Strides Dev Med Educ. 2025 October; 23(1):e1515. doi 10.22062/sdme.2025.200840.1515

Original Article

Investigating the Factor Structure of the Hidden Curriculum Questionnaire in the Universities of Medical Sciences

Asghar Soltani[1*], Ghasem Askarizadeh[2], Hamideh Zarepour[3]

[1]Associate Professor, Department of Education, Faculty of Literature and Humanities, Shahid Bahonar University of Kerman, Kerman, Iran
[2]Associate Professor, Department of Psychology, Faculty of Literature and Humanities, Shahid Bahonar University of Kerman, Kerman, Iran
[3]M. A. Students, Department of Psychology, Faculty of Literature and Humanities, Shahid Bahonar University of Kerman, Kerman, Iran

Received: 2025 January 19
Revised: 2025 September 16
Accepted: 2025 October 04
Published online: 2025 October 04

***Corresponding author:**
Department of Education, Faculty of Literature and Humanities, Shahid Bahonar University of Kerman, Kerman, Iran.
Email: a.soltani.edu@uk.ac.ir

Citation:
Soltani A, Askarizadeh G, Zarepour H. Investigating the Factor Structure of the Hidden Curriculum Questionnaire in the Universities of Medical Sciences. Strides Dev Med Educ. 2025 October; 23(1):e1515. doi:10.22062/sdme.2025.200840.1515

Abstract

Background: In recent years, increasing attention has been drawn to the role of the hidden curriculum in medical education, particularly regarding its influence on the professional development and identity formation of medical students. As an informal and often implicit component of medical training, the hidden curriculum plays a critical role in shaping students' values, behaviors, and perceptions, ultimately influencing their approach to patient care and professional conduct.

Objectives: Against this backdrop, the primary objective of this study was to investigate the factor structure of the Hidden Curriculum Questionnaire within medical universities.

Methods: The statistical population consisted of 5,086 students at Kerman University of Medical Sciences. A sample of 360 students was selected from this population using proportional stratified sampling to participate in the study by completing the questionnaire. The research instrument, a 33-item questionnaire developed by Rauf et al., was specifically designed to evaluate the hidden curriculum in medical institutions. To investigate the factor structure of the questionnaire, both first-order and second-order confirmatory factor analyses.

Results: The results revealed that three factors—communication and reform, student-centeredness and empowerment, and accountability and Inclusiveness—significantly elucidate the structure of the hidden curriculum from the perspective of medical students. Following the removal of five items, the revised questionnaire is deemed an effective instrument for assessing the hidden curriculum in Iranian medical universities. Furthermore, the factors of communication and reform, along with student-centeredness and empowerment, emerged as the most influential components in evaluating the hidden curriculum.

Conclusion: The findings of this study underscore the role of the hidden curriculum in shaping the educational experiences and professional development of medical students. The refined 28-item questionnaire, validated through rigorous confirmatory factor analysis, proves to be a reliable and effective tool for assessing the hidden curriculum in Iranian medical universities.

Keywords: Medical Education; Hidden Curriculum; Students; Medical; Confirmatory Factor Analysis; Psychometrics

Background

The concept of the hidden curriculum (HC) in medical education has recently generated significant discourse among scholars and practitioners. However, there remains a lack of consensus regarding its ongoing relevance, the specific components that constitute it, and the degree of its influence on medical training. Further empirical investigation is warranted to deepen our understanding and contribute meaningfully to this ongoing dialogue (1). The HC in medical education addresses the implicit methods through which knowledge and behavior are shaped, functioning outside the boundaries of a medical school's formal curriculum. It is especially significant due to the professional nature

of the field, the diverse educational components, and the extensive learning environments, particularly in clinical settings. Essentially, the HC transmits the values, beliefs, and standard behaviors inherent in medical sciences (2, 3).

The definition of the hidden curriculum is currently a subject of debate. Some perceive it as encompassing the undesirable aspects of medical training, while others argue that it includes positive interactions and can be beneficial for both students and faculty (1, 4). The term "hidden curriculum" refers to the non-academic outcomes and by-products of education that are unexamined, covert, latent, unwritten, unplanned, and often invisible (5). Based on a definition, the HC represents a significant dimension of educational curricula, encompassing elements that extend beyond the formally established and informal curricula. Although unofficial, the HC can facilitate learning processes. In an alternative conceptualization, the HC is characterized by unarticulated expectations, unintended learning outcomes, implicit messages, and a curriculum shaped by students themselves. This encompasses the knowledge, ideas, perceptions, performance, and values that students acquire outside of their officially prescribed lessons. The impact of the hidden curriculum can result in enduring and influential educational outcomes (3). Hafferty has extensively explored the hidden curriculum in medical education, defining it as a collection of influences at both organizational and cultural levels. These influences encompass organizational policies, evaluation activities, resource allocation decisions, and intra-organizational policies (6, 7). Hafferty proposes that to uncover the hidden curriculum, one should examine four key phenomena: institutional policies, evaluation activities, resource allocation decisions, and institutional slang or nomenclature (8). The educational journey of medical students extends beyond the formal curriculum, encompassing a myriad of additional influences that shape their experiences and competencies. These influences, collectively referred to as the Hidden Curriculum, encompass a spectrum of values, behavioral norms, attitudes, skills, and implicit knowledge that students acquire throughout their training (9).

An examination of the scholarly literature in this domain reveals that a pivotal inquiry concerning hidden curricula in medical education pertains to their definition and the methodologies for measuring them using suitable and pertinent constructs. Consequently, various studies over the years have endeavored to delineate these elements and devise and validate appropriate instruments for their assessment.

