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### Student Questionnaire to Evaluate Basic Medical Science Teaching (METEQ-B)

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# **Student Questionnaire to Evaluate Basic Medical Science Teaching (METEQ-B)**

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## **RESUMEN**

**Objetivos:** diseñar un cuestionario para que los estudiantes evalúen las habilidades de enseñanza del profesor, de acuerdo con la definición de las cualidades de la enseñanza de las ciencias médicas básicas, y para identificar las dimensiones subyacentes. Todo ello con el propósito de llevar a cabo una evaluación de la enseñanza de las ciencias médicas básicas en la Facultad de Medicina de la Universidad Nacional Autónoma de México (UNAM), como parte del proyecto de evaluación de la enseñanza en dicha institución.

**Material y métodos:** 6239 estudiantes contestaron 6598 cuestionarios que evaluaron a 327 profesores. El cuestionario se aplicó durante las clases normales en el ciclo escolar 1995-1996. Los profesores evaluados no estuvieron presentes en el momento en que se llevó a cabo la evaluación.

**Resultados:** se definieron tres factores que de acuerdo a su contenido se denominaron estrategias de enseñanza, evaluación del aprendizaje y ética y responsabilidad.

**Conclusiones:** se encontraron ciertas similitudes entre el contenido de los ítems del cuestionario y los utilizados en otros instrumentos, sin embargo, este cuestionario también comprende destrezas y habilidades que el profesor debe enseñar a los estudiantes con el propósito de alcanzar el perfil establecido en el curriculum de la Facultad de Medicina de la Universidad Nacional Autónoma de México.

## **SUMMARY**

**Objectives:** our aims were to design a student questionnaire to evaluate professorial teaching abilities based on a definition of quality teaching of basic medical sciences and to identify its underlying dimensions to perform an evaluation of the teaching of basic medical sciences at the *Universidad Nacional Autónoma de México* (UNAM) School of Medicine as part of this institution's Teaching Evaluation Project.

**Subjects:** a total of 6598 questionnaires were answered by 6239 students who evaluated 327 teachers.

**Material and methods:** the questionnaire was applied during the normal-class schedule during the 1995-1996 academic year. Professors under evaluation were not present at the time evaluation took place.

**Results:** three factors were defined that according to their content were denominated as teaching strategies, learning evaluation, ethics, and responsibility.

**Conclusions:** certain similarities were found between content of items included in this questionnaire and those used in other studies; however, the questionnaire also comprised the skills and abilities that a teacher should instill in their students to achieve? the graduate preestablished by the current curriculum of the UNAM School of Medicine.

## **Palabras clave**

- ✓ habilidades de enseñanza
- ✓ evaluación de enseñanza
- ✓ cuestionario estudiantil
- ✓ evaluación

## **Key words**

- ✓ teaching abilities
- ✓ teaching evaluation
- ✓ student questionnaire
- ✓ evaluation

## Introduction

Several reasons for assessing teaching include the need for institutions of higher education to demonstrate their credibility to the society, promote and provide feedback to teachers who wish to improve their teaching performance, and to recognize the importance of effective teaching.<sup>1-3</sup> Experiences in this field date back to the 1920s.<sup>4</sup>

Teaching in this work has been assessed for two main reasons: to provide diagnostic information for teachers with regard to specific aspects of their teaching to help them improve their performance (formative evaluation), and to serve as the basis for decision-making concerning hiring, contract renewal, incentives, and promotions (summative evaluation).<sup>2-7</sup>

Teaching assessment allows for identification of planning and designing needs of teacher-training programs and of those who provide pedagogic training for teachers. Potential benefits of this type of evaluation include the following: the possibility of implementing a permanent system to provide information on the status of teaching; encouragement of teachers to improve their teaching skills; promotion of a greater acceptance level of evaluation; obtaining of results that can be taken into account by members of the academic bodies responsible for teacher promotion, and recognition of the importance of teaching.<sup>5,7-10</sup>

Development of a teaching staff is fostered when evaluation of teacher performance is used to encourage teacher and to provide them with opportunities to improve their skills. Nonetheless, there is no available data of the degree to which evaluation of teaching is used for this purpose at universities.<sup>1,11,12</sup>

Some studies indicate that systematic evaluation has encouraged teachers to place more importance on teaching, and that their teacher evaluations have improved as a result.<sup>13</sup> Likewise, teaching assessment based on student ratings has shed light on other important aspects of the teaching-learning process.<sup>4,10,14</sup>

