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The Experiences of Faculty Members and Medical Students of Basic Medical Sciences of Characteristics of a Competent Professor: A Qualitative Study

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Abstract

Background: The instructor is one of the key factors in attaining educational goals in medical education, and the instructor's competencies facilitate students' educational achievement. The present study is an attempt to explain the experiences of faculty members and students of characteristics of competent professors who play an influential role in the academic achievement of basic medical sciences students in universities of medical sciences across the country.

Methods: The present study is a conventional qualitative content analysis. Fifteen faculty members and students of medicine from Iranian universities of medical sciences from different regions of the country were selected using a purposive and then theoretical sampling. A semi-structured interview was used for data collection.

Results: In this study, four themes and nine sub-themes were extracted from interviews. The themes included "clinical knowledge", "teaching competency", "monitoring students' performance", and "cognitive-psychological arousal". The sub-themes were "clinical knowledge' including "Non-applied teaching of basic sciences and unfamiliarity of instructors of basic sciences with the clinic"; "teaching competency" including "having instructional design skills, teaching based on the psychology of learning, and professional development"; "monitoring students' performance" including "fair evaluation and valid evaluation", and "cognitive-psychological arousal" including "student support and reinforcement".

Conclusion: The present study identified the important characteristics of the competencies of professors of basic medical sciences working in Iranian medical universities. The competency of professors is essential in promoting students' educational achievement and training efficient and professional students in the field of medicine to render quality health services. The results of this study will assist administrators and educational policymakers in planning for the promotion of professors and medical education.

Keywords: Competency, Medical Professors, Faculty Member, Medical Basic Sciences, Academic Achievement, Medical Student

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Introduction

One of the main responsibilities of educational institutions such as universities is to train students as the future capital to guarantee the economic, social, and political promotion of societies (1). Considering the mission of the

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↑What is "already known" in this topic:
A good professor with suitable and desirable competencies can be effective in improving the students and the university's reputation.

→What this article adds:
The characteristics of a competent professor in medical basic sciences are "clinical knowledge," including "Non-applied teaching of basic sciences and unfamiliarity of instructors of basic sciences with the clinic"; "teaching competence," including "having instructional design skills, teaching based on the psychology of learning, and professional development"; "monitoring students' performance" including "fair evaluation and valid evaluation", and "cognitive-psychological arousal" including "student support and reinforcement".

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medical field in serving people and maintaining health of society, the medical profession is one of the most sacred ones that demands educated and trained specialists (2, 3). Undergraduate medical studies in Iran is a 7-year program consisting of four stages: basic sciences, physiopathology, apprenticeship, and internship (3).

The basic medical sciences stage is the background for academic progress and accurate understanding of the content of the next stages of general medicine. Medical students solve clinical problems and make clinical decisions by using the knowledge and skills they acquire at this stage (3). Identifying the factors that affect the academic achievement of students is a suitable approach to planning and developing educational programs so that the best possible results can be achieved for educational institutions and students (4). Variables that predict academic achievement are numerous and diverse (5), including professors' competencies. Professors are fundamental pillars of education in each university (6), who deal with the soul and emotions of learners, and their improper acts, can lead to irreparable damages. In fact, their decent performance and characteristics provide the ground for achieving educational goals (7) .

To this end, each higher education institution has a set of criteria to determine the competencies of their professors in order to study their performance in tenure and promotion committees where they identify their exemplary professors to improve the quality of education (8). The faculty competencies positively affect the classroom environment and improve the progress of students. Learning and teaching in the university depend on the capabilities of the teachers that have a positive correlation with the student performance, progress, and achievement. The decrease in academic performance and the low quality of students is sometimes a reflection of the lack of capabilities of the professors in quality teaching that is a competency in knowledge and skills which enables teachers to succeed. To accelerate student learning, teachers must demonstrate expertise across a wide range of competencies in a complex environment (6). Competent teachers are required to prepare competent learners for the promotion of the education system in the global era (9).

In a holistic approach, education pursues many goals that enable a person to expand their potential for the well-being of themselves, their family and society. Education equips a person with the responsibility for developing and maintaining a just socio-economic system, preserving, and transmitting human heritage, as well as adopting a sensible and sensitive approach to the use of resources. In the absence of an accomplished educational system, especially competent and professional teachers, these cannot be achieved (10).