Sarikhani et al. (9) identified ten primary components through a thematic content analysis approach, categorizing them into four distinct groups: structural factors, educational factors, cultural factors, and social factors. The sub-categories or main components of the hidden curriculum in medical education that they recognized are as follows: social factors, including student-instructor relationships, students' interpersonal relationships, role modeling from instructors, and role modeling from clinical staff; cultural factors, including organizational culture and students' cultural context. structural factors: organizational rules and structures, educational and clinical physical setting; educational factors: teaching methods, evaluation methods.

Pourbairamian et al. (6) identified the domains, impacts, factors, and components of the hidden curriculum in residency programs and proposed an initial conceptual framework. Through qualitative content analysis of selected studies, 55 codes were identified and categorized into seven themes and fourteen subthemes. The themes included organizational factors, sociocultural factors, professional factors, communication factors, educational factors, personal characteristics of residents, and educational characteristics of residents. Among these, educational factors and personal characteristics of residents were deemed most significant, while communication factors and educational characteristics of residents were considered least significant.

Yazdani et al. (5) employed thematic content analysis to capture the perspectives of key informants on the management of the hidden curriculum in medical education. Eleven interviewees contributed to the analysis, which identified five key themes: human resources, learning, organizational behavior, formal curriculum, and organization. The findings suggest that effectively managing these components can lead to better management of the hidden curriculum, enabling the planning of students' education based on required and desirable performance outcomes.

Andarvazh et al. (10) used the McKenna method for concept analysis to define the hidden curriculum in medical education. Researchers reviewed 561 English and 26 Persian references, narrowing the selection down to 125 abstracts and thoroughly studying 55 articles. The hidden curriculum is defined as a powerful, intrinsic,

and sometimes contradictory message embedded in an organization's structure and culture, conveyed implicitly through the learning environment by both structural and human factors. It includes cultural habits, norms, values, belief systems, attitudes, skills, desires, and social expectations, which can have both positive and negative effects. They concluded that the hidden curriculum contributes to reproducing existing class structures, socialization, and preparing learners for professional integration.

Rauf et al. (11) aimed to develop and validate a questionnaire to identify the characteristics of the hidden curriculum in medical education. Building on previous qualitative research, a panel of experts created a questionnaire, which was then verified through exploratory factor analysis (EFA) and quantitative methods. The initial 90-item questionnaire was refined to 39 items, and further validation resulted in a 33-item questionnaire with strong psychometric properties. The study identified three main factors of the hidden curriculum: accountability and equal opportunity, communication and stakeholder relationships, and student-centeredness and empowerment. These constructs collectively measure the hidden curriculum in medical institutes.

Studies show a lack of valid tools to measure the hidden curriculum in Iranian medical education. This study aims to develop a robust, locally validated instrument to address this gap. Specifically, this research investigates the factor structure of a 33-item questionnaire designed to assess the hidden curriculum in medical institutes, adopted from Rauf et al. (11), employing a confirmatory factor analysis methodology. Thus, this study represents a significant contribution to the field by examining, for the first time within an Iranian context, the factor structure and psychometric properties of the "Hidden Curriculum Questionnaire in Medical Institutes." This research provides the first validated instrument specifically designed to measure the hidden curriculum within the unique context of Iranian medical education. Additionally, by rigorously validating a tailored instrument, this study provides a novel and essential tool for future research on the hidden curriculum in Iran, addressing a previously unexplored gap.

This study validated the first- and second-order factor structures of the "Hidden Curriculum Questionnaire in Medical Universities" for Iranian medical education, demonstrating its reliability and applicability for assessing hidden curriculum components. The findings confirmed three first-order factors—Communication and Reform, Student Centeredness and Empowerment, and Accountability and Inclusiveness—while establishing The Hidden Curriculum as a second-order construct. Notably, student-centeredness and Empowerment played the most significant role. Despite the study's strong validity and reliability, it was limited to students from Kerman University of Medical Sciences, necessitating future research across broader populations and faculty perspectives to further refine the tool.

Objectives

Against this backdrop, the primary objective of this study was to investigate the factor structure of the Hidden Curriculum Questionnaire within medical universities.

Methods

Participants and Setting: The current study is descriptive and falls within the scope of evaluating the psychometric properties of a questionnaire. The statistical population consisted of students from Kerman University of Medical Sciences, totaling 5,086 individuals. A sample of 360 students was selected using the Krejcie and Morgan table, employing a proportional stratified sampling method across various faculties, including Health, Nursing and Midwifery, Medicine, Paramedical Sciences, Pharmacy, Dentistry, Iranian Medicine, and Medical Management and Information. Participants were selected from the research's statistical sample, with proportional allocation to each faculty. Upon arrival at each faculty, researchers engaged with available student groups in classrooms. Accordingly, some of the students in the classrooms were invited to participate in the study. The study protocol, including informed consent forms, data collection procedures, and measures to ensure participant confidentiality, was reviewed and granted formal approval by the Ethics Committee of Kerman University of Medical Sciences. Before the initiation of the study, all participants were comprehensively briefed on the research objectives, the confidentiality of their responses, and their right to withdraw from the study at any point. The anonymity of the participants was ensured throughout the implementation and analysis of the research data.