Teaching performance can be assessed by the teacher him/herself, the head of the department, colleagues or peers, and by students and former students.<sup>15,16</sup> However, they cannot all evaluate the same aspects with the same accuracy. For example, a teacher's peers are more qualified to

judge whether his or her knowledge is up-to-date and to assess the quality of the curriculum syllabus, while students are able to rate teaching methods, organization, clarity, communication skills, enthusiasm, and their own relationship with the teacher.<sup>4,17</sup> Several studies have found that former students and peer ratings of teaching performance coincide with student ratings.<sup>1,18</sup>

One of the most commonly used instruments for evaluating teaching is student questionnaires. Because students are the principal receivers of instruction, their points of view have proven extremely useful.<sup>1,7-9,19-21</sup>

Analysis of the factorial structure of instruments designed to evaluate teaching through student opinions has shown different results. Fernández reports on two dimensions:<sup>22</sup>

- a) Proven teaching ability
- b) Motivational and interaction skills

Metcalfe and Matharu identified three categories:<sup>23</sup>

- a) Attitude and behavior
- b) Design and preparation
- c) Teaching or communication flow

Kirschling *et al.* found five factors:<sup>24</sup>

- a) Knowledge
- b) Teaching methods
- c) Communication style
- d) Experience
- e) Feedback

It is worth noting that the number of dimensions does not reveal the complexity of "good teaching" *per se*, although this number may enhance it. Factors and individual-rating items are useful for diagnostic purposes.<sup>10</sup>

Generally speaking, it is important that instruments be designed in accordance with the area of study that will be evaluated. In other words, each instrument should be designed to conform with the characteristics that will be evaluated; thus, each instrument should therefore include the relevant domains or characteristics of the teacher's desired behavior without focusing on a particular aspect.<sup>25,14</sup>

There have been reports since 1927 on the validity and reliability of instruments for evaluation of teaching.<sup>4</sup> There are three types of validity as follows: construct, and content, criterion-related and predictive. This study is related with construct validity. In this respect, Marsh notes that factor analysis is a critical tool for testing construct validity;<sup>10</sup> in addition, as mentioned by Abrami *et al.*, few studies refer to criteria for determining reliability, and suggest that Cronbach coefficients ca. 0.80 should be considered acceptable.<sup>26</sup>

In the field of medicine and medical education, international organizations have urged medical schools and faculties to improve the quality of teaching and learning to respond more satisfactorily to the population needs.<sup>27</sup> This would obviously entail systematic study and evaluation of the quality of medical education at each institution;<sup>28</sup> however to date, teaching has not received the same attention given to research and clinical practice.<sup>29,30</sup>

In keeping with the latter, in the most recent review of the medical curriculum at the Medicine Faculty of the National Autonomous University of Mexico (UNAM), De la Fuente *et al.* emphasized evaluation of teaching to evaluate the role of teachers in professional training and in accordance with international guidelines.<sup>31</sup> Consequently, an institution's main purpose for evaluating teaching is to improve it.<sup>3</sup>

The evaluation project of the UNAM School of Medicine, initiated in 1994, intends to produce questionnaires to evaluate professorial teaching abilities rated by students, to implement evaluation of teacher performance, to train experts in evaluation, and to design a pilot scheme to improve teaching based on detected needs. The decision to use student questionnaires was made because there have been many reports concerning the validity of this method produced over the last 25 years.<sup>32-37</sup>

Development of this project has led to the participation of a significant number of faculty members in the design and application of the questionnaires, as well as in interpretation of results. This study has the following objectives: to design a student questionnaire to evaluate professor teaching abilities based on a definition of quality teaching of basic medical sciences, and to identify its underlying dimensions.

The current curriculum is based on a traditional structure, with different departments coordinating different courses.<sup>38</sup> These courses are divided into basic and clinical subjects. Basic medical sciences include the following subjects: Anatomy; Cell and Tissue Biology; Embryology; and Biochemistry, taught during the first year of Medical School, and Pharmacology; Immunology; Microbiology, and Parasitology, taught in the second year. The curriculum mainly emphasizes two teaching strategies: problem-solving by experimentation in the laboratory and use of case studies, and tutorial teaching. However many courses are conducted with use of lectures, discussions, and practical activities supported by use of slides, transparencies, the blackboard, video films, and CDs. In practical activities, students review fixed or fresh materials, make dissections, using computer programs designed for practicing, and occasionally participating as commentators in some of the lectures.

