Original Article

A Student Assessment System Framework

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Abstract

Background & Objective: One of the factors for achieving quality improvement of educational programs defined establishing student assessment system at universities. The aim of the study was to develop a framework for a student assessment system.

Materials and Methods: The present study is an educational scholarship study that conducted in three phases. In the first phase, the reviewing the literature was conducted in databases includes Scopus, Medline-PubMed, Science Direct, Web of Science, Magiran and SID. The components of the student assessment system were extracted. In the second phase, the results of literature presented in the expert panel (n =18) and the initial version of student assessment system framework was developed. In the third phase, content validity was assessed in viewpoints of experts (n=15) by content validity indexes.

Results: The results showed the student assessment system framework developed in four domains, "goals" (one item), "structure and organization" (two items), "design and implementation of assessment system" (twelve items) and "quality assurance" (four items) was developed.

Conclusion: Development and implement of a student assessment system could lead to improve the quality of education through establishing of a systemic structure and organizing various tools in student assessment process.

Introduction

Academic system quality is a multidimensional and complicated issue. In the last two decades, the quantitative growth and insufficient qualitative development of universities in Iran could be a serious threat to the higher education system. Therefore, the use of proper mechanisms to enhance the education system's quality is vital. The World Federation for Medical Education (WFME) has reported the improper expansion of medical education delivery systems in the past two decades (1), which increases the need for evaluation and monitoring mechanisms in order to improve the quality of education systems. In this regards, there has been increasing attention placed on the use of quality assurance strategies and evaluation of educational systems by managers and educational officials. This is well specified in the macro policymaking processes of the country (2). In addition, mechanisms to control, guide, and improve the quality of the educational system have been considered in the accreditation systems (3). Meanwhile, there is no specific and uniform framework for quality assessment in universities of medical sciences, which has led to challenges in the improvement of education quality in universities. Therefore, the establishment of an efficient assessment system that fits the education process features is important (4). Furthermore, adopting a systematic assessment approach has been recognized as a potential solution for guaranteeing the quality of educational programs (5). This will lead to the formation of a purposeful cycle for education quality improvement in a way that various loops of the educational system direct toward performance improvement. The establishment of an assessment

system should include the specification of the structure and components of inclusive evaluation activities (6). The systematic evaluation framework refers to an integrated set that emphasizes the relationship between evaluation and different components of educational programs (6). The system's components include goals, executive affair of the program, support affair, documentation of the program, program upgrade, and accountability, all of which are considered as a comprehensive set. The framework of assessment system helps program developers achieved a common terminologies in their design and present a comprehensible picture of evaluation program (7). In addition, neglected areas of educational programs are identified in the assessment system's framework, which increases the quality of the assessment program (7). In the comprehensive assessment system, a change of approach from "learning assessment" to "assessment for learning" is taken into account through an accurate selection of evaluation methods and the development of rules and regulations. In "assessment for learning" approach highlights learning in the evaluation processes. The advantages of the comprehensive assessment system include providing feedback, creating learning opportunities in the assessment system, designing organizational systems (8). Moreover, active participation of learners in the learning process, the identification of facilitators and barriers of students' learning in the educational program recognized as the advantages (4). The comprehensive student assessment system has been introduced as the starting point of a programmatic evaluation approach (9), which highlights an organized set of evaluation methods and improves learning (10). In other words, the programmatic evaluation approach focuses on the organization of evaluation methods for optimizing the program's purpose fitness and enhancing learning and decision-making activities. This approach leads to the active participation of students in the learning process and facilitates learning through feedback from the evaluation (11).

The development of assessment system in the universities has been overlooked in the investigated context. Lack of concurrence between educational objectives and type of assessment in education systems, unidimensional assessments and neglecting the evaluation of students' attitude and performance skills were recognized as traditional evaluation. In addition, poor selection of systematic content in evaluation processes, lack of development of assessment blueprint and lack of deployment of "assessment for learning" approach are some of the traditional assessment problems in the investigated university assessment system. Given the fact that the establishment of an assessment system is one of the solutions to improve quality in the education system, the present study aimed to develop a comprehensive assessment system framework.

Materials and Methods

This was an educational scholarship project conducted during 2018-2019 and involved three stages.