A study by Miguel and Barsaga on factors affecting learners' performance investigated the variables of teachers, parents, and society. It is concluded that the teacher is the key factor in the learners' progress and the quality of education depends on the quality of teachers (11).

By identifying the competencies needed by professors, it is possible to identify the needs of professors and design development programs for professors carefully. As many institutions have created local faculty development programs to train their medical educators based on local needs (12), the results of this study can also help plan the growth and development of medical professors in basic sciences.

Many studies have been conducted on the competency of professors in the field of medicine, which is mostly related to the ability to teach, but to the best of our knowledge, no research has been specifically conducted on medical basic sciences in Iran. Given the importance and impact of the basic sciences stage on the clinical training of undergraduate medical students, the researchers attempted to provide a framework presenting the characteristics of a competent medical teacher in the process of the academic achievement of medical students.

Methods

This study used a conventional qualitative content analysis, which is a suitable method for generating knowledge, new insights, presenting facts, and practical guidance for practice (13). This analytical approach avoids the use of predefined categories and creates categories that emerge from the analyzed data. The advantage of this approach is that it generates information directly from data without imposing preconceived theoretical perspectives (14).

Sampling

Purposive sampling and then theoretical sampling were used to select the research participants. After securing ethical permission from the Iran University of Medical Sciences, informed consent was secured from professors and students who were interested in participating in the research. The participants were undergraduate medical students and professors of medical basic sciences from medical universities from across the country. The inclusion criterion for students was completing at least three semesters of undergraduate medical studies, and for professors, it was at least five years of teaching experience in medical basic sciences. After interviewing five professors and ten students using a semi-structured in-depth interview (Table 1) in a period of nine months in 2021-2022, the researchers reached data saturation.

Data collection

Semi-structured interviews were used to collect data. Most of the interviews were conducted face-to-face and individually (only the researcher and the interviewee) and by observing considerations that provided psychological security and privacy for the free expression of people's experiences and thoughts. However, due to the COVID-19 restrictions, some of the interviews were done on the phone. At the beginning of the interview, the purpose of the research was explained to the participants, and a time was set for conducting the interview. Interview sessions were held in professors' offices and a private place in the medical school for interview with the students. The information sheet containing the title, purpose, introduction of the research team, and necessity of the research was provided to the participants and their informed consent was secured. Before starting data collection, the research team decided on interview-guided questions that had the conditions of

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Table 1. Demographic characteristics of the study participants

Participant number	Academic position	Academic Position	Marital status	Sex	Residential status	Medical Sciences University
1	Student	Intern	Single	Female	Private	Shahed
2	Student	Apprentice	Single	Female	Dorm	Iran
3	Student	Apprentice	Single	Female	Private	Iran
4	Faculty	Associate Professor	Married	Female	Private	Iran
5	Doctor of Medicine	General Practitioner	Single	Female	Dorm	Zahedan
6	Student	Apprentice	Single	Male	Private	Mashhad
7	Student	Basic Medical Sciences	Single	Male	Dorm	Tehran
8	Student	Basic Medical Sciences	Married	Female	Dorm	Shahed
9	Faculty	Professor	Married	Male	Private	Iran
10	Student	Basic Medical Sciences	Single	Male	Dorm	Birjand
11	Faculty	Professor	Married	Male	Private	Tehran
12	Student	Basic Medical Sciences	Single	Female	Dorm	Tehran
13	Faculty	Professor	Married	Female	Private	Iran
14	Student	Basic Medical Sciences	Single	Female	Dorm	Tehran
15	Faculty	Professor	Married	Male	Private	Shahid Beheshti

openness, relevance, and indirectness. Probing questions emerged during the interview and all the interviews were recorded with the consent of the participants. The guided questions of the semi-structured interview focused on the experiences of the students and the professors on the competencies of professors. The interview process began with demographic questions and then guided questions related to the study. For example, the first question asked, "Tell me about your experience of the characteristics and competencies of a professor you encountered in the basic sciences stage of your undergraduate studies?", The researcher tried to get rich information about participants' experiences by effective communication and interaction with them. In the interview session, based on the participant's responses, follow-up probing questions such as "Could you please explain it more?", "Could you please give an example?", "What do you mean?", "Why?", and "Did I understand you correctly?" were asked. On average, each interview lasted for 30-45 minutes.