Measures: The primary instrument utilized in this research was the "Hidden Curriculum Questionnaire in Medical Institutes," which consists of 33 items (Appendix 1) and was developed and validated by Rauf

et al. (11). This questionnaire encompasses three subscales: Communication and Reform, Student Centeredness and Empowerment, and Accountability and Inclusiveness. Respondents indicated their level of agreement with each item using a five-point Likert scale, ranging from "strongly agree" to "strongly disagree". Before administration, the questionnaire was translated into Persian. The process involved independent translation and back-translation by two translators. This multi-step process included forward and back-translation, reconciliation by the researchers, and cognitive debriefing through pilot testing to ensure conceptual, semantic, and cultural equivalence within the target context. The resulting English version was compared to the original, verifying that the essential meaning of all items was retained. Additionally, in accordance with ethical research standards, the confidentiality of participants' responses was explicitly stated in the distributed questionnaires.

Statistical Analysis: After conducting a screening for outliers and missing data, the total number of questionnaires included in the statistical analyses was reduced to 360. The collected data were subsequently analyzed using the Statistical Package for Social Sciences (SPSS) version 26 and Analysis of Moment Structures (AMOS) version 24 software. The instrument's reliability was assessed utilizing the internal consistency method within SPSS, where Cronbach's alpha coefficients were calculated for both the overall scale of the instrument. All coefficients surpassed the critical threshold of 0.7 and were statistically significant, with the overall questionnaire achieving a Cronbach's alpha of 0.94. Furthermore, the Cronbach's alpha coefficients for the CR, SCE, and AI subscales were calculated as .87, .85, and .86, respectively, indicating strong internal consistency for each measure.

The analysis of the correlation coefficients among the various factors within the model, as well as their associations with the overarching construct of the hidden curriculum, reveals that all correlations among the model's factors are statistically significant at the 0.001 level. Notably, the correlation coefficients between the total scale score and the individual components—Communication and Reform, Student Centeredness and Empowerment, and Accountability and Inclusiveness—are 0.930, 0.883, and 0.907, respectively. These values suggest a robust internal validity for the instrument.

To elucidate the construct validity and analyze the factor structure of the "Hidden Curriculum Questionnaire in Medical Institutes," as well as to assess the second-order factor analysis model, Confirmatory Factor Analysis (CFA) was conducted using AMOS software, employing the maximum likelihood estimation method. First-order confirmatory factor analysis (CFA) tests whether observed variables load onto their respective latent factors, thus confirming the structure of the measurement model. Second-order CFA extends this approach by evaluating whether first-order factors load onto a higher-order latent construct, providing insight into broader underlying dimensions. Essentially, first-order CFA focuses on direct relationships between observed variables and factors, while second-order CFA examines hierarchical relationships among multiple latent constructs to determine if they create a more general overarching factor.

Two categories of fit indices were utilized to evaluate the proposed research model. The first index considered was the chi-square statistic (χ^2), which serves as a measure of goodness-of-fit; however, it is regarded as a "badness-of-fit" index, as higher values indicate weaker support for the theoretical model under examination (12). The application of the chi-square statistic necessitates data collection from a sample size ranging between 200 and 500 participants (13). In this study, a total of 360 completed questionnaires were analyzed, allowing for the appropriate use of the chi-square statistic to assess model fit. Furthermore, the ratio of the chi-square statistic to the degrees of freedom (CMIN/DF) was employed as an additional model fit index. This relative or normalized chi-square index is deemed acceptable when its value is less than three (14). Additional fit indices were classified into two groups: comparative and parsimonious goodness-of-fit indices. The Comparative Fit Index (CFI) and Tucker-Lewis Index (TLI) fall within the category of comparative indices (with the chi-square statistic also categorized among absolute fit indices). Values exceeding 0.95 for these indices are interpreted as indicative of an excellent fit, while values above 0.90 are considered acceptable (15). The parsimonious fit indices utilized in this analysis included the Parsimonious Normalized Fit Index (PNFI) and the Parsimonious Comparative Fit Index (PCFI), along with the Root Mean Square Error of Approximation (RMSEA). Generally, values above 0.5 are deemed appropriate for the first two indices. For RMSEA, a threshold of less than 0.06 is indicative of a very good model fit, while values below 0.08 are considered acceptable (15).

It is essential to note that, in addition to using these indicators to assess model fit, items with factor loadings

below 0.5 were excluded from the model to enhance its conciseness, reliability, and validity. This threshold was selected based on established methodological guidelines in psychometric research, which suggest that factor loadings ≥0.5 (indicating at least 25% shared variance between the item and the latent factor) are considered practically significant for retaining items in a scale (16, 17).

While the use of a factor loading cut-off of 0.5 is a conventional and well-justified criterion for item retention, the psychometric robustness of the scale could be further strengthened by also evaluating items based on their contribution to the scale's internal consistency (e.g., corrected item-total correlation > 0.3) and the absence of significant cross-loadings onto other factors. This multi-faceted approach helps ensure the final instrument is both parsimonious and conceptually sound.

Results

Table 1 outlines the faculty-wise distribution of participants (N = 360), with Medicine predominating (41.6%), trailed by Health Sciences (13.0%), Paramedical Sciences (12.5%), Nursing and Midwifery (10.5%), Pharmacy (9.7%), Dentistry (7.8%), Medical Management and Information (4.4%), and Iranian Medicine (0.6%). Based on this Table, the study comprised a total of 360 participants, with females representing the majority (n = 218, 60.7%), followed by males (n = 142, 39.3%).

Table 2 presents the reliability of the measurement scale and the item-total correlations. The corrected item-total correlations range from 0.369 to 0.718, reflecting varying item-construct associations, with higher values indicating stronger contributions. Cronbach's alpha remains stable (0.940–0.943) if any item is deleted, confirming high internal consistency unaffected by individual item removal. The scale means and variance analyses reveal response distribution patterns, with items such as q32 and q1 exhibiting notable variance.

