



Professors' Valuation Criteria from the Perspective of Students of Shiraz University of Medical Sciences Using Shannon's Entropy Technique in 2016

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Abstract

Background and Objectives: One of the ways to assess professors is through evaluation by students. This is one of the most challenging methods, with many people for and against it. The present study aimed to weigh existing evaluation criteria in the form of students' evaluation of professors at Shiraz University of Medical Sciences.

Methods: The present descriptive-analytical cross-sectional study was conducted with 240 students of Shiraz University of Medical Sciences in 2016-17. Data were collected using a six-criterion questionnaire. Questionnaires were distributed among students by the researcher through the schools' education units and then collected. Data were statistically analyzed using SPSS. Weighing criteria were done by Shannon's entropy method in Excel.

Results: Of the six evaluation criteria, "Attracting students' attention" weighed the most (0.2087 out of 1), followed by "Use of interactive and new teaching methods" (0.2049), "Ability to make the subject understood and motivate" (0.1728), "Punctuality" (0.1727), "Proper communication" (0.1546), and "Proper planning" (0.0863).

Conclusions: Attention to basic criteria in students' evaluation of professors is highly important, and this kind of evaluation is only useful when evaluation questionnaires are reviewed by students and include important points and become a part of an extensive and systematic evaluation program for the progress of faculty members.

Keywords: Evaluation Criteria, Professor, Student, Weighing, Shannon's Entropy

1. Background

One of the most important resources of any organization or institution is experienced human resources. Thus, every organization needs trained and competent employees to survive and remain competitive (1). Additionally, evaluation of the performance and capabilities of these forces and control of their behaviors has always been regarded as one of the requirements of organizations (2). Performance evaluation is a systematic process of collecting, analyzing, and interpreting data to determine the extent of realization of goals (3). In other words, performance evaluation determines the credibility and benefits of someone's performance (4). Evaluation requires a proper, sensitive, and accurate system and assessment tools for correct evaluation and minimization of adverse consequences. Adverse consequences of poor evaluation include reduced employee satisfaction, reduced motivation, indifference toward duties, and, ultimately, reduced

system efficiency (5).

The education system is a dynamic and purposeful phenomenon that contains quantitative and qualitative dimensions. The balanced and parallel development of these dimensions is among the essential goals of the education system (6). Because one of the missions of universities and higher education centers is to train and supply capable employees to organizations, the survival of organizations is closely associated with the educational quality of universities (7). One of the main pillars of universities and educational centers that significantly affect the quality of education is well-trained and educated faculty members (8). In other words, a university's mission is accomplished when it can train the workforce required by organizations with the help of professors and up-to-date and adequate educational tools (9, 10).

In fact, university professors, as one of the most important inputs to the country's educational system, play a substantial role in the education system and, in a way, repre-

sent this system. Therefore, ongoing improvements to the quality of education require enhancement in the quality of this vital input (11, 12). Performance evaluation of faculty members is one of the methods for improving the quality of educational activities of professors in higher education centers. It is possible to use the evaluation results to determine weaknesses and strengths and carry out educational reforms and transform planning (13).

The evaluation of university professors is carried out in different ways, including evaluation by the departmental director, colleagues, and school authorities. One of the most common evaluation methods in most countries, including Iran, is evaluation by students (14, 15). This was done for the first time in 1960 in Brooklyn college and in the universities of Purdue, Washington, and Michigan (16). The process of evaluation of professors by students includes a questionnaire containing evaluation criteria, which is made available to students to express their views. These criteria consist of parts such as personality attributes of professor, scientific and up-to-date information (17), communication skills (18), ability to make the subject matter understood and exam technique (19), and use of educational aids (20). The purpose of using this tool is to provide feedback to teachers, provide an efficacy criterion, provide students with information relating to choices of subjects and professors, and the use in educational research (21).

Many studies have been conducted on students' evaluation of professors, and they have provided evidence in favor of or against this type of evaluation (22). However, some experts have considered evaluations by students, in which students are in the position of judges and are comprehensively opinion-surveyed about one particular subject or all subjects, as the best type of evaluation, because students are the only people who are directly taught by professors. Therefore, when it comes to the evaluation of educational activities, they are fully capable of expressing their views about their professors' teaching status (23).