First stage: literature were searched on databases of Medline/PubMed, Science Direct, Web of Science, Medline, Scopus, Magiran, and SID through keywords such as Programmatic, Assessment System, Student Assessment, and Standards Evaluation in during 2000-2018. In total, 36 articles and reports that focused on issues related to the structure, mechanism, and components of the comprehensive assessment system were entered into the study. However, 11 duplicates were removed and 25 articles were assessed in the first stage in terms of title and abstract. In the next stage, nine articles were eliminated due to irrelevance to the goals of the present research, and the text of 16 articles and reports were assessed. In this regard, the text of the reports and articles were reviewed several times by two trained individuals. In addition, the texts were analyzed based on the thematic synthesis approach

(12), for which the features and components of the assessment system were extracted from the texts as free codes. Extracted codes were classified based on the similarity of themes and entered in the second step to compile related items.

Second stage: This stage was carried out to develop the items of the comprehensive assessment system framework. Accordingly, five expert panels were held with a total time of 12 hours. The inclusion criterion of experts was work experience in the field of education. The sessions were held at two levels including a specialized working group and key officials in the field of education and educational policymaking. The results were presented in panel discussions and items of the comprehensive assessment system were developed based on the extracted codes. The items should be defined comprehensively and in a way that they could show the framework of the comprehensive assessment system practically and accord to the principles. The extracted codes in each category were reviewed several times, and the duplicates were removed or combined. Finally, the draft framework was developed in the expert panel meeting and finalized with a consensus. Acquisition of more than 85% of the total votes was determined as the criterion for reaching a consensus.

Third stage: At this stage, a draft form and open-ended questions were provided to the participants electronically to assess the content validity of the proposed items. After that, the proposed corrections were reviewed by the expert panel (similar to the panel members in the second phase) and finalized in this stage. The framework was sent for quantitative assessment of content validity indicators; the content validity ratio (CVR) and content validity index (CVI). In this regard, CVR was determined by receiving the opinions of the mentioned experts about the items based on a three-degree spectrum (necessary, useful but not necessary, and not necessary). Moreover, the minimum value of CVR was determined based on the Lawshe table. In CVI, the relationship criterion was assessed for each item of the mentioned tools using a four-point Likert scale (13, 14). Furthermore, the transparency index was evaluated using the four-point range to assess the degree of ambiguity or clarity of the purpose of each item. The results of the stage were reviewed in the expert panel and the final version of the framework was developed.

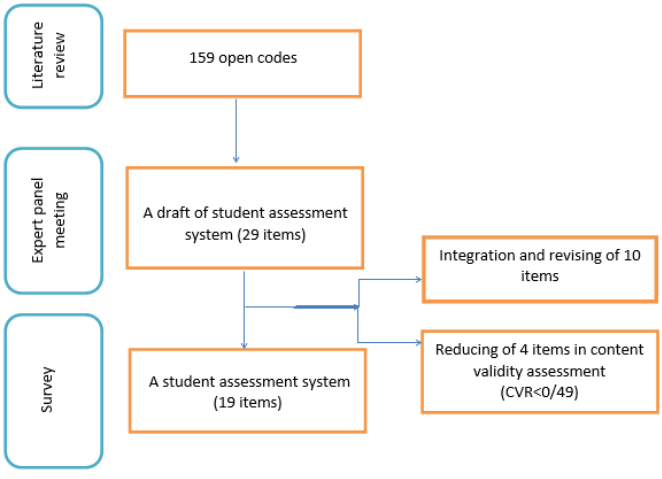

Figure 1: The development steps of the framework of student assessment system

Results

Participants:

In the second stage, eight faculty members with work experience in the education field (44.44%), 7 education managers at the education department level (38.88%), and three school dean and vice chancellor for education (16.66%) participated. The mean experience of cooperation in educational activities of the participants was 7±3 and their mean age was 36±5 years. The third stage was carried out with the cooperation of the educational officials of the schools, heads of departments, and faculty members (15). Overall, there were 15 education managers and officials, 13 of whom were male (87%) and the rest (13%) were female. The mean experience of cooperation in educational activities of the participants was 9±4 and their mean age was 38±4 years. In the first phase, 159 free codes related to the components of the comprehensive assessment system were extracted and classified. In the second phase, the draft of the comprehensive assessment system framework was developed with 29 items in four categories. In addition, the integration of 11 items (turning them into five comprehensive items) and the edition of five items for more transparency were proposed in the qualitative evaluation of content validity. The framework of the comprehensive assessment system with 23 items was entered quantitatively in the content validity evaluation phase. According to the results, four items with CVR<0/49 were eliminated from the framework (Appendix 1). In addition, the CVI of all items was reported higher than 0/7, which led to their remaining in the framework. Ultimately, the framework of the comprehensive assessment system was finalized with 19 items. The quantitative CVIs of the mentioned framework are presented in Table 1.

The final version of the comprehensive assessment system was compiled in 19 items and four main axes, including 'goal' (1 item), 'managerial structure and organization' (2 items), 'assessment system design and implementation framework' (12 items) and 'quality assurance of assessment system' (4 items). The mentioned framework emphasized the necessity of developing the main goals of the assessment system and the alignment of the evaluation program with the curriculum and learning processes for educational institutions. Moreover, the necessity of forming various committees to carry out policymaking, implementation, and monitoring of the assessment system in the educational institution was mentioned in the axis of 'structure and organization'. In the axis of 'design and implementation of the comprehensive assessment system', which included the most items in the framework, educational institutions were required to prepare a suitable structure for the assessment system. The axis encompasses various components, such as the use of blueprint, standardization of minimum pass level methods, holding formative and summative tests, and a suitable feedback mechanism. The axis of quality assurance of program evaluation included the development of instructions to improve the quality of the test, considering the quality assurance process related to the various components of the comprehensive assessment system, establishing the essential infrastructures, sufficient resources, and advocacy program and meta-evaluation of the comprehensive assessment system. In this axis, the focus was on faculty empowerment as one of the key criteria for quality assurance.

Table 1. Content validity indexes of student assessment system

Axes	Student assessment system items	Clarity	CVI	CVR
Goal	1. It is essential that the goals of the assessment system be formulated and available to all stakeholders. It is recommended to the alignment of the assessment program with the curriculum and learning processes.	0.92	0.92	0.96
Managerial Structure and Organization	2. In order to formulate the assessment system and its implementation, it is necessary to specify the structure and management organization (including scientific committees, executive committees, members of each committee and their job descriptions in accordance with the conditions of the faculty / hospital).	1	0.84	0.53
	3. Each faculty, teaching hospital can use the consulting services of Educational Development Center and the Educational Development Office in College/Hospital at all stages of designing, implementing and ensuring the quality of the assessment system.	0.92	0.92	0.53
Assessment System Design and Implementation	4. It is necessary to determine the content of the assessment based on the outcome and objectives of the course and the core content should be properly covered in the test. It is recommended that the attitudinal, cognitive and psychometric skill assessed proportionately.	0.92	0.92	0.69
	5. In order to ensure the content coverage of the test, it is necessary to compile blueprint based on the educational objectives and course plan. It is recommended that the course plan and blueprints be provided to learners at the beginning of the semester.	0.84	1	0.84
	6. In addition to the final exam, it is necessary to include the constructive formative exams in the assessment program.	0.92	0.92	0.53
	7. It is necessary to use different assessment methods for student assessment and the reasons for choosing evaluation methods should be clearly documented.	0.84	1	0.84
	8. In choosing the assessment method, it is necessary to consider the utility criteria of assessment tools.	0.84	0.84	0.69
	9. It is better to use appropriate assessment tools in order to follow the achievement status of learners. It is recommended to develop a mechanism for recognizing students with poor performance and academic failure, following them and providing feedback to them.	0.84	1	0.69
	10. It is necessary to determine and document the minimum pass level	0.76	1	0.53