Table 1. Demographic distribution of research participants by faculty and gender

Variable	Frequency	Percent
Faculty		
Medicine	150	41.6
Health	47	13.0
Nursing and Midwifery	37	10.5
Paramedical Sciences	45	12.5
Pharmacy	35	9.7
Dentistry	28	7.8
Iranian Medicine	2	.6
Medical Management and Information	16	4.4
Total	360	100.0
Gender		
Female	218	60.7
Male	142	39.3
Total	360	100.0

Table 3 presents the fit indices associated with the factor model of the "Hidden Curriculum Questionnaire in Medical Institutes." The data indicate that all fit indices fall within the acceptable range, thereby validating the factor analysis model and confirming its suitability for the statistical population under study. The root mean square error of approximation (RMSEA) was calculated to be 0.057, which is below the conventional threshold of 0.08, indicating a good fit. Furthermore, the chi-square to degrees of freedom ratio (CMIN/DF) for this model was determined to be 2.159, reflecting an adequate level of fit **.** Moreover, the evaluation of additional fit indices reveals that the Tucker-Lewis Index (TLI = 0.90) and the Comparative Fit Index (CFI = 0.90) exceed the recommended benchmark, indicating a satisfactory model fit. The two parsimonious fit indices, namely the Parsimonious Normalized Fit Index (PNFI = 0.76) and the Parsimonious Comparative Fit Index (PCFI = 0.82), also surpass the criterion of 0.5, further affirming their adequacy.

Table 4 and Figure 1 present the factor loadings for each parameter associated with the identified factors, along with the standard regression weights for each factor within the factor model. The data indicate that all parameters corresponding to the sub-factors of the model exhibit positive and statistically significant factor loadings in relation to their respective latent factors. However, following the initial application of the factor analysis model, parameters 1, 3, 7, 24, and 32 were excluded from the model because their factor loadings fell below the threshold of 0.5. These parameters were excluded to purify the measurement model, retaining only items with strong, statistically significant relationships to the underlying latent factors.

This Table also presents the fit indices associated with the second-order factor model of the "Hidden Curriculum Questionnaire in Medical Institutes." The data indicate that all fit indices fall within the acceptable range, thereby validating the factor analysis model and confirming its suitability for the statistical population under study. The root mean square error of

approximation (RMSEA) was calculated to be 0.059, which is below the conventional threshold of 0.08, indicating a good fit.

Furthermore, the chi-square to degrees of freedom ratio (CMIN/DF) for this model was determined to be 2.232, reflecting an adequate level of fit. Moreover, the evaluation of additional fit indices reveals that the Tucker-Lewis Index (TLI = 0.90) and the Comparative Fit Index (CFI = 0.90) exceed the recommended benchmark, indicating a acceptable model fit. The two parsimonious fit indices, namely the Parsimonious Normalized Fit Index (PNFI = 0.75) and the Parsimonious Comparative Fit Index (PCFI = 0.81), also surpass the criterion of 0.5, further affirming their adequacy.

Table 5 and Figure 2 present the second-order factor loadings for each parameter associated with the identified constructs, along with the standard regression weights for each factor within the proposed model.

The findings indicate that all sub-factors of the model—namely, Communication and Reform, Student Centeredness and Empowerment, and Accountability and Inclusiveness—exhibit positive and statistically significant factor loadings corresponding to their respective latent construct, the Hidden Curriculum. Specifically, the factor representing Student Centeredness and Empowerment demonstrates the highest regression weight of 0.96 in relation to the latent factor of the Hidden Curriculum. In contrast, the Communication and Reform is associated with the lowest regression weight of 0.87 regarding its influence on the Hidden Curriculum latent construct. Furthermore, Accountability and Inclusiveness contribute to the elucidation of the Hidden Curriculum latent factor, exhibiting a regression weight of 0.94.

Discussion

Brown's typology (18) delineates four distinct categories of curriculum: the formal curriculum, encompassing published syllabi linked to curriculum policy documents, often referred to as the explicit curriculum; the enacted curriculum, which pertains to the curriculum that is delivered in practice; the hidden curriculum, which encompasses unintended learning experiences encountered by students; and the null curriculum, which consists of content that is absent from the formal curriculum yet ought to be included. According to this typology, the curriculum within educational institutions encompasses values and expectations that may not be explicitly articulated in the formal curriculum but are nonetheless assimilated by learners through their experiences in educational settings. Eisner (19) refers to this dimension of the curriculum as the implicit or hidden curriculum. This definition suggests that the hidden curriculum encompasses a range of issues, including social control, covert and unacknowledged activities, as well as the non-scientific implications of educational practices.

Based on the empirical evidence reviewed in this study, there is a lack of a suitable and standardized instrument to evaluate the status of the hidden curriculum in Iranian medical higher education. Such an instrument is necessary to assess the components and structural elements that define the nature and essence of the hidden curriculum within medical education. This study aimed to validate the first and second-order factor structures of the "Hidden Curriculum Questionnaire in Medical Institutes" within the Iranian context.

This measurement instrument, consisting of a 33-item questionnaire developed by Rauf et al. (11), was specifically designed to assess components of the hidden curriculum in Pakistan. The findings indicated that both the first and second-order factor models demonstrated a good fit, thereby establishing this instrument as a standard tool for evaluating various aspects of the hidden curriculum in Iranian medical education institutions. The analysis confirmed three first-order factors: Communication and Reform, Student Centeredness and Empowerment, and Accountability and Inclusiveness.