In their study, Hokmabadi and Fallah concluded that the most important attributes of a good professor in students' views are mastery over the subject, fluency of expression, and ability to communicate (24). Thus, if students' evaluation of professors is the central criterion, and aims to assess the learning progress, and students' achievement of predetermined expectations, and is performed according to standards, it can be a useful tool to strengthen professors' and students' motivations (25).

Students' evaluation will greatly help decision-making by university authorities and provide professors with feedback in relation to their teaching method. The results of a study showed that most professors and students agree that evaluation affects educational performance of profes-

sors (26). Another issue worth noting is the criteria used in evaluation, which form the basis for identification and selection assessment.

Various criteria are used to evaluate professors' performance in different educational institutions, including universities, each of which assesses a particular dimension of performance. For instance, criteria such as proper planning by professors, communication, making key subjects understood, and teaching techniques are used in Shiraz University of Medical Sciences. There are various methods for understanding the importance of the different criteria used for assessing a particular variable, which can be summarized using two general methods. One of these methods is determining the importance of a criterion based on previous studies, in which the importance of each criterion can be identified (27). However, this method is applicable only to comprehensive and matching variables and is uniformly used in different organizations. To assess the importance of assessment criteria variables such as professors' performance (which may be different in different organizations), the second method can be used—grading the importance of criteria according to the views expressed by different groups, depending on the place of service (27).

Given the importance of the subject, the present study was conducted with the aim of weighing professors' assessment criteria from the perspective of students of Shiraz University of Medical Sciences to obtain more scientific and accurate results. The present study results can be used to raise the scientific, educational, and motivational levels of professors as well as students.

2. Methods

The present descriptive-analytical cross-sectional study was conducted with the aim of weighing professors' assessment criteria from the perspective of nonpostgraduate students of Shiraz University of Medical Sciences in 2016 - 17. The study population included all students of Shiraz University of Medical Sciences in the first half of the academic year of 2016 - 17 who had completed their first academic semester at least. Given the nature of the present study, and based on the views expressed by the statistics consultant, sample size was established to be 240 students using rule of thumb.

For allocation of the samples, first, a category was formed from schools based on number of students. Samples were distributed over schools by stratified sampling appropriate for the population size, and 240 students were chosen from 10 schools. Students were randomly selected from each school according to their student number and using a table of random numbers.

Data were collected using a two-part questionnaire. The first part contained demographic details of participants, and the second part included questions relating to the six main items in the professors' evaluation form: "Drawing students' attention while teaching," "Using interactive and new teaching techniques," "Ability to make the subject understood and motivating," "Punctuality," "Proper communication," and "Proper planning." Answers to the questions were given a score based on a 5-point Likert scale (very important = 9, important = 7, average = 5, low importance = 3, and very low importance = 1). To avoid errors due to the word "Average" in the questionnaire, participants were asked to give a score to each item according to its importance from 1 to 9. Validity of the questionnaire was confirmed by experts, and reliability was assessed using Cronbach's alpha coefficient. To this end, a pretest was taken from a sample of 40 students. Cronbach's alpha coefficient of 0.82 was found for the results, which confirmed the reliability of the questionnaire.

Participation and completion of the questionnaire were carried out using student volunteers. The study objectives were explained, and confidentiality of data was stressed; verbal consent was then obtained from the participants. The questionnaires were distributed anonymously among participants and self-administered by them. Data were analyzed using SPSS-23 (IBM Corporation, Armonk, NY, version 23) by means of the T-test, ANOVA, and Pearson correlation coefficient at a significant level of $P < 0.05$.

To weigh criteria, Shannon's entropy method was used in Excel version 2016. This method has five general stages. First, each datum collected from students was divided by the total data in each item ($P_{ij} = n_i/\zeta_i$). In the second stage, each figure obtained (often in decimal form) was multiplied by its $\ln(P_{ij} \times \ln P_{ij})$. Next, the sum of previous operations for each item was multiplied by $-K = (1)/(\ln 350)$ (total sample size = 240), and the result for each item was named Eq. In the fourth stage, each Eq was subtracted from 1 ($d_j = 1 - Eq$), and the results obtained for each item were added together ($d_j = dj_1 + dj_2 + dj_3 + dj_4 + dj_5 + dj_6$). In the final stage, each d_j was divided by ζd_j , and in this way the final weight of each item was found.

