

# MEDICAL STUDENTS' EVALUATION OF TEACHING SYSTEM: A BASIS FOR IMPROVING MEDICAL EDUCATION

Jie Shan<sup>1, #</sup>, JiaYi Zhang<sup>1, #</sup>, YingJun Zhu<sup>1, #</sup>, Yue Zhou<sup>2, \*</sup>, Shuang Liu<sup>1, \*</sup>, LiZhi Chen<sup>1, \*</sup>

<sup>1</sup>Department of Science and Education, the Affiliated Guangdong Second Provincial General Hospital of Jinan University, Guangzhou 510630, Guangdong, China.

<sup>2</sup>Department of Emergency, TCM-Integrated Hospital of Southern Medical University, Guangzhou 510315, Guangdong, China.

<sup>#</sup>Jie Shan, JiaYi Zhang and YingJun Zhu are both the first authors.

<sup>\*</sup>Yue Zhou, Shuang Liu and LiZhi Chen are both the corresponding authors.

<sup>\*</sup>Corresponding Authors: Yue Zhou, Shuang Liu, LiZhi Chen

**Abstract:** A high-quality teaching system is pivotal to the cultivation high-quality talents. Whereas teachers play a critical role in improving the teaching quality, quality teaching feedback is an ingredient for teacher success. Therefore, a reasonable and robust evaluation method for a teaching system will help academics to continuously analyze their teaching content and methods thereby improve teaching quality. The quality of medical education is fundamental to the development of medical education. Medical education is crucial in developing advanced medical talents through training, and the education quality of medical students directly influences the quality of medical and healthcare practice in the future. At present, there is an upward trend in the implementation of the evaluation of the teaching system in medical schools of various universities. However, several shortcomings remain. This review analyzes and discusses approaches to establish a scientific and reasonable evaluation system for medical students, to provide new ideas for the construction of medical evaluation indicators as well as clear guidelines and directions for medical schools to carry out education and teaching reforms in the future.

**Keywords:** Medical students; Evaluation of teaching system; Student evaluations of teaching; Teaching quality; Management of teaching evaluation system

## 1 INTRODUCTION

The increasing demand to train many qualified medical talents to provide quality medical services and a healthy population inspired the development of medical education reform in China. An improvement in the quality of medical education is a fundamental guarantee of effective medical talent training, and the assessment and inspection of medical education ensure the improvement of the quality of medical education. Students directly participate in teaching activities, and student evaluations of teaching (SETs) are an important means to evaluate teaching quality [1, 2]. Although SETs were originally developed to assess courses and programs, they have also been used over the years to measure teaching effectiveness [3]. SETs are mainly used to identify problems in the teaching process in time to improve teachers' teaching skills, mobilize their initiative, enthusiasm, and creativity in teaching, enhance teaching ability and change teaching attitude [4]. Thus, medical educators should adopt SETs to improve their teaching ability and attitudes.

The current medical students' evaluation of the teaching system generally lacks a scientific and effective evaluation index system and method and pays insufficient attention to management tools of the evaluation system. This evaluation of the teaching method has a single function; it is only used as the main basis for the promotion of teachers and the implementation of "merit pay" [5]. This has weakened its diagnostic, regulatory, guidance, motivational, and improvement functions. In addition, most of the current evaluation of teaching systems used in medical schools cannot evaluate the evaluation subjects from a professional perspective, and rarely involve the knowledge, ability, and quality of teachers. The main problem is the lack of effective feedback and feedback delay [6]. Therefore, there is a need to combine the three levels, i.e., students, teachers, and school management, to develop an evaluation of a teaching system that is more conducive to improving the professional standards of medical students and standardizing the curriculum, to ensure training of qualified medical personnel.