Additionally, the overarching construct of The Hidden Curriculum was identified as a second-order factor. These structural components are essential for effectively measuring the Hidden Curriculum Questionnaire in Medical Institutes. Notably, the dimension of Student Centeredness and Empowerment was found to exert the most significant influence on the hidden curriculum index. It shows that all factors were strong contributors, with Student Centeredness and Empowerment being the strongest roles in elucidating the hidden curriculum within medical education institutions. These findings align with previous research conducted by Neve and Collett (20), Yazdani et al. (5), Li et al. (21), Shakerinejad et al. (22), and Parekh et al. (23).

Furthermore, the results indicated that removing five items from the original instrument resulted in a refined questionnaire that retains essential constructs pertinent to the hidden curriculum, thus rendering it a suitable tool for measuring this phenomenon in Iranian higher medical education. However, it is important to

note that the definitive application of this questionnaire and its proposed items should not be based solely on the results of this study.

The reliability analysis revealed satisfactory internal consistency for both the overall scale and its constituent subscales within the sample utilized. The Cronbach's alpha coefficient for the complete questionnaire was 0.94, with each subscale exceeding the critical threshold of 0.7. These reliability estimates are consistent with those reported in prior studies; Rauf et al. (11) reported an overall instrument reliability of 0.96, with subscale values above 0.80. In the Iranian sample, the reliability coefficients for each subscale ranged from 0.85 to 0.88.

The findings of this study have significant implications for educational practices in Iranian medical institutions by providing a validated instrument for assessing the hidden curriculum. This tool allows faculty and administrators to identify unintended influences on student learning, including social norms, institutional expectations, and covert educational practices. By recognizing these factors, educators can implement targeted reforms to enhance inclusivity, student empowerment, and communication within medical training. Practical changes could include revising teaching methods to promote active student engagement, integrating discussions on implicit biases in medical education, and establishing policies to address curriculum gaps. The tool enables administrators to monitor the impact of institutional practices on students' professional development, ensuring a more transparent and equitable learning environment. Additionally, expanding its application across diverse medical institutions will provide further insights into the broader effects of the hidden curriculum, guiding future policy development in Iranian medical education.

Conclusion

Given the validation of the first and second-order factor structure of the "Hidden Curriculum Questionnaire in Medical Institutes" within Iranian higher medical education, it is recommended that scholars in medical education employ this instrument. Its validity and exceptional conciseness enhance its applicability in research on the hidden curriculum in medical education.

However, the study's limitations include its restriction to students of Kerman University of Medical Sciences. Future research should therefore evaluate this instrument across a broader statistical population with diverse backgrounds. Additionally, the study's statistical population comprised medical students from various scientific disciplines. Due to the limited number of these subgroups, it was not feasible to conduct comparative analyses for tool validation. Consequently, it is advised that this tool be administered to larger statistical samples to facilitate subgroup analyses. Moreover, it is suggested that future researchers develop and validate similar tools based on the constructs of this questionnaire to explore faculty members' perspectives on the hidden curriculum in medical sciences. The utilization of this validated instrument enables institutions to quantitatively assess the hidden curriculum, thereby facilitating its strategic management to enhance student development and optimize educational outcomes.

Acknowledgements: The authors acknowledge the contributions of the students who devoted their time to the study.

Conflict of interests: There is no conflict of interest.

Ethical approval: This research was conducted in compliance with the ethical guidelines and received approval from the ethics committee of Kerman University of Medical Sciences (Code: IR.KMU.REC.1403.450. Before the initiation of the study, all participants were comprehensively briefed on the research objectives, the confidentiality of their responses, and their right to withdraw from the study at any point. The anonymity of the participants was ensured throughout the implementation and analysis of the research data.

Funding/Support: This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

References

1. Brown MEL, Coker O, Heybourne A, Finn GM. Exploring the hidden curriculum's impact on medical students: professionalism, identity formation and the need for transparency. Med Sci Educ. 2020 Jul 24;30(3):1107-21. doi: 10.1007/s40670-020-01021-z. [PMID: 34457773] [PMCID: PMC8368648]
2. Mclaren P. Life in schools: an introduction to critical pedagogy in the foundations of education. 6th ed. New York: Routledge; 2015:183–4. doi:10.4324/9781315633640.
3. Hosseini A, Ghasemi E, Nasrabadi AN, Sayadi L. Strategies to improve hidden curriculum in nursing and medical education: A scoping review. BMC Med Educ. 2023 Sep 11;23(1):658. doi: 10.1186/s12909-023-04652-z. [PMID: 37691094] [PMCID: PMC10494411]
4. MacLeod A. The hidden curriculum: is it time to re-consider the concept? Med Teach. 2014 Jun;36(6):539-40. doi: 10.3109/0142159X.2014.907876. [PMID: 24787524]