3. Results

Of all participants, 52.1% were women, 33.8% were second-year students, and 53.3% were in the 21 - 23 years' age group (Table 1).

Analysis of the results from Shannon's entropy method showed that the criterion "Drawing attention of students while teaching" weighed the most and came the first among other criteria (0.2087 out of 1), followed by "Use of interactive and new teaching methods," "Ability to

Table 1. Frequency Distribution and Details of Participants

Variable	No. (%)
Age, y	
18 - 20	87 (36.3)
21 - 23	128 (53.3)
24 - 26	19 (7.9)
27 - 32	6 (2.4)
Gender	
Male	115 (47.9)
Female	125 (52.1)
Academic year	
First	43 (17.9)
Second	81 (33.8)
Third	72 (30)
Fourth	31 (12.9)
Higher	13 (5.4)

make the subject understood and motivate," "Punctuality," "Proper communication," and "Proper planning" (Table 2). The results showing the score for each criterion from the students' perspective are presented in Table 3.

Table 2. Final Weight of Each Criterion of Students' Evaluation of Professors

Criterion	Final Weight of a Score
Attracting attention of students while teaching	0.2087
Use of interactive and new teaching methods	0.2049
Ability to make the subject understood and motivation	0.1728
Punctuality	0.1727
Proper relationships	0.1546
Proper planning	0.0863

Age was found to have a significant relationship with "Proper planning" ($r = 0.201$, $P = 0.01$) and "Punctuality" ($r = 0.203$, $P = 0.021$). Significant relationships were also observed between gender and "Ability to make the subject understood and motivating" ($P = 0.001$) and between academic year and "Drawing students' attention while teaching" ($P = 0.036$) (Table 4).

4. Discussion and Conclusions

According to the present study's results, "Drawing students' attention while teaching" was the most important

Table 3. Frequency Distribution of Scores Given to Each Criterion From Students' Perspective^a

Importance Level/Criterion	1	3	5	7	9
Punctuality	13 (5.4)	22 (9.2)	49 (20.4)	76 (31.7)	80 (33.3)
Proper planning	11 (4.6)	17 (7.1)	47 (19.6)	82 (34.2)	83 (34.6)
Use of interactive and new methods	18 (7.5)	24 (10)	58 (24.2)	63 (26.3)	77 (32.1)
Ability to make the subject understood and motivation	14 (5.8)	28 (11.7)	39 (16.3)	57 (23.8)	102 (42.5)
Attracting the attention of students while teaching	24 (10)	31 (12.9)	51 (21.3)	61 (25.4)	73 (30.4)
Proper relationships	13 (5.4)	16 (6.7)	51 (21.3)	57 (23.8)	103 (42.9)
Total	93 (6.4)	138 (9.6)	295 (20.5)	396 (27.5)	518 (36)

^aValues are expressed as No. (%).

Table 4. Significant Relationship of Professors' Evaluation Criterion with Demographic Variables from Students' Perspective

Variable	Professors Evaluation Criteria	Test	Significant Level
		Pearson Correlation Coefficient	P Value
Age	Attracting attention of students while teaching	0.169	0.158
	Use of interactive and new methods	0.072	0.565
	Ability to make the subject understood and motivation	0.050	0.462
	Punctuality	0.203	0.021 ^a
	Proper relationships	0.070	0.407
	Proper planning	0.201	0.010 ^a
Gender		T-Test	P Value
	Attracting attention of students while teaching	1.414	0.684
	Use of interactive and new methods	1.071	0.638
	Ability to make the subject understood and motivation	2.531	0.001 ^a
	Punctuality	0.898	0.370
	Proper relationships	-0.1	0.679
Academic year		F	P Value
	Attracting the attention of students while teaching	2.614	0.036 ^a
	Use of interactive and new methods	1.413	0.230
	Ability to make the subject understood and motivation	1.716	0.147
	Punctuality	0.920	0.336
	Proper relationships	0.136	0.969
	Proper planning	1.339	0.256