## 2 OVERVIEW OF THE MEDICAL STUDENTS' EVALUATION OF THE TEACHING SYSTEM

### 2.1 Content of the Evaluation of Teaching

Content of the evaluation of teaching is the cornerstone of the evaluation of the teaching system, and good and reasonable medical assessment content is a prerequisite for medical students' evaluation of the teaching system. The content of teaching evaluation usually includes teaching attitude, teaching content, teaching philosophy, teaching methods, teaching level, and teaching management. A previous study investigating the criteria medical students value

and use when assessing teaching skills found that the four descriptive keywords that appeared most frequently were engagement, level of the learner, enthusiasm, and respect, which represented four themes, teaching methods, content, teacher personal attributes, learning environment [7]. The setting of teaching evaluation content should not only be reliable, effective, and consistent but also concise and sufficient. Formulating an effective and reliable questionnaire is an indispensable tool to make a good judgment on teachers' potential and ability [8].

Unlike other disciplines, the medical field is unique. The undergraduate medical student curriculum is composed of theoretical basic knowledge and clinical skills practice. The former focuses on the construction of the medical basic knowledge system, while the latter is the practical application of theoretical knowledge, including the use of laboratory instruments, medical technology hands-on practices, and direct interaction with patients in clinical settings. Therefore, the content of the medical students' evaluation of the teaching system should involve the assessment of teaching quality at both theoretical and practical levels. Based on the different teaching styles of academics, clinical teaching may be a more inherently subjective process, and therefore more aspects should be considered when designing the clinical teaching assessment criteria [9-11].

## 2.2 Evaluation of Teaching Methods

At present, medical students can evaluate teaching mainly using paper-based and paperless online evaluations. The specific process of paper-based evaluation includes the following: the teaching department sends the students the "Course Teaching Rating Form", students fill it out and submit it within the deadline, and the staff collects it for sorting and statistical analysis. The specific process of online evaluation is as follows: students log on to the evaluation website, select the course, score and evaluate and fill in suggestions, and complete the evaluation. With advances in mobile phone and internet technologies, more universities choose to use paperless online evaluation of teaching systems than the traditional paper-based evaluation method, which is limited by high cost, inefficiency, unreliable, low participation, etc. Online evaluation not only improves the efficiency of evaluation but also improves the reliability of evaluation results by using advanced algorithms [12, 13]. To ensure that every student actively participates in the evaluation, the university imposes sanctions on students who do not complete the evaluation within the specified time and disqualify them from taking classes in the next semester, to increase the participation rate of students and make the final data operable.

However, whether students should be anonymous in a teaching evaluation system remains controversial. A previous study compared the teaching performance of medical school faculty through anonymous and open assessments (where the evaluator's identity was revealed) and explored the barriers to open assessment. Results showed a statistically significant difference between open and anonymous assessments, with faculty members scoring lower on anonymous assessments. The greatest barrier to the validity of open assessment data was students' concern that the assessment results obtained by real names would affect their relationships with faculty, suggesting that students would be more honest in anonymous assessments. This study supports the use of anonymous assessment methods to more accurately reflect teaching performance [14]. However, in some cases, teachers who fairly award grades that do not meet students' expectations may score lower on anonymous assessments, which could limit the accuracy of anonymous assessments [15]. Although the study shows that this is not uncommon, students should be rightfully awarded what they deserve.

## 2.3 Time for Evaluation of Teaching

The student evaluation of the teaching system is generally implemented once a semester, before the end of the semester. The school will organize the distribution of relevant documents, students independently view the information of the instructor through the online evaluation system per the requirements of the document, and the instructor of the selected course makes a real evaluation [16]. The online evaluation system allows students to view the instructor's information and evaluate the instructor of their chosen course. In the School of Public Health and Basic Medicine of Jinan University, for example, the evaluation period is between the 14th and 18th week of each semester, towards the end of the course. This schedule not only prevents the final exam results from affecting the fairness of students' evaluations but also allows medical students to complete most of the courses and get a basic understanding of the course system before making their evaluations, thus ensuring the rationality and integrity of course evaluation. Research has shown that students' evaluations of courses and instructors are influenced, at least in part, by the grades they expect or receive [7]. Therefore, the evaluation scores should be released after the final exam results are announced to enhance object scoring.