5. Yazdani S, Momeni S, Afshar L, Abdolmaleki M. The management of hidden curriculum in medical education: a thematic content analysis study. J Med Educ. 2019;18(2). e105666. doi:10.22037/jme.v18i2.24504.
6. Pourbairamian G, Bigdeli S, Arabshahi SK, Yamani N, Sohrabi Z, Ahmadi F, et al. Hidden curriculum in medical residency programs: a scoping review. J Adv Med Educ Prof. 2022 Apr;10(2):69-82. doi: 10.30476/JAMP.2021.92478.1486. [PMID: 35434154] [PMCID: PMC9005762]
7. Hafferty FW. Beyond curriculum reform: confronting medicine's hidden curriculum. Acad Med. 1998 Apr;73(4):403-7. doi: 10.1097/00001888-199804000-00013. [PMID: 9580717]
8. Bennett N, Lockyer J, Mann K, Batty H, LaForet K, Rethans JJ, et al. Hidden curriculum in continuing medical education. J Contin Educ Health Prof. 2004 Summer;24(3):145-52. doi: 10.1002/chp.1340240305. [PMID: 15490546]
9. Sarikhani Y, Shojaei P, Rafiee M, Delavari S. Analyzing the interaction of main components of hidden curriculum in medical education using interpretive structural modeling method. BMC Med Educ. 2020 Jun 1;20(1):176. doi: 10.1186/s12909-020-02094-5. [PMID: 32487128] [PMCID: PMC7269001]
10. Andarvazh MR, Afshar L, Yazdani S. Hidden curriculum: An analytical definition. Journal of Medical Education. 2017;16(4): 198-207.
11. Rauf A, Fatima F, Gilani R, Shabnam N. Development and validation of a questionnaire about hidden curriculum in medical institutes: A pilot study. Front Med (Lausanne). 2023 Feb 9:10:996759. doi: 10.3389/fmed.2023.996759. [PMID: 36844228] [PMCID: PMC9947458]
12. Ghasemi V. Structural equation modeling in social researches using Amos Graphics. Tehran: Jameshenasan; 2013. [In Persian]
13. Hoyle RH. Structural equation modeling: Concepts, issues, and applications. Thousand Oaks: Sage; 1995.
14. Kline RB. Principles and practice of structural equation modeling. 4th Ed. New York: Guilford Press; 2023.
15. Schreiber JB, Nora A, Stage FK, Barlow EA, King J. Reporting structural equation modeling and confirmatory factor analysis results: A review. The Journal of Educational Research. 2006; 99(6):323-38. doi:10.3200/JOER.99.6.323-338.
16. Hair JF, Black WC, Babin BJ, Anderson RE. Multivariate data analysis. 7th ed. London; Prentice Hall; 2010.
17. Tabachnick BG, Fidell LS. Using multivariate statistics. 5th ed. Boston, MA: Pearson; 2007.
18. Brown G. The ontological turn in education: The place of the learning environment. Journal of Critical Realism. 2009; 8(1): 5-34. doi:10.1558/jocr.v8i1.5.
19. Eisner EW. The educational imagination: On the design and evaluation of school programs. 2nd Ed. New York: Macmillan Pub; 1985.
20. Neve H, Collett T. Empowering students with the hidden curriculum. Clin Teach. 2018 Dec;15(6):494-499. doi: 10.1111/tct.12736. [PMID: 29178606]
21. Li GJ, Sherwood M, Bezjak A, Tsao M. Assessing the hidden curriculum in medical education: a scoping review and residency program's reflection. Can Med Educ J. 2024;15(5): 113-24. doi: 10.36834/cmej.78841. [PMID: 39588038] [PMCID: PMC11586034]
22. Shakerinejad M, Gholamnia-Shirvani Z, Khodadadi E, Nikpour M. Dental students' experience of hidden curriculum: A qualitative study. Journal of Medical Education Development. 2024;17(54):31-43. doi: 10.61186/edcj.17.54.31.
23. Parekh R, Jones MM, Singh S, Yuan JS, Chan SC, Mediratta S, et al. Medical students' experience of the hidden curriculum around primary care careers: a qualitative exploration of reflective diaries. BMJ Open. 2021 Jul 29;11(7):e049825. doi: 10.1136/bmjopen-2021-049825. [PMID: 34326054] [PMCID: PMC8323369]

Table 2. Reliability and item-total correlation analysis

Item	Mean	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
q1	3.2521	0.405	0.942
q2	2.5152	0.608	0.940
q3	3.3767	0.464	0.942
q4	2.2853	0.634	0.940
q5	2.6454	0.558	0.941
q6	2.6814	0.666	0.940
q7	2.8504	0.459	0.942
q8	2.2964	0.656	0.940
q9	2.7452	0.498	0.942
q10	2.3213	0.601	0.941
q11	2.5457	0.572	0.941
q12	1.9751	0.552	0.941
q13	2.5596	0.588	0.941
q14	2.3186	0.499	0.941
q15	2.6759	0.625	0.940
q16	2.2742	0.631	0.940
q17	2.6205	0.573	0.941
q18	2.2355	0.575	0.941
q19	2.1911	0.718	0.940
q20	2.8837	0.613	0.940
q21	2.9446	0.599	0.941

q22	2.7535	0.569	0.941
q23	2.7119	0.512	0.941
q24	2.8809	0.439	0.942
q25	2.7175	0.589	0.941
q26	2.8199	0.440	0.942
q27	2.6981	0.554	0.941
q28	2.7922	0.599	0.941
q29	2.3352	0.602	0.941
q30	2.7452	0.651	0.940
q31	2.0831	0.572	0.941
q32	3.6648	0.369	0.943
q33	3.4044	0.536	0.941

Table 3. Fit indices of hidden curriculum within the first- and second-order factor model in medical sciences universities

Model	Fit indices								
	χ^2	df	χ^2/df (CMIN/DF)	P-value	CFI	TLI	RMSEA	PNFI	PCFI
First-order	738.307	342	2.159	<0.001	0.90	0.90	0.057	0.76	0.82
Second-order	765.595	343	2.232	<0.001	0.90	0.90	0.059	0.759	0.818
Standard values	-	-	<3	<0.05	>0.90	>0.90	<0.08	>0.5	>0.5

Table 4. Factor load and significance level of the parameters in the first-order factor model

