 2019 (COVID-19) period, and significantly affected the students' evaluation and exam quality. Some criticisms were also expressed by both professors and students about the process implementation. In this study, therefore, attempts were made to address the criticisms by making preparations and using internal experiences and experts, and the attempts culminated in many changes in the program.

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