## 2.4 Necessity and Purpose of the Evaluation of Teaching

Medicine is a highly specialized discipline, and the clinical aspects of knowledge are constantly changing with the advancement in the medical field. Therefore, clinical teaching in medical schools should be continuously updated and strengthened to enhance teaching quality [17]. In addition, some medical faculty members are physicians, with little teaching responsibilities and little or no training on how to be effective academics, and have little time to develop their teaching skills; hence, an effective and well-developed evaluation process could be valuable in improving the quality of clinical teaching [18-20].

SETs are a fundamental system for quality assurance of teaching in universities, and their establishment fully respects the subject position of students. Compared with teachers' mutual evaluation, experts' evaluation, and university leaders' evaluation, students play a more critical role in the evaluation of teachers' teaching quality as the subject and object of

teaching because they participate in the process of internal quality assurance and experience teachers' knowledge and style in the process of teaching [6, 21]. Effective SETs can not only help academics discover their strengths and weaknesses in the teaching process, to better summarize their teaching experience, improve their teaching methods and enhance the quality of teaching, but also strengthen the teaching monitoring system and improve the overall level of teaching[22-24]. A successful teacher evaluation process can also provide objective measures of teaching performance for performance evaluation and promotion decisions[25]. Therefore, establishing a comprehensive set of student evaluation systems for teaching quality in medical undergraduate education is an important method and means to comprehensively improve the teaching quality of medical schools, and it is of great significance to promote the development of medical education[26].

### **3 PROBLEMS IN THE MANAGEMENT OF THE TEACHING EVALUATION SYSTEM**

SETs are one of the main means of teaching quality supervision in universities, and it is important to improve teaching quality and ensure the achievement of teaching objectives; thus, most medical schools are already implementing teaching evaluation. However, SETs are often, to some extent, limited during application. Besides, management and optimization of evaluation in universities still face several drawbacks as illustrated herein.

#### **3.1 Content of Assessment is Fixed and the Way of Assessment is Single**

The content of the current medical students' evaluation of the teaching system is mostly single and fixed, and uniform assessment entries are used in different medical courses, which cannot be set according to the characteristics of the courses and the course teachers. This may lead to homogenization, low relevance course evaluation, and uneven improvement effect on different courses, which cannot achieve comprehensive development. Most of the descriptions of assessment contents are focused on classroom teaching, which neglects the assessment of clinical teaching. Clinical instruction is very different from classroom instruction in that it involves multiple faculties and facilities, has a low student-to-faculty ratio, and uses various teaching methods (e.g., one-on-one tutorials, conferences, rounds, and simulations) [27]. Therefore, optimizing and improving the medical student assessment system must begin with eliminating the disadvantages of single assessment content.

Current teaching assessment methods lack diversified and flexible teaching methods. Most comprehensive universities only have a single way of online assessment for the simplification of procedures. However, the medical undergraduate curriculum is more complex than that of engineering, agriculture, arts, and sciences, and its complexity lies in the multi-level teaching methods, diversified teaching purposes, and numerous curriculums. Therefore, the overly simplified assessment method cannot provide detailed feedback on the training and management of medical students[22]. Moreover, since students are often bored with a large number of courses, the perfunctory evaluation is inevitable, leading to high or low overall grading and less meaningful suggestions, which limits the effectiveness of online evaluation [28].

The evaluation of competency-based higher education has become quite a hot topic in European Union countries. Its new concept of assessment is divided into three stages. The first stage assesses whether the competencies that students should acquire in the course are well defined. The second stage assesses the teaching and learning process and the competencies acquired by the students. The third stage assesses specific aspects of the teaching and learning process [29]. This evaluation of the teaching system not only evaluates the quality of teaching but also the actual gains made by the students in the learning process, which is a holistic evaluation system worthy of consideration.