^aSignificant difference at 0.05.

criterion, and it was weighed the highest. This criterion refers to the ability of professors to use different methods

to attract students' attention while teaching. Based on the results obtained, this criterion has the highest effect on de-

cisions about professors' performance. Next, professors who were academically highly adept in the subject they taught but were unable to generate interest in the subject scored poorly in students' evaluation. The results obtained by Siamian et al. showed that one of the reasons that students attached importance to professors' teaching methods was their level of care; attention; and firmness and desire to gain more knowledge, score better, and continue further studies (28).

Mean score of "Drawing students' attention while teaching" was significantly different in students in different years, particularly the first- and second-year students. In higher education, the variety of subjects and professors, and the combination of practical and theoretical units, creates great diversity. In their early years of study, students are faced with classroom consistency and monotony in subjects and teaching methods, but after their first and second years their expectations match those of the rest. In a study conducted by Vakili et al. "fluency of expression" was one of the factors affecting students' evaluation of professors (29). Siamian et al. (28) and Ghorbani et al. (28) considered "fluency of expression" to be one of the most important attributes of a good professor. The results obtained by Jirovec et al. showed that there is a close relationship between students' evaluation of professors' teaching ability and attracting students through tangible teaching skills (30).

According to the present study's results, from the students' perspective, the criterion "Use of interactive and new teaching methods" ranked second in terms of importance. It seems that using modern and different teaching techniques instead of merely giving lectures leads to better evaluation of professors by students. Although a professor's most natural attribute is his or her academic skills in his or her specialized discipline, everyone who has a lot of knowledge are not necessarily good teachers. In the age of the influx of information, a professor should be knowledgeable, prepared, and familiar with the current science. Preparedness does not mean accumulation of information, but teaching and research ability, and knowledge of modern teaching methods is one of the necessities of this key role (31). In their study, Vaezi et al. considered professors' teaching skills to be appropriate criteria for students' evaluation of professors (32). Zare-Bidaki et al. concluded that one of the criteria for students' evaluation of professors was the use of teaching aids within the range of facilities and consistency with the subject (33). The results obtained by Sepahi et al. showed that the use of appropriate teaching techniques was considered by students to be a part of professors' teaching skills (34). In a study conducted by Hajdin and Pazur, professors' teaching ability and methodology was ranked first by students among

other evaluation criteria (35). This result agreed with those of the present study. Spooren and Mortelmans cited professors' ability to present subject matter as a part of their professional skills and stated that they affect students' evaluation of professors (36). Crumbley et al.'s results showed that 88% of students regarded teaching method and lecturing skills as highly important in the evaluation score of professors (37). The criterion of "making the subject understood and motivating" ranked second in terms of importance in students' view. In their studies, Crumbley et al. (38) and Vahabi et al. (39) concluded that the ability to make the subject understood was one of the most important factors affecting professors' evaluation by students. The results obtained by Allahvaisy et al. in Kurdistan University of Medical Sciences showed that the ability to make scientific subjects understood was one of the most influential factors among students and teachers in the evaluation scores of professors. It was especially important in terms of evaluation of professors (40), which agrees with the present study.

The results obtained in the studies conducted by Allahvaisy et al. (41), Hossini and Sarchami (32), and Kerman-Saravi et al. (42) showed that generating interest and motivation in students is an important criterion in the evaluation of professors by students. Lively and enthusiastic professors can achieve the highest level of learning in students (41). The results of Ghadami et al.'s study showed that professors' ability to convey and motivate students and make them understand the subject is an important attribute (43). Spooren and Mortelmans argued that transparency and ability of professors to help students in the course of learning are among professors' professional skills (36).

The analysis of results showed significant differences between the sexes in the criterion of "Ability of making the subject understood and motivating." Female students gave a higher score to this criterion than did male students. It should be pointed out that different sexes require different motivation by professors to study a subject. Thus, in this respect, professors should broaden their abilities.