The basic cycle consists of 37-39 groups with 25-38 students per group. Courses are programmed for 10 months and are divided into terms or periods according to their specific objectives. Developmental Biology, Anatomy, and Biochemistry are taught by the same professor; the Cell and Tissue Biology course is taught by two professors and both are evaluated; the remainder of the subjects have three to four head professors, one for each period of the course.

Twenty-five faculty members from all departments of basic medical sciences participated in the study. The process of drafting the questionnaire involved four stages: a workshop-course to train participants on teaching evaluation; determination of features and indicators of what is regarded as good teaching; formulation of questionnaire items, and the carrying out of four pilot tests.

Participants identified and defined attributes of good teaching and classified them in categories. These attributes were used as references to make up questionnaire items. In each pilot test, teachers evaluated were selected at random. Factor analysis was then carried out to identify the questionnaire's underlying dimensions; items loading in more than one factor and with loading values lower than 0.40 were eliminated or reformulated. Originally, five categories were proposed: academic competence; teaching aptitude; teacher-student relationship;

learning evaluation, and ethics and responsibility; nevertheless, results of the last pilot test revealed only three factors: teaching strategies; learning evaluation, and ethics and responsibility.

## Methods

In this study, 6598 questionnaires were answered by 6239 students who evaluated 327 teachers. Teachers were evaluated once during each course at approximately halfway through the course, or at the end of the period during which the course was

offered. Thus, the same student answered several questionnaires, but never on the same professor unless he/she gave more than one course. Only fully completed questionnaires representative in number of class size were included in the analysis. This criterion was regarded as met when the questionnaire was answered by at least 60 % of students in classes with > 30, 80 % of students in classes of 20-29, 90 % of students in classes with 16-19, and all students in classes with 15 or fewer students.

The questionnaire was reviewed and modified as a result of the four previous pilot tests. Its final

**Table 1**  
**Factor analysis of the Medical Science Teaching Evaluation Questionnaire (METEQ-B)**

| Items  | Factor 1 | Factor 2 | Factor 3 |
|--|----------|----------|----------|
| 11. The class encourages me to look for more information on the topics deal with         | 0.898    | 0.078    | -0.129   |
| 15. The class fosters my problem-solving skills  | 0.868    | 0.064    | -0.058   |
| 1. The way the class is taught encourages me to study on my own                          | 0.842    | 0.019    | -0.038   |
| 17. The teacher asks questions which encourage me to reflect                             | 0.792    | 0.084    | 0.001    |
| 6. The teacher links topics to other subjects.   | 0.754    | 0.021    | 0.026    |
| 20. The way the class is taught encourages me to attend the teacher's classes            | 0.748    | -0.000   | 0.161    |
| 14. The teaching methods used in the class encourage learning                            | 0.730    | -0.009   | 0.188    |
| 5. The teacher encourages student participation  | 0.696    | 0.062    | 0.121    |
| 21. The teacher explains the topics clearly.   | .593     | -0.083   | 0.355    |
| 19. Uses more than one way of explaining a concept if the first explanation is not clear | 0.520    | -0.044   | 0.378    |
| 22. The teacher shows interest in his/her students                                       | 0.471    | 0.083    | 0.357    |
| 2. Work done outside class is taken into account for the final grade                     | -0.092   | 0.836    | 0.181    |
| 9. The teacher assigns work which contributes to the development of the course           | 0.061    | 0.778    | -0.094   |
| 16. Work done outside class is returned with comments and observations                   | 0.194    | 0.778    | -0.094   |
| 3. The class is conducted in an atmosphere of respect                                    | -0.034   | -0.011   | 0.808    |
| 18. The teacher covered the topics included in the syllabus                              | 0.021    | 0.021    | 0.794    |
| 23. The work standards agreed upon at the beginning of the course have been met          | 0.063    | 0.092    | 0.753    |
| 12. Questions in the exam correspond to what was taught in class                         | -0.049   | 0.127    | 0.664    |
| 8. The teacher has a good command of the topics included in the syllabus                 | 0.291    | -0.114   | 0.627    |
| 24. The teacher grades fairly  | 0.336    | -0.109   | 0.624    |
| 13. The teacher explains the topics in comprehensible language                           | 0.336    | -0.109   | 0.624    |
| 4. The teacher answers questions outside class   | 0.021    | 0.205    | 0.618    |
| 10. The teacher takes students' opinions into account                                    | 0.359    | 0.125    | 0.450    |
| Eigenvalues  | 13.10    | 1.52     | 0.978    |
| % of variance  | 57.0     | 6.6      | 04.3     |
| Cronbach reliability coefficient   | 0.954    | 0.853    | 0.916    |