#### **3.2 Lack of Timeliness of Teaching Evaluation**

Most of the assessment periods are set towards the end of the semester, affecting the timeliness of the assessment [30]. Due to the special nature of medical courses, different modules are mostly taught by teachers with different research directions, and hence a specialized course may be taught by a team of several academics [10]. Because the system only shows the name but not the photo of the instructors, students may not be impressed by the lectures after the semester, and some of them can only make vague scores based on their impressions, which may not guarantee the authenticity, accuracy, and reliability of the ratings [31]. Some studies have evaluated the efficiency of sampling and voluntary student samples for teacher evaluation, and the results showed that the sampling method can reduce the evaluation requirements for students, and there is little bias in the evaluation results from either method [32, 33]. Therefore, increasing the number of teacher evaluations per semester using sampling and voluntary student samples could help ensure the timeliness of the evaluations.

#### **3.3 Inaccurate Positioning of the Evaluation Subject**

Evaluations of teaching systems are often perceived as sensitive and controversial; questioning the validity of student evaluations of faculty teaching skills by administrations may trigger controversy [34-36]. An effective evaluation index system should be scientific and reasonable, assess all major aspects specified for teaching quality, and be completed with the active cooperation of students. However, the current evaluation indexes in major universities are often jointly formulated by the academic affairs office and other management departments and school expert supervisory groups, while neglecting students (who only passively cooperate with them) in the setting and weighting of the evaluation

indexes, thereby resulting in students' passive participation in teaching evaluation activities, which significantly affects evaluation results. For students, the evaluation process is their right and duty, and research shows that students are highly motivated by regular evaluations and are not biased by the difficulty of the subject itself or their interest in the process [37-39]. However, students' evaluation of courses and teachers are influenced, at least in part, by the amount of work they are required to do and the grades they expect or receive [40, 41]. Some students may be concerned that the results of the evaluation may affect their final grade and fail to fairly evaluate the course, which influences the efficacy of the evaluation system and its intended purpose of establishing a link between instructors and students [42].

### 3.4 Limitations in the Use of Assessment Results

The use of student evaluation results by schools directly affects the attitude of medical students to participate in the evaluation [43]. Some management departments do not handle the results of students' evaluations on time and conduct follow-up surveys and feedback. This makes the evaluation a formality and a state of coping, undermining students' opinions and suggestions, who gradually become disinterested. Teaching management departments are the custodians of all the evaluation results of teachers. Whereas teachers receive their evaluation results, there is no evaluation feedback for students. This kind of asymmetric information feedback may leave a negative impression on students. Collectively, these could lead to inaccurate, inefficient, and misleading evaluation results. All assessments in medical education require valid and reliable evidence to be interpreted meaningfully [44, 45].

Several other factors not limited to the performance of teachers exist and could influence the final evaluation results [46, 47]. College curriculum, environment, and psychological state of students all have an impact on the evaluation results. Thus, the evaluation results also reveal the problems of management, faculty, and students [48]. It is noteworthy that the ultimate goal of the evaluation is not only to get a statistical result but also to ensure the teaching effectiveness of teachers' and promote the development of teaching in the college. If the college does not have the resources to help teachers meet and exceed the standards required by summary assessment, it is fundamentally unreasonable to evaluate the teachers based on these standards [49].