Component	Item	Standardized Regression Weights	Critical Ratio	p-value
Communication and Reform	2	0.617	-	-
	4	0.697	10.965*	<0.001
	5	0.600	9.720*	<0.001
	6	0.684	12.920*	<0.001
	8	0.696	10.950*	<0.001
	9	0.511	8.537*	<0.001
	10	0.664	10.414*	<0.001
	11	0.594	9.555*	<0.001
	12	0.593	9.563*	<0.001
	13	0.625	9.940*	<0.001
	14	0.519	8.576*	<0.001
Student centeredness and Empowerment	15	0.656	-	-
	16	0.695	11.586*	<0.001
	17	0.638	10.782*	<0.001
	18	0.659	10.932*	<0.001
	19	0.785	12.642*	<0.001
	20	0.663	11.099*	<0.001
	21	0.650	10.852*	<0.001
Accountability and Inclusiveness	22	0.599	-	-
	23	0.569	9.084*	<0.001
	25	0.627	9.569*	<0.001
	26	0.505	8.219*	<0.001
	27	0.610	9.568*	<0.001
	28	0.671	10.134*	<0.001
	29	0.673	10.015*	<0.001
	30	0.708	10.852*	<0.001
	31	0.630	9.554*	<0.001
	33	0.518	8.325*	<0.001

*p<0.001

Table 5. Factor load and significance level of the parameters in the second-order factor model

Component	Item	Standardized Regression Weights	Critical Ratio	p-value
Hidden Curriculum	CR	0.943	-	-
	SCE	0.965	9.695	<0.00
	AI	0.875	8.805	<0.00
Communication and Reform	2	0.615	-	-
	4	0.696	10.946*	<0.00
	5	0.610	9.822*	<0.00
	6	0.685	13.026*	<0.00
	8	0.694	10.926*	<0.00
	9	0.520	8.660*	<0.00
	10	0.664	10.426*	<0.00
	11	0.595	9.580*	<0.00
	12	0.601	9.671*	<0.00
	13	0.625	9.947*	<0.00
	14	0.541	8.866*	<0.00
Student centeredness and Empowerment	15	0.657	-	-
	16	0.695	11.612*	<0.00
	17	0.637	10.790*	<0.00
	18	0.659	10.950*	<0.00
	19	0.784	12.665*	<0.00
	20	0.663	11.119*	<0.00
	21	0.651	10.893*	<0.00
Accountability and Inclusiveness	22	0.591	-	-
	23	0.568	9.036*	<0.00
	25	0.653	9.805*	<0.00
	26	0.509	8.248*	<0.00
	27	0.626	9.705*	<0.00
	28	0.689	10.274*	<0.00
	29	0.698	10.213*	<0.00
	30	0.704	10.392*	<0.00
	31	0.628	9.511*	<0.00
	33	0.508	8.179*	<0.00

*p<0.001

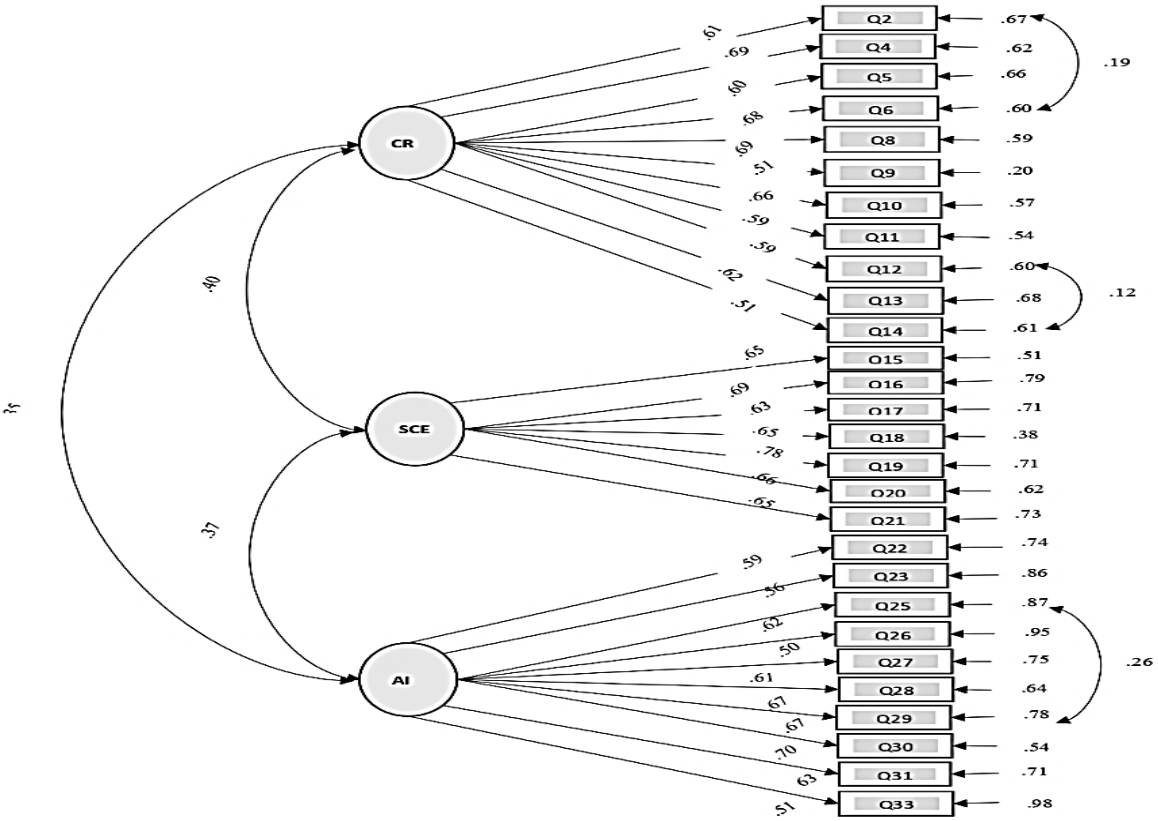

Figure 1. First-order confirmatory factor analysis model validating the hidden curriculum measurement scale in medical education