According to the present study's results, "Punctuality" was the fourth important criterion in students' view. This criterion assessed the presence of the professor in the educational setting at a specified time. Ghorbani et al. concluded that punctuality and attendance on time of professors in the classroom is one of the important criteria in performance evaluation of professors by students (28). The present study's results showed a significant relationship between age and "Punctuality," revealing the differences between two educational systems (the education system and higher education system). First-year students have only recently entered the higher education system from the education system. In the education system, all classes

start on a specific time of the day and end on a specific time, but in higher education, each class starts some time during the day. Beheshti-Rad et al. considered professors' teaching discipline and punctuality to be one of the four most important components in the evaluation of professors (44). The results obtained in the studies conducted by Beheshti Rad et al. (45), Abdolahi et al. (42), and Heidari et al. (46) on the factors affecting professors' evaluation by students showed that in regard to observing teaching rules, the criterion of "Punctual class start and finish" was one of the influential factors.

According to the present study's results, the criterion "proper communication" was ranked fifth by students, and this criterion had a significant relationship with age. Amini et al. reported a positive and significant relationship between communication skills and teaching performance of professors, and considered inclusion of communication skills in their teaching programs to be essential (47). In Hajdin and Pazur's study, students ranked professors' communication skills 10th out of 19 criteria (35). This agreed with the present study in regard to the low priority of this criterion in evaluation. The results of the studies conducted by Amini et al. (48) and Turhan (49) showed that, among the different evaluation areas, students attached greater importance to professors' skills in communicating with students and in conveying concepts and to professional abilities of professors. Additionally, the results obtained by Heidari et al. showed that in the domain of communication skills, professors' ability to establish a friendly rapport with students had the highest priority compared to other communication skills (46). This disagreed with the present study's results. One of the reasons for the disagreement between the present study and some of the other studies appears to be study participants. The present study was conducted on nonpostgraduate students, and naturally, criteria such as "Drawing attention of students" and "Use of interactive and new teaching techniques" were more important to them, whereas given their position, students of postgraduate and higher levels are more sensitive to professors' proper communication skills. Bergman and Gaitskill in stating the attributes of capable professors in view of students, considered the ability to establish interpersonal rapport as an essential attribute (50). Having self-confidence and establishing close relationship with students was the most important teaching attribute of a good professor from the perspective of the students of Qazvin University of Medical Sciences (51). The results of a study conducted by Bergman et al. at the University of Cincinnati showed that students attached greater importance to professors' communication skills and professional ability (49). A study conducted by Joshi et al. in Nepal also reported similar results (52).

By establishing a proper relationship with students, professors can teach this desirable attribute and also convey their scientific knowledge (34). In fact, a friendly relationship is among the positive attributes of extroverted professors, and students seem to show their appreciation of friendly professors by giving them high evaluation scores. Friendliness and proper relationship of professors can provide motivation for students to progress and succeed (53).

Students considered "Proper planning," which refers to the proper use of time for planning, as the sixth area of priority in the evaluation of professors. The results obtained by Spooren and Mortelmans showed that 88% of students considered eloquence, seriousness, and planning and organization of topics to be highly important (37). Additionally, the results obtained in studies conducted by Siamian et al. (28), Zare Bidaki et al. (34), Joshi et al. (53), Zohour and Eslami Nejad (54), Ghafourian Borujerdi et al. (55), and Aliasgharpour et al. (56) showed that in addition to professors' mastery of the subject and eloquence, planning and organization of topics was highly important in students' evaluation of professors.

Attention to, and knowledge of, related and essential factors in students' evaluation of professors are very important, and it is essential that the purpose of evaluation be properly explained to students before distributing questionnaires to them so that the questionnaires can be properly completed. This kind of evaluation is often useful only when evaluation questionnaires are reviewed by students, when they include important points, and when they are part of an extensive and systematic evaluation program for the progress of faculty members. It is recommended that measures be taken to include the weight of each criteria in the final score of professors' evaluation. Moreover, in addition to students' evaluation of professors, other evaluation methods, including peer evaluation and self-evaluation, should be used. The limitations in the present study included lack of cooperation of some students, which was improved through explanations provided by the researcher.

Supplementary Material

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

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