## 4 SUGGESTIONS AND IMPROVEMENTS FOR THE MANAGEMENT OF MEDICAL STUDENTS' TEACHING EVALUATION SYSTEM

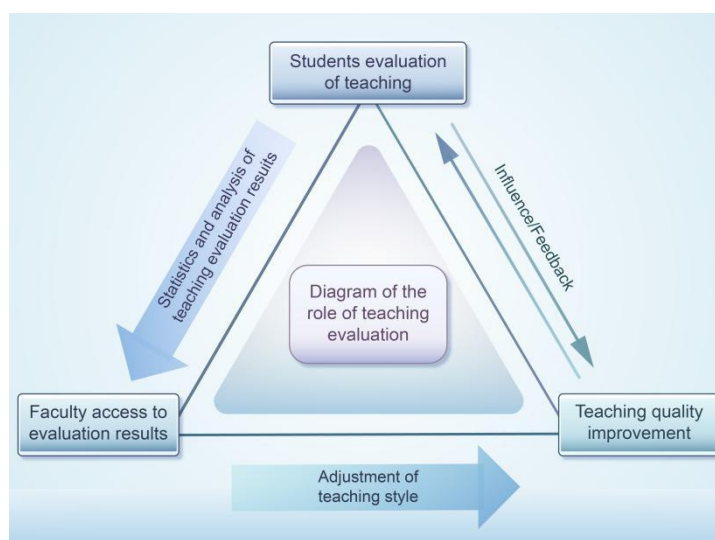
### 4.1 Recommendations

Overall, instructional assessment is challenging, rewarding, interesting, and transformative [50]. The main problems of the current teaching assessment system are the fixedness of the content of the assessment, the singularity of the assessment method, and the time-lag assessment. Through a careful review of "Comrade Li Keqiang's Important Guiding Ideas in the National Conference on the Reform and Development of Medical Education", "Opinions on the Evaluation of Undergraduate Teaching in General Higher Education Institutions" and "Several Opinions on the Overall Improvement of Higher Education Quality", and analysis of the current situation of domestic medical education, the following suggestions are made.

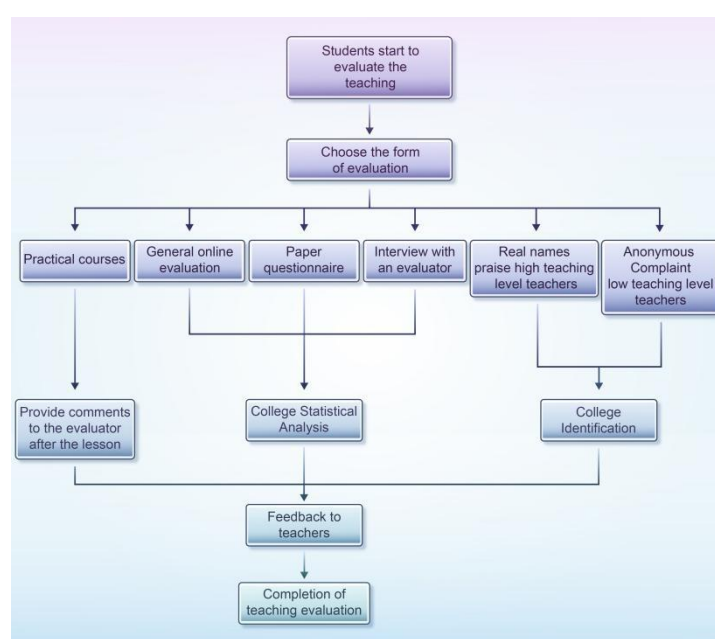
- Highlight the disciplinary characteristics of medical students' assessment programs, which must be different from those of other majors in comprehensive universities, optimize the same settings for the characteristics of both theoretical basic knowledge and clinical skills practice courses, propose differentiated designs, and set up student assessment programs in a reasonable and targeted manner.
- Provide a variety of assessment methods that focus on developing ways to facilitate student assessment of courses and on but not limited to online assessment. Parallel multiple methods of assessment, where students can selectively complete one form of assessment, ensure that the content of the assessment is uniform and varied.
- Improve the authenticity and accuracy of student evaluations and optimize the lag of course evaluations. The number of evaluations can be appropriately increased each semester. However, the number of items on each evaluation should be reduced to ease the burden on students and dampen the effect on their enthusiasm for evaluation.
- Improve the reward system by including the completion of teaching evaluation into the basis for students' merit assessment, and appropriately reward students with high cooperation to improve the enthusiasm of students and the reliability of the evaluation [51].
- Complete a phase-course evaluation when anonymously publishing statistical data; timely notify teachers with poor teaching quality and adjust their teaching style to further optimize the lag of evaluation [14].