Data analysis

After conducting each interview, the researcher listened to the interview carefully and transcribed it verbatim. Graneheim and Lundman's method was used for data analysis. The steps of which include writing the whole interview immediately after each interview, reading the full text of the interview to get a general understanding of its content, determining the meaning units and basic codes, classifying similar primary codes in more comprehensive classes, determining the hidden content in the data and extracting the main theme (15). During the transcriptions, situations such as the pronunciation of words, tone of voice, pause, laughter, sigh, cry, or the participant's emphasis were also recorded, and the structure of the participants' colloquial speech was observed while transcribing the interviews. The interviews were analyzed at the end of the interview. In order to get familiarized with the data and evaluate them accurately, the transcriptions of the interviews were read and re-read several times to get a general impression of the participants' statements. Then, a code was given to each meaning unit such as a keyword/phrase/sentence or key text. In the next step, similar primary codes were put together to form the sub-themes that were then put under the themes.

The accuracy and trustworthiness of the data

In the present study, Guba and Lincoln's criteria of credibility, transferability, dependability, and confirmability were used to evaluate the accuracy and trustworthiness of the collected data (16). In this study, the researchers used the method of immersed engagement with the data for nine months and spent enough time collecting and analyzing the data to confirm the credibility and acceptability of the data. Another strategy used to confirm the credibility of the data was integration, in which the researchers used interviews as well as the diversity of participants. In addition, the researchers enhanced the acceptability of the data by using audio recording and transcribing and analyzing the data immediately after each interview and using its feedback for subsequent interviews and also continuous comparison of the data.

To confirm dependability, a member-check was used, and each interview content was confirmed by the participants. And to ensure the correctness of data interpretation, the researcher returned the collected data and the coded texts to the participants and asked them to confirm or reject the extracted subthemes and themes. In addition, for peer-check the coded data and the results of the research were shared with two medical education experts to get their critical opinions. The third criterion to ensure the accuracy and trustworthiness of the data is transferability, meaning that the data be transferrable or applicable in similar contexts or groups. In this research, the researchers made deep, analytical, and rich descriptions of the background and characteristics of the participants, described the study context, and clearly described the obstacles and limitations so that the readers can use the findings of the study in other social contexts. To meet the confirmability criterion, all the stages of conducting the research, especially the stages of data analysis, were recorded in a detailed and comprehensive way so that, if other researchers wish to continue the research in other contexts, they can easily do so based on the documents of this research.

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Results

After coding all the interviews, 780 initial codes were extracted, and after integrating similar ones, the number of codes reduced to 234 codes. Finally, four themes and nine sub-themes were extracted from the codes (Table 2). The themes that emerged included "clinical knowledge," "teaching competency," "monitoring students' performance," and "cognitive-psychological arousal." The sub-themes were "clinical knowledge," including "Non-applied teaching of basic sciences and unfamiliarity of basic sciences professors with the clinic"; "teaching competency," including "having instructional design skills, teaching based on the psychology of learning, and professional development"; "monitoring students' performance" including "fair and valid evaluation of the student's performance"; "cognitive-psychological arousal" including "students support and reinforcement".

Clinical knowledge

Non-applied teaching of basic sciences

One of the most important glitches that medical students of basic sciences encounter is the gap between basic and clinical sciences, and most of the students said that the professors do not teach in a practical way; therefore, they do not have a good understanding of the lessons and just memorize them, and the reason for that is the lack of clinical foundation of the professors of basic sciences. Participant number 1 stated, "They don't teach us the applications of what we learn, where we can use what we are learning now in practice (not explaining the application of basic sciences courses in the clinic), so we just memorize what they are and what they aren't".

Unfamiliarity of professors of basic sciences with the clinic

A number of students considered lack of clinical background of most of the professors of basic sciences as the major reason for focusing on theoretical teaching. Participant number 5 said, "Most of the professors of basic sciences are PhD graduates of basic sciences and they do not have a clinical background; in other words, they don't have much knowledge of which part of these courses is really useful for a medical doctor (The professor's lack of knowledge of the contents related to the clinic).