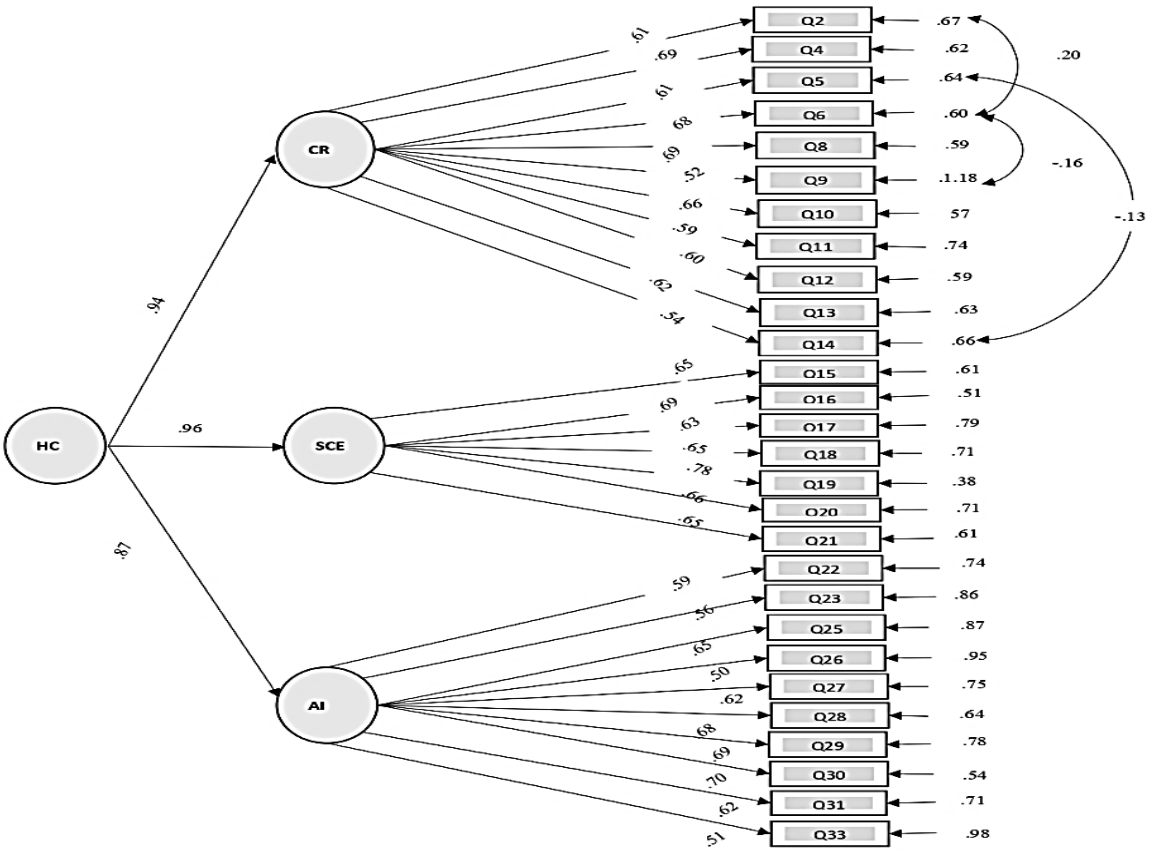

Figure 2. Second-order confirmatory factor analysis model validating the hidden curriculum measurement scale in medical education

Appendix 1. Hidden Curriculum Questionnaire in Medical Institutes (adopted from Rauf et al. [11])

	Items
1*	I have a good relationship with my teachers.
2	The teachers and staff of our institute are highly supportive.
3*	The confidentiality of our personal and academic records is respected and maintained.
4	The vision of our institutes is progressive.
5	There is open access to all relevant information.
6	Teachers, students, and staff work closely together in collaboration.
7*	Cultural diversity in our institutes is highly respected.
8	Our institute's policies and procedures encourage diversity, equity, and inclusion.
9	I am highly motivated to excel in this institute because I have the power to make a difference in how things are done in my class.
10	Alternative approaches to learning are encouraged in my institute.
11	The learning activities at my institute are intellectually challenging.
12	Our curriculum reforms are in line with the best international practices.
13	Administrative functioning is organized.
14	We are made aware of progressive curricula and driven to explore better opportunities internationally.
15	Co-curricular activities at our institute foster a healthy and friendly environment.
16	Our medical institute takes active measures to provide admission to a diverse candidate pool.
17	Our institute gives us equal and open opportunities to participate in various physical activities.
18	Our extracurricular activities are highly organized and popular among students.
19	Our institute provides support and empowerment to students in all aspects of their academic and non-academic growth.
20	My association with this institute will help me to do well in the future.
21	Academic achievement is highly rewarded and recognized in this institute.
22	The teacher's attitude encourages students to ask questions.
23	Teachers' marking is fair and objective.
24*	Teachers do not show bias toward selected students.
25	All students have an equal opportunity to participate in and excel at academic and non-academic activities, irrespective of their gender and cultural background.
26	Teachers inform students about any changes to plans regarding assignments and tests well in advance.
27	Teachers allow students to explain their points of view without judging them.
28	Teachers treat us equally.
29	There is no gender disparity in our medical institute.
30	Teachers and administration respect individuals and value their differences.
31	I believe the administration will take appropriate action in response to incidents of discrimination or bias.
32*	I am empowered to make important decisions regarding my learning.
33	I am empowered to make my own choices to achieve my goal. I believe that I am capable of achieving my goals at this institute.

*In the validated version tailored for the Iranian context, items marked with an asterisk were excluded.