### 4.2 Specific Processes for Improving the Evaluation of a Teaching System Model

The model of medical students' assessment system in any form of improvement should be an organic combination of students, lecturers, and supervisors (faculty), with no party missing. The improved assessment model should emphasize its feasibility and scientific and practical significance and eliminate formalism, prioritize students, and always be adjustable (Figs. 1 and 2) [52].



**Figure 1** Schematic Diagram of the Role of Teaching Evaluation



**Figure 2** Flow Chart of Student Evaluation

## 5 CONCLUSION

In summary, to solve the current problems in the medical students' evaluation of the teaching system, firstly, pay sufficient attention to the composition of the evaluation system and analyze and optimize its content, mode, and time components in turn. Secondly, utilize the results of students' evaluation and establish the mechanism of evaluation between students, teachers, and colleges in time, which plays a significant role in improving the education quality of teachers and teaching quality. However, the current medical students' evaluation of the teaching system is facing a myriad of setbacks; therefore, it is imperative to be abreast with the requirements of the medical undergraduate course syllabus and grasp the specific learning situation of medical students, to effectively carry out medical assessment reform and promote the reform of the whole medical training talent program. As an important way of teaching quality monitoring and a scientific medical student assessment system, SETs can boost the development of the national medical profession and continuously ensure qualified and excellent medical talents.

## COMPETING INTERESTS

The authors have no relevant financial or non-financial interests to disclose.

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## AUTHORS' CONTRIBUTIONS

All authors contributed to the concept and structure of the paper. Lizhi Chen wrote the first draft of the manuscript that was then critically revised by Jie Shan, Jiayi Zhang, Yingjun Zhu, Yue Zhou, and Shuang Liu. Jiayi Zhang finished making article figures and performed the final edit prior to submission. All authors approved the final version for publication and agree to be accountable for all aspects of the work.