Teaching competency

Having instructional design skills

Instructional design is about how learning takes place and the arrangement of activities related to it. The professors of basic sciences expressed their skills in instructional design by familiarizing themselves with the principles of medical education, recognizing individual differences of the learners, knowing the learners' level of knowledge, recognizing the learning styles of the learners, and choosing the appropriate content and educational materials. Regarding the selection of educational content and materials, participant number 4 said, "I am so obsessed about developing the materials, I always try to select materials that are clear and up-

Table 2. The competencies of basic medical sciences professors affecting students' educational achievement

Codes	Sub-themes	Themes
Making basic sciences applicable	Non-applied teaching of basic sciences	Clinical knowledge
Not explaining the application of basic sciences in the clinic		
Superficial learning of non-applicable subjects in the clinic		
Professors' clinical experience	Unfamiliarity with basic sciences professors at the clinic	
Professors' clinical background		
Medical education literacy	Having instructional design skills	Teaching competency
Selecting suitable content and educational materials		
Knowing the learners' individual differences		
Knowing the learners' level of knowledge		
Knowing the learners' learning styles		
Using attention-grabbing activities	Teaching based on the psychology of learning	
Interactive teaching		
Successful model for transferring educational materials		
Using modern methods of teaching		
Positive personality traits of Professors	Professional development	
Teaching competence of Professors		
Communicative skills of Professors		
Professional ethics of Professors		
Teaching skills of Professors		
The importance of professor's experience in the process of teaching		
Lack of bias in evaluation	Fair evaluation	Monitoring students' performance
Applying a suitable evaluation method		
Formative evaluation	Valid evaluation	
Correspondence between evaluation and goals		
Evaluation toward the student's learning		
Not abandoning the student	Students Support	Cognitive - psychological arousal
Encouraging the student		
Providing academic counseling to the student		
Rewarding the student for good scores in the exam	Reinforcement	
Allocating points for participation in class activities		
Using verbal encouragement		

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date (selection of clear and up-to-date educational materials), and take into account the learners' goals".

Participants number 9 said, "So, I try to identify the needs of the learners in the field I am teaching (identifying the learning needs of students) in two ways: first, the curriculum of the program and, second, by asking myself what competencies they are expected to acquire (identifying the learning needs of students through the curriculum of the program, identifying the competencies expected from the student at the end of the program) and trying to teach accordingly.

Teaching based on the psychology of learning

The psychology of learning works on how people learn and interact with their environment. In the learning process, professors need to have the necessary information and knowledge of modern educational theories and learning and educational psychology. The professors' teaching methods should be in harmony with the principles and goals of education and the characteristics of the learners. The experiences of professors and students in this regard were summarized in five categories of attention-grabbing activities in teaching, interactive teaching, successful model of transferring the content of teaching materials, professor's attention to the principles of teaching and learning and the use of modern methods in education.

Regarding the concepts of attention-grabbing activities in teaching and using modern methods in education, participant number 4 said, "I often give tangible examples (giving understandable examples), we exchange questions and answers (questions and answers), so I try to give clinical cases for medical students (providing clinical cases), and I try to talk about the applications of cases (expressing the application of clinical cases), I try to use ways of teaching that are different from lecture-based teaching, for example, we had a team based-learning and the students liked it a lot" (using modern teaching methods).

Professional development

Professional development or the existence of core competencies in the performance of professors is necessary for their professional development. The participants expressed different aspects of professors' professional characteristics, including positive personality traits, professional ethics, teaching skills, and teaching experience.

Regarding the importance of teaching experience, participant number 1 said, "I remember the genetics professor was a guy who had never taught at the university before, he knew a lot about genetics but he had no teaching experience (lack of teaching experience), so he did not teach the materials in the way we were expected to learn".

Considering the characteristics of professional ethics, participant number 4 says, "I really try to consider my students' personalities and characters, I avoid having arguments with them (respecting students' dignity and personality), and I had a positive relationship with them" (effective relationship with students).

Monitoring Students' performance

Fair evaluation

From the perspective of the students and professors, evaluation should be done in a fair and accurate way and without any bias. In regard to fair evaluation and lack of bias, participant number 9 says, "Professors need to accept and have a good relationship with students' joking behavior in class and their personality characteristics. I have never let these things affect my evaluation of students (not considering students' behavioral traits in evaluation). In my opinion, evaluation is the last stage of learning".