*n* = 6239

version contains 24 multiple-choice items, each with five possible answers that allowed students to describe the frequency with which the behavior described was observed in percentage terms, as follows:

- Never (0-19 %)
- Almost never (20-39 %)
- Sometimes (40-59 %)
- Almost always (60-79 %)
- Always (80-100 %)

The questionnaire was applied during the normal class schedule of the 1995-1996 academic year. Professors under evaluation were not present at the time the evaluation took place. Persons responsible for giving out the questionnaire read aloud the same instructions to all groups and emphasized the importance of answering all questions honestly, so that teaching standards could be improved.

## Results

Principal components and exploratory factor analysis with varimax rotation were carried out.<sup>39</sup> Two principal components with eigenvalues of > 1 were identified, and a third component was maintained because it had a value of ca. 1 (0.973). Three factors defined in items with factorial values were > 0.40 and that appeared in only one factor were retained. As a result of these criteria, one item ("The teacher answers my questions satisfactorily") was eliminated.

Based on their content, factors were termed teaching strategies, learning evaluation, and ethics and responsibility. Together, these accounted for 67.4 % of variance, and Cronbach alpha reliability coefficients were 0.954, 0.853, and 0.916, respectively (Table 1).

The first factor includes items with a content related with teaching strategies that encourage reflection, problem-solving, concept analysis and learning, the subject's degree of integration with other subjects, relevance of the subject to medical practice, and the professor's interest in his/her students. The second factor includes items involving behavior linked with evaluation of student performance, such as the teacher's taking the student's work into account and returning it with comments and observations.

The third factor includes contents related with the professor's command of the subject, use of clear language, respect for his/her students, coverage of the program, compliance with norms, and fair grading. Highest correlation was between teaching strategies and ethics and responsibility (0.867) followed by teaching strategies and learning evaluation (0.554) (Table 2).

## Discussion

Statistical analyses carried out permitted identification of three dimensions of teaching: teaching strategies; learning evaluation, and ethics and responsibility. Each possessed a high degree of reliability, ranging from 0.954-0.853; these dimensions are congruent with three of the five categories originally considered. Indicators of two of the original categories, i.e., academic competence and teaching aptitude, appeared in the first factor (teaching strategies), and some indicators of teacher-student relationship appeared mainly in the third factor.

**Table 2**  
**Factor correlation matrix**

| Items  | Factor 1 | Factor 2 | Factor 3 |
|--|----------|----------|----------|
| Factor 1:  |          | 0.554*   | 0.867*   |
| Factor 2:  |          |          | 0.542*   |
| <i>n = 6598; *p &lt; 0.000, two-tailed test.</i> |          |          |          |

Although the factor denominated *learning evaluation* only contains three items, they have high factorial values (0.847, 0.841, and 0.775) and good reliability coefficient.

The third factor includes items that indicate the professor's degree of responsibility with regard to compliance with the program and the standards agreed upon, as well as his/her command of the subject and the respect shown for his/her students. This behavior is regarded as linked with the professor's ethics; therefore, the factor was denominated ethics and responsibility.



Certain similarities were found between questionnaire item content and that used in other studies, such as those concerned with clarity of explanation, command of the subject, integration with other areas of learning, encouragement of participation, ability to motivate students, and evaluation of learning.<sup>8,22-24</sup>

However, the design of the questionnaire took into account the skills and abilities that a teacher should instill in his/her student to achieve the graduate profile established by the UNAM Medical School's current curriculum. Consequently, the questionnaire includes qualities not considered in the remaining evaluation instruments reviewed, such as capacities for problem-solving and independent study.

The work carried out to date has enhanced our knowledge of the status of the teaching of basic medical sciences at our Institution and has increased the participation level of professors in the evaluation process. In addition, the information yielded by questionnaire evaluations has shown its usefulness for improving the quality of teaching.

Instruments for evaluating teaching should take into account aspects that encourage students to achieve the desired characteristics as a result of the teaching-learning process. This questionnaire identified the aspects of teaching that lead to fulfilment of this objective with a high degree of reliability. Nonetheless, further research is needed to verify whether the same factorial structure defined in this study will be maintained in future applications and to investigate additional types of questionnaire validity.<sup>40,5</sup>

### **Authors' note**

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