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## REFERENCES

- [1] Marsh HW, Fleiner H, Thomas CS. VALIDITY AND USEFULNESS OF STUDENT EVALUATIONS OF INSTRUCTIONAL QUALITY. *Journal of Educational Psychology*, 1975, 67: 833-839.
- [2] Kim SM, Park SG, Jee YK, et al. Perception and attitudes of medical students on clinical clerkship in the era of the Coronavirus Disease 2019 pandemic. *Medical education online*, 2020, 25, 1809929.
- [3] Constantinou C, Wijnen-Meijer M. Student evaluations of teaching and the development of a comprehensive measure of teaching effectiveness for medical schools. *BMC medical education*, 2022, 22, 113.
- [4] Ploteau S, Winer N, Barrier J, et al. Evaluation of the instruction and the instructors by the students during a clinical training period in a gynecology and obstetrics unit. *Journal de gynécologie, obstétrique et biologie de la reproduction*, 2007, 36, 807-816.
- [5] Morgan H, Purkiss J, Porter A, et al. Student Evaluation of Faculty Physicians: Gender Differences in Teaching Evaluations, 2016, 25, 453-456.
- [6] Hunukumbure AD, Horner PJ, Fox J, et al. An online discussion between students and teachers: a way forward for meaningful teacher feedback? *BMC medical education*, 2021, 21, 289.
- [7] Pettit J, Axelson R, Ferguson K, et al. Assessing effective teaching: what medical students value when developing evaluation instruments, 2015, 90, 94-99.
- [8] Al-Rubaish AM, Abdel Rahim SI, Hassan A, et al. Developing questionnaires for students' evaluation of individual faculty's teaching skills: A Saudi Arabian pilot study. *J Family Community Med*, 2010, 17, 91-95.
- [9] Conigliaro RL, Stratton TD. Assessing the quality of clinical teaching: a preliminary study. *Medical education*, 2010, 44, 379-386.
- [10] Hwang JE, Kim NJ, Song M, et al. Individual class evaluation and effective teaching characteristics in integrated curricula. *BMC medical education*, 2017, 17, 252.
- [11] Schiekirka S, Raupach T. A systematic review of factors influencing student ratings in undergraduate medical education course evaluations. *BMC Medical Education*, 2015, 15, 30.
- [12] Xu X, Liu F. Optimization of online education and teaching evaluation system based on GA-BP neural network. *Computational Intelligence and Neuroscience*, 2021, 8785127.
- [13] Rosenberg ME, Watson K, Paul J, et al. Development and implementation of a web-based evaluation system for an internal medicine residency program. *Academic Medicine*, 2001, 76, 92-95.
- [14] Afonso NM, Cardozo LJ, Mascarenhas OA, et al. Are anonymous evaluations a better assessment of faculty teaching performance? A comparative analysis of open and anonymous evaluation processes. *Family Medicine*, 2005, 37, 43-47.
- [15] Tucker B. Student evaluation surveys: anonymous comments that offend or are unprofessional. *Higher Education*, 2014, 68, 347-358.
- [16] Berk RA. Top five flashpoints in the assessment of teaching effectiveness. *Medical Teacher*, 2013, 35, 15-26.
- [17] Lewisson N, Hellgren L, Johansson J. Quality improvement in clinical teaching through student evaluations of rotations and feedback to departments. *Medical Teacher*, 2013, 35, 820-825.
- [18] Srinivasan M, Li ST, Meyers FJ, et al. "Teaching as a competency": competencies for medical educators. *Academic Medicine*, 2011, 86, 1211-1220.
- [19] van den Berg BA, Bakker AB, Ten Cate TJ. Key factors in work engagement and job motivation of teaching faculty at a university medical centre. *Perspectives on Medical Education*, 2013, 2, 264-275.
- [20] van Bruggen L, Ten Cate O, Chen HC. Developing a novel 4-C framework to enhance participation in faculty development. *Teaching and Learning in Medicine*, 2020, 32, 371-379.
- [21] Lidice A, Saglam G, editors. Using students' evaluations to measure educational quality. *Proceedings of the Akdeniz Language Studies Conference, Antalya, TURKEY*. 2012.
- [22] Vaughan B. Clinical educator self-efficacy, self-evaluation and its relationship with student evaluations of clinical teaching. *BMC Medical Education*, 2020, 20, 347.
- [23] Boerebach BC, Arah OA, Heineman MJ, et al. The impact of resident- and self-evaluations on surgeon's subsequent teaching performance. *World Journal of Surgery*, 2014, 38, 2761-2769.
- [24] Julian K, Appelle N, O'Sullivan P, et al. The impact of an objective structured teaching evaluation on faculty teaching skills. *Teaching and Learning in Medicine*, 2012, 24, 3-7.
- [25] Woods NN. Evaluation matters: lessons learned on the evaluation of surgical teaching. *The Surgeon*, 2011, 9(Suppl 1): S43-S44.