Valid evaluation

Valid evaluation is the assessment of students' achievement of educational values or goals (17). Participant number 2 says, "One of our professors was very committed, and he wanted us to learn. He would always ask questions in class to make sure we had learned the lesson (formative evaluation). He would explain again when he felt we had not learned a part of the lesson. He would ask the students to raise their questions if they had any, and his exam was always standard (standard exams, and the questions were exactly based on the materials in the coursebook".

Cognitive-psychological arousal

Students support: The meaning of student support in this study is the psychological support of students, considered considering entering a new period of studies that is different from high school, and also some of them are separated from their families Participant number 11 says, "We need to allocate time to our students, talk to them and meet them. Being seen is a lot more important than seeing" (valuing students).

Reinforcement: Student reinforcement in the teaching-learning process is a computational framework for modeling and automating targeted (18). Participant number 4 says, "I tell my students that at the end of the session, I will give them a quiz on the materials taught during the class. I make it clear that the quiz has no negative point, I mean they won't lose any points, but I tell them that if they get a good grade on the quiz, they will receive a bonus score in the final grade" (using the test as a motivational tool, rewarding students for good grades in class quizzes).

Discussion

Considering that the professor is an influential factor in student academic achievement, the present study was an attempt to explain the experiences of faculty members and students of characteristics of a competent professor who plays an influential role in the academic achievement of basic medical sciences students in universities of medical sciences across the country. The professor's clinical knowledge is derived from the teaching of basic sciences courses and its application in the clinic, and it is necessary for the professors of the basic sciences to be familiar with the clinic. According to the experiences expressed by the students in this study, there is a relative separation and lack of coordination between basic sciences courses and clinical courses, which confuses students, and the time gap between

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the basic sciences stage and clinical internship aggravates this issue. Another important reason is the unfamiliarity of basic sciences professors with the problems and issues of clinical courses, the reason for which was lack of clinical background of the most basic sciences professors. In this regard, Dahle et al. reported that the plan of integrating basic sciences and clinical courses leads to better and deeper learning in the student, and the student can better apply the principles of basic science in clinical fields (19).

Dominguez et al. considered lack of clinical foundation of professors of basic sciences as one of the important challenges of the program for the integration of basic and clinical sciences (17). Basic sciences instructors are not trained as clinical experts but are expected to tailor their content appropriately to its clinical application. This is a challenge that requires a deliberate effort on the part of the instructors of basic sciences. A practical solution to facilitate curriculum integration is to create experiential opportunities for professors of basic sciences to see the clinical application of their content and to combine these initiatives with training in effective medical education practices (20). Moreover, one way to minimize the barriers to the teaching of clinical topics by professors of basic sciences is to create experiential learning opportunities for them to learn from their physician colleagues about the clinical application of their content. Pairings between clinicians and basic science instructors can help bridge the "cultural gap" between these two groups of instructors, which in turn enables ongoing curricular integration collaborations (17).

Basic sciences occupy a large part of the preclinical curriculum. Clinicians should be involved in teaching basic sciences. Students believe that the application of basic sciences in clinical practice should be strengthened early in the medical program. Teachers should be more oriented toward general principles than pure knowledge. The knowledge will remain ineffective and soon evaporate. Merely learning the concepts of basic sciences does not guarantee that the student will be able to use them to solve problems in practice. Therefore, we should pay more attention to application of learned concepts to enable learners to solve problems. We should try to integrate teaching of basic sciences in the clinical context and then strengthen these sciences in the clinical years (21).

The second theme was “teaching competency.” Teaching competencies are the teacher's knowledge, attitude, and skills that can support the "physical, mental, emotional, social and spiritual development" of learners and promote student achievement (22). In order to have expert and committed doctors, we must train them in medical schools in an appropriate scientific way so that they can efficiently play their roles in society. In various studies, different classifications of teachers' teaching competencies have been investigated. These characteristics almost overlap with each other, and it has been stated that the main characteristics of a teacher for effective teaching are the same for medical teachers and other professions. One of the sub-themes of teaching competency in the present study is the professor’s instructional design skills . In this study, based on the concepts of familiarity of the professor with the principles of education, selection of appropriate educational materials and content, knowledge of learners and educational needs, the theme of “instructional design skills” was extracted. The purpose of educational design is to predict and adjust educational events based on the goals, content, and available facilities according to the cognitive structure and characteristics of the learners. Before starting teaching, the professor needs to predict and prepare everything and write the program schedule. Therefore, it can be said that having instructional design skills comes before other activities of the professor.