	by the standard methods.			
	11. It is necessary to formulate an appropriate formula to combine the results of different tests from the perspective of different evaluators.	0.76	0.92	0.53
	12. After the test, it is necessary to review the test indicators by the relevant unit (for example, the test center or the Educational Development office in the college. hospital).	0.92	0.76	0.84
	13. It is necessary to develop mechanisms for providing feedback to the learner after the formative and summative tests in accordance with the purpose of the test and the facilities of the faculty / hospital, in the assessment program. It is recommended that counseling sessions be designed to support the process of providing and using feedback for learners.	0.76	0.92	0.69
	14. It is necessary to define a mechanism for dealing with learners' protests.	1	0.92	1
	15. It is necessary to develop instructions related to ensuring the security of the test (before, during and after the test).	0.84	0.92	0.84
	16. It is necessary to develop instruction to improve the quality of tests (before and after the test) and to validate the evaluations. The development of regular reports for providing feedback to the evaluation committee/ evaluators is suggested.	0.76	0.92	0.83
	17. It is better to consider the quality assurance process related to the various components of the student assessment system in revising the assessment program.	0.84	0.76	0.63
Quality Assurance of Assessment System	18. Schools / hospitals should provide the necessary infrastructure, adequate resources and support programs to develop and implement an assessment program and to improve the quality of the evaluation program. It is recommended that faculty empowerment programs be included in these programs.	0.69	0.79	0.83
	19. It is necessary for each of the faculties / hospitals to set a schedule for the evaluation of the "student assessment program" and to send to the educational development center of University. It is recommended that colleges / hospitals develop and implement a mechanism to use the information of student assessment process in curriculum evaluation.	0.92	0.92	0.53

Discussion

The comprehensive assessment system is recognized as a necessity for improvement of education quality, which can provide a suitable opportunity for ensuring students and graduates' achieving of essential capabilities through organizing a process of design, implementation, and evaluation. In the present study, the framework of the comprehensive assessment system was compiled in four main axes of program goal, managerial structure and organization, assessment system design and implementation framework and quality assurance of the evaluation program in 19 items. The assessment system can guide the assessment processes by creating a coherent structure between the different components of the evaluation (10). In a study by Dijekstra, the assessment program framework was divided into four axes of implementation, support, documentation, program promotion, and accountability based on the fitness-for-purpose principles. In this framework, goal has a vital part to achieve quality (7, 15). In the current study, four axes were recognized for the assessment system, including assessment system goals, managerial structures and organizations, design, and implementation of the system, and quality assurance of assessment system. In the present framework, the goals were considered as the main director of the assessment system, which emphasized the organization of evaluation programs in line with the realization of the "assessment for learning" approach. One of the key axes in the assessment system presented in the Dijekstra study was 'program implementation', which included 'data collection', 'data integration and valuing, and 'program implementation' as the main structure of the evaluation framework. In the axis, 'data collection' including various components of the assessment system (e.g., evaluation content, formative & summative evaluation, the purpose of assessment, use of proper tools and scoring systems) considered as a key component (7). Moreover, 'organizing and observing the fitness between the levels of competence, level of objectives (knowledge, attitude, and performance) and the type of test', 'applying appropriate standards in test design and analysis' and 'using the methods of minimum pass level' were also considered in this axis (15-17). Determining the minimum pass level is a systematic decision-making and judgment process, in which professional individuals determine the standard pass score in the test. In fact, the minimum pass level is the cutoff point that distinguishes competent students from incompetent learners. This judging process is carried out by experts and professionals and is affected by test content and objective, learners' ability, as well as educational and social conditions (16). 'Blueprint' is another tool for organizing test components that are used as a guide to direct the content in the assessment system and is closely related to the data collection element (6). The blueprint contributes to the use of a systematic approach to prepare the test (18). The use of a blueprint in documenting different components of the test (such as purpose, content, competency level, type of test, etc.) is important, which is one of the factors of quality assurance. The assessment system emphasizes the collection of various data about the learner using valid and reliable tools, creating a "learning-performance-feedback" cycle in the assessment process, providing opportunities to learn from assessment through feedback, using triangulation in assessment tools and resources (19). Another element emphasized in the design and implementation of the current framework was 'utility of the tools', which was essential to increase the quality and accountability of medical education. The utility of the tools by considering the factors of validity, reliability, educational effect, cost-effectiveness, and acceptability of the test allows the selection of efficient tools in the comprehensive evaluation system (15, 20). Various studies have emphasized the importance of the utility in selecting

a suitable test (4, 9, 14, 21-23). Test feasibility is another key factor in choosing a test from the perspective of evaluators and learners, which considers the acceptability and feasibility of the test (21, 24). In the comprehensive assessment system, attention to educational, economic, and implementation aspects of assessment tools are recognized as the effective factors for achieving maximum desirable outcomes (20). Therefore, considering the utility of the tools in the assessment system is of importance.