- [26] Hsieh MC, Chen TY. Promoting innovation in the objective structured teaching examination and feedback: clustering teachers to aid teaching evaluation. *Medical Education Online*, 2019, 24, 1620544.
- [27] Love DW, Heller LE, Parker PF. The use of student evaluations in examining clinical teaching in pharmacy. *Drug Intelligence & Clinical Pharmacy*, 1982, 16, 759-764.
- [28] Uijtdehaage S, O'Neal C. A curious case of the phantom professor: mindless teaching evaluations by medical students. *Medical Education*, 2015, 49, 928-932.
- [29] Bergsmann E, Schultes MT, Winter P, et al. Evaluation of competence-based teaching in higher education: from theory to practice. *Evaluation and Program Planning*, 2015, 52, 1-9.
- [30] Canaday SD, Mendelson MA, Hardin JH. The effect of timing on the validity of student ratings. *Journal of Medical Education*, 1978, 53, 958-964.
- [31] Stratton TD, Witzke DB, Freund MJ, et al. Validating dental and medical students' evaluations of faculty teaching in an integrated, multi-instructor course. *Journal of Dental Education*, 2005, 69, 663-670.
- [32] Kreiter CD, Lakshman V. Investigating the use of sampling for maximising the efficiency of student-generated faculty teaching evaluations. *Medical Education*, 2005, 39, 171-175.
- [33] Carline J, Scher MJJ. Comparison of course evaluations by random and volunteer student samples. *Journal of Medical Education*, 1981, 56, 122-127.
- [34] Greenwald AG. Validity concerns and usefulness of student ratings of instruction. *American Psychologist*, 1997, 52, 1182-1186.
- [35] Nemec EC, Baker DM, Zhang D, et al. Development of valid and reliable tools for student evaluation of teaching. *Currents in Pharmacy Teaching and Learning*, 2018, 10, 549-557.
- [36] Leamon MH, Fields L. Measuring teaching effectiveness in a pre-clinical multi-instructor course: a case study in the development and application of a brief instructor rating scale. *Teaching and Learning in Medicine*, 2005, 17, 119-129.
- [37] Pfeifer MP, Peterson HR. The influence of student interest on teaching evaluation. *Journal of General Internal Medicine*, 1991, 6, 141-144.
- [38] Hill DA. SCORPIO: a system of medical teaching. *Medical Teacher*, 1992, 14, 37-41.
- [39] Murray D, Boothby C, Zhao H, et al. Exploring the personal and professional factors associated with student evaluations of tenure-track faculty. *PLOS One*, 2020, 15, e0233515.
- [40] Stroebe W. Why good teaching evaluations may reward bad teaching: on grade inflation and other unintended consequences of student evaluations. *Perspectives on Psychological Science*, 2016, 11, 800-816.
- [41] Mendelson MA, Canaday SD, Hardin JH. The relationship between student ratings of course effectiveness and student achievement. *Medical Education*, 1978, 12, 199-204.
- [42] Snell L, Tallett S, Haist S, et al. A review of the evaluation of clinical teaching: new perspectives and challenges. *Medical Education*, 2000, 34, 862-870.
- [43] McClain L, Gulbis A, Hays D. Honesty on student evaluations of teaching: effectiveness, purpose, and timing matter! *Assessment & Evaluation in Higher Education*, 2018, 43, 369-385.
- [44] Beckman TJ, Ghosh AK, Cook DA, et al. How reliable are assessments of clinical teaching? A review of the published instruments. *Journal of General Internal Medicine*, 2004, 19, 971-977.
- [45] Downing SM. Reliability: on the reproducibility of assessment data. *Medical Education*, 2004, 38: 1006-1012.
- [46] Zhang Z, Wu Q, Zhang X, et al. Barriers to obtaining reliable results from evaluations of teaching quality in undergraduate medical education. *BMC Medical Education*, 2020, 20, 333.
- [47] Dodeen H. Validity, reliability, and potential bias of short forms of students' evaluation of teaching: the case of UAE University. *Educational Assessment*, 2013, 18, 235-250.
- [48] Mårtenson D, Nystrup J. Evaluation and consequences of teaching competence: Scandinavian developments. *Medical Education*, 1984, 18, 394-400.
- [49] Elzubeir M, Rizk D. Evaluating the quality of teaching in medical education: are we using the evidence for both formative and summative purposes? *Medical Teacher*, 2002, 24, 313-319.
- [50] LaVelle JM, Lovato C, Stephenson CL. Pedagogical considerations for the teaching of evaluation. *Evaluation and Program Planning*, 2020, 79, 101786.
- [51] Jones RF, Fromm JD. Faculty and administration views of problems in faculty evaluation. *Academic Medicine*, 1994, 69, 476-483.
- [52] Heckman K, Kim R, Lee A, et al. Surgeons have an opportunity to improve teaching quality through feedback provision. *Annals of Surgery*, 2018, 229, 164-168.