Bauer believes that professors should have in-depth knowledge of their specialty and be skilled in combining theoretical and practical information and have the ability to effectively transfer their knowledge and skills to students. Also, the effectiveness of teaching depends on the capabilities and skills of professors in determining educational goals and expectations, creating a supportive learning environment, using appropriate educational methods, teaching in small and large groups, working with learning resources, appropriate role models, constructive feedback, assessing and evaluating learners, goal-based evaluation, and evaluation of the program (23).

In the study by Bazargan et al., it has been stated that the educational performance of professors includes meeting expectations and obtaining a favorable status in terms of subject mastery, setting objective goals, course design, and organization, scientific and human interaction, interest and passion for teaching, learner-oriented education and evaluation (7).

Teaching based on the psychology of learning and educational psychology is another sub-theme of teaching competency, which includes interesting activities in teaching, interactive teaching, a successful model of teaching the content, the professor's attention to the principles of teaching and learning, and the use of modern methods in education.

Gagne, one of the pioneers of educational psychology, has proposed a nine-step model for education, the first step of which is to attract the learner’s attention. He states that in order to maximize learning, the learner's full attention must be captured and his interest aroused because curiosity motivates learning (24).

Regarding drawing attention and student participation, Goldberg et al. have stated that teachers should continuously monitor student participation in classrooms. A teacher's ability to provide sufficient time for learners, engage all students in active learning processes, and elicit their cooperation are critical prerequisites for enhancing learner achievement.

P.J. McLeod et al. conducted a study on the implicit knowledge of clinical instructors regarding the basic principles of education. This study states that professors in medical schools rarely receive formal training in the basic principles of education. However, most of them become qualified teachers. Probably, they acquire the implicit knowledge of these principles through teaching experience. If medical instructors are helped to turn their implicit knowledge of education into explicit, the effectiveness of their teaching may improve because successful teaching requires understanding of the learning process. An instructor

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who understands learning processes may easily change their learning behaviors during or after a learning event (25).

Another sub-theme is the use of modern teaching methods by professors. Foley has stated that teaching techniques for health professions are necessary to increase the quality of the work of the professors. These will increase their awareness of teaching and learning techniques and methods and their application in various fields of medical sciences (26). In a study conducted by Sarshar et al. on the explanation of the experiences and views of the faculty members of the Faculty of Basic Sciences of Tehran University of Medical Sciences on different teaching methods, according to experts and education specialists, familiarity with teaching techniques and methods are among the most important criteria that an instructor needs. One of the new methods that the professors found suitable and practical for the medical basic sciences students is the team-based teaching (TBT) method. However, most professors could not use this method due to the large amount of compulsory content of the courses. In this regard, Barzegar et al. reported that by determining the content of the courses as core and non-core and reducing the necessary volume of the content of the courses and some other changes, it is possible to provide the basis for the use of new teaching methods and thus promote the quality of education (27).

Considering the economic, social, and technological changes and developments, millennial students have also changed accordingly. According to the researchers, a learning environment based on the principles of constructivism is a suitable learning environment for classrooms. Today, students need to understand how to access the information they need and how to apply this information in real-life situations. In addition, students are faced with many situations for which there are no straightforward and pre-prepared answers, and rather they should be able to analyze the situations and use their knowledge and skills to find a solution that is useful and use of new teaching methods such as complete forms of TBL, problem-based learning (PBL) and case-based discussion (CBD) are highly welcomed by these students.

Professional development is another theme of teaching competency of professors, which refers to the professional characteristics that a professor needs to have in order to promote students' academic achievement. In the present study, positive personality traits, academic competence, communication skills, professional code of ethics, and teaching skills and experience were included in this category.

Teaching any subject is a very complex cognitive activity in which the teacher must apply knowledge from different fields (28). Content knowledge generally refers to the facts, concepts, theories, and principles that are taught and learned in specific subjects or courses in schools (28). Pedagogical knowledge relates to "how" an instructor teaches a subject (29). In every profession, there is specialized knowledge that makes it unique and distinct and has outstanding characteristics that are completely different from other professions. One of the characteristics of good teachers is that they possess a significant amount of specialized knowledge. Higher levels of specialist knowledge allow teachers to challenge learning environments, while supporting learners' learning processes (28).

There is convincing evidence that there is a high correlation between teachers' "content knowledge" and learners' academic achievement. A growing body of research shows that student achievement is more influenced by the quality of the teacher in terms of content knowledge than by the student's prior academic record or the school the student attends (30)

Many studies have been conducted on the communication skills of professors. Some evidence considers effective communication between professor and student to be essential in increasing the effectiveness of the teaching and learning processes. The teacher's character and moral aspects, along with their scientific knowledge and teaching styles, can be effective in improving the relationship between the teacher and the student and as a result, increasing and improving the teaching and learning processes. In a study on the students' understanding of effective and non-effective professors, Tang et al. stated that a proper relationship between the professor and the student creates positive consequences such as increasing self-confidence, learning motivation and improving professional skills in students, reducing the probability of academic failure and improving their professional identity (31).

Another sub-theme of professional development was teaching experience. Experience is considered an advantage in any profession, including teaching. Lieberman et al. reported that a teacher's experience gives them confidence and improves their performance in teaching, motivating, encouraging and guiding learners (32).

Stronge stated that the teacher's teaching experience is one aspect of an effective teacher. Experience "offers teachers an opportunity for professional development by learning from doing." One way to improve teacher effectiveness is through professional development programs that are deemed necessary to provide teachers with continuous updates on effective teaching (33).

In Morghayie et al. study on the explanation of the views of professors and graduate students regarding teaching and learning methods, the teacher's characteristics, including the personality characteristics of "flexibility", the academic characteristics of "the teacher's literacy, the teacher's experience", the "teacher's skills, interest in teaching, the interaction between the teacher and the student, and the teacher's competencies" are mentioned as important factors in students' learning (34), which are in line with the present study.

Adherence to the principles and values of the professional code of ethics was another sub-theme of the teacher's teaching competency, which is of significant importance for university professors who have the main role in managing and directing education because professors play an important role in improving students' performance by observing professional code of ethics. A teacher's professional code of ethics is known as a scientific discipline that examines the effects of manifestations and principles of a professional code of ethics in teaching, behavioral patterns and relationships in the "teacher"-"student" system and thus

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provides rules (35). In the study on the process of developing a professional code of ethics for teachers, Campbell states that increasing awareness of the ethical dimensions and responsibilities of teaching is necessary both to promote professionalism and, more importantly, to improve performance (36).

In explaining the theme of professional development of professors, it can be said that when professors have sufficient and necessary expertise and ability in these skills, they can use their knowledge, skills, and expertise in the education process, thus creating a favorable environment for students' better academic achievement.

The next theme is monitoring the performance of students, which includes fair and valid evaluation. If teachers do not understand how to conduct qualitative evaluation efficiently, their learners are directly disadvantaged (37). In the study by Jone et al. on promoting fair evaluation of learning during clinical simulation, it was stated that many factors influence assessment and evaluation process, including provision of reliable and valid tools/rubrics, student preparation, faculty preparation, faculty beliefs and values, and faculty objectivity. Professors use their own experiences as a basis for interpreting student performance even when measurable standards are used. This review emphasized the influence of instructors' personal values on evaluation decisions. Personality differences between learners and teachers may affect teachers' perceptions and require teachers to be aware of the effects of their own beliefs and values on decision-making (38).

Teachers should be skilled in implementing, scoring, and interpreting the results of evaluation methods. Choosing and developing good evaluation methods is not enough per se, and teachers must apply them correctly. They will be able to analyze evaluation results to identify learners' strengths and weaknesses. They should use evaluation methods in a way that encourages learners' academic achievement and does not increase learners' anxiety levels (39).

Understanding legal and ethical responsibilities and commitment to them should be evident in all the work a teacher does, including evaluation, and is a sign of professional performance. Areas of understanding include test preparation, confidentiality of information, opportunities for learning, and appropriate procedure. Teachers should make decisions based on the results of multiple and appropriate evaluations (40).

In explaining monitoring of student performance, it can be said that the evaluation of the teaching-learning process provides valuable information for professors, students, and managers about the educational achievement of learners, the effectiveness of programs, and the alignment of educational and learning activities with predefined educational goals and objectives. Effective evaluation can also be useful both in the correct screening of students and in increasing students' motivation and efforts for better and deeper learning. Therefore, professors can achieve this by choosing appropriate and fair methods, conducting formative evaluations, and matching evaluation with goals of the course.

The last theme is the cognitive-psychological arousal of students for learning, which includes supporting students and reinforcement. Psychological and cognitive arousal means creating motivation in the student in the process of academic achievement. In Brissette et al. systematic review of motivation of medical students, it was stated that motivating the learner is one of the most important roles of a teacher. Modern medical education curricula assume that medical students have an innate desire to become doctors and are motivated by internal rather than external factors. In this study, it is stated that we should not overemphasize intrinsic motivation in medical students as adult learners and neglect extrinsic motivations such as rewards or financial status (41).

As we strive to develop instructional techniques that target the intrinsically motivated adult learner, at least some learners may behave as extrinsically motivated learners. We all encounter learners who are unmotivated in certain courses, do not strive to meet standards, or may feel a difference between the institution's goals and their own. There are still a diverse aspects of current medical education programs that lead students to behave in extrinsically motivated patterns. It is important to understand that motivation is a multifaceted concept, and we should try to find new techniques to increase learners' tendency to self-directed learning. This type of medical education tries to create lifelong learners who feel a personal responsibility for their knowledge. As we recognize that different learners may learn in different ways and develop our teaching session accordingly, considering different motivational patterns may lead to a curriculum that motivates a greater proportion of learners (41).

In explaining the cognitive-psychological arousal, it can be said that psychological support of basic medical sciences students, considering that they are entering a new and different period from school, through measures such as academic counseling, communication with students, and giving hope and encouragement creates a kind of protection against individual problems, and the learner will be able to easily overcome the pressures and crises of the environment and achieve a higher level of academic performance. Also, the use of positive stimuli in teaching and using reinforcement processes increases the student's motivation to learn and, subsequently, their academic achievement.

Most of the studies have stated teaching competency as the most important characteristic of a competent professor. In a study that investigated the competencies of medical professors in Mashhad, Akbari Lakeh et al. used Alabama University teaching competency self-assessment instrument, which includes the characteristics of preparation for instruction, presentation of organized instruction, assessment of student performance, classroom management, positive learning climate, communication, professional development and leadership, and performance of professional responsibilities. Most of which , are similar to the present study and they stated no significant difference between the professors of basic and clinical sciences in these characteristics (22).

Srinivasan et al. expressed six core competencies, based on the ACGME competencies framework: medical

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knowledge; learner-centeredness; interpersonal and communication skills; professionalism and role modeling; practice-based reflection; and systems-based practice for medical educators. The first four competencies are in line with the present study (12). One of the major differences in the competency of medical professors and other professions is in clinical knowledge. Most of the professors of the basic sciences have a doctorate degree in the fields of basic sciences and they are not familiar with the clinical knowledge. For this reason, they are not able to express the clinical application of the basic sciences. Therefore, educational managers should use strategies to improve this competency in medical basic sciences professors.

Conclusion

This qualitative research was an attempt to understand and describe the experiences of medical students and professors of basic medical sciences regarding the components of the competencies of professors of basic medical sciences. The capabilities of professors are necessary to promote the academic achievement of efficient and professional medical graduates. The results of the study assist educational planners and policymakers to recognize these competencies and create an atmosphere to promote them among professors.

Study Limitation

The researchers had no specific limitations beyond the control of the study. And the problems due to the spread of the Covid-19 pandemic resulted replacing face-to-face interview with interviews on the phone.

Suggestions for further research

Conducting a study on the experiences of professors and medical students of competencies of clinical professors, to be compared with the results of this study is suggested.

Ethical considerations

This study, as a part of the Ph.D. thesis of medical education entitled “Designing an academic achievement model in medical students of Basic Sciences in Iran Medical Sciences Universities,” secured code of ethics from the ethics committee of Iran University of Medical Sciences (IR.IUMS.FMD.REC.1400.356).

The information sheet was sent to the participants and informed written consent was secured from the study participants. The informed consent process provided participants the opportunity to ask questions and consider all the possibilities. Participants could refuse to participate or withdraw from the study at any time. Each interview was recorded by a digital sound recorder after obtaining the participants’ informed written consent, and important notes were taken.

Conflict of Interests

The authors declare no competing interests.

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