Quality assurance is considered a fundamental factor for the success and achievement of any program's goals. Ensuring compliance with quality assurance principles is important in developing an assessment program (4, 21, 25). Quality assurance not only considered for a part of the system but also it must be considered in all components of the program from objectives to implementation and documentation. In addition, quality assurance factors, including 'support', 'documentation', 'program improvement', and 'accountability' that should be taken into account in all parts of the system. Some of the most key quality assurance elements include 'feedback provision', 'faculty empowerment', 'analysis and psychometrics of tools', and 'updating and developing programs', which were also considered in the present study (6, 15, 21).

Another component in quality assurance of assessment system is the 'documentation' of assessment programs. The axis follows two important objectives, including documentation, improvement of the program implementation, and increasing the program's clarity and transparency. Moreover, 'accountability' is one of the main concepts of an educational system, which necessitates these systems to focus on community needs. Considering this axis in the assessment system emphasizes the response of the educational system to the needs of society and changes the components of the educational system, accordingly. 'Updating the evaluation methods', 'meta-evaluation', and 'external assessment' are also important factors (6), which were also included in the current framework. The present framework of the comprehensive assessment system aimed to guiding the various components of the system. The system includes the purpose of the test, test content, test selection, questions-answers, and scoring framework, determination of minimum pass level method, test resources/tools, how to select evaluators, how to evaluate, the behavior of evaluators and use feedback. Some of the major drawbacks of the present study included limitation in conducting a systematic search (limited number of databases under review, limitation of search language in Farsi and English), and the number of experts participating in the framework development process.

Conclusion

The current framework could be used as a basis for standardization and organization of comprehensive assessment system in universities. The framework included four axes of goal, structure and organizations, design and implementation of the comprehensive assessment system, and quality assurance of the assessment system as the key axes of the assessment system. The implementation of the assessment system can facilitate to achieve "assessment for learning" approach through the organization of various components of the student assessment.

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References

1. Van Niekerk JdV. WFME Global Standards receive ringing endorsement. Med Educ. 2003; 37(7): 585-586.

2. Mirzadeh A, Tavakoli S, Yazdani K, Taj M. Accreditation: A Way to Quality Assurance and Improvement. Iran J Med Educ. 2004; 4(2): 105-116.

3. Vakili Z, Momen-Heravi M, Moravveji SA, Abdi F, Yavari M. Evaluation of Educational Departments of Kashan Shahid Beheshti Teaching Hospital. Iran J Med Educ. 2017; 17: 43-53.

4. Gandomkar R, Mirzazadeh A, Sadighpour L, Jalili M, Safari M, Amini B. Developing Comprehensive Course Evaluation Guidelines: A Step towards Organizing Program Evaluation Activities in Tehran University of Medical Sciences, Iran. Strids Dev Med Educ. 2015; 12(1):111-118.

5. Imanipour M, Jalili M, Mirzazadeh A, Dehghan Nayeri N, Haghani H. Viewpoints of Nursing Students and Faculties about Clinical Performance Assessment Using Programmatic Approach. Iran J Med Educ. 2013; 129(1): 743-755.

6. Dijkstra J, Van der Vleuten C, Schuwirth L. A new framework for designing programmes of assessment. J Adv Health Sci Educ. 2010; 15(3): 379-393.

7. Schuwirth LW, Van der Vleuten CP. Programmatic assessment: from assessment of learning to assessment for learning. Med Teach, 2011; 33(6): 478-485.

8. Heeneman S, Oudkerk Pool A, Schuwirth LW, van der Vleuten CP, Driessen EW. The impact of programmatic assessment on student learning: theory versus practice. Med Educ. 2015; 49(5): 487-498.

9. Gandomkar R, Jalili M, Mirzazadeh A. Developing comprehensive student assessment guidelines: The first step towards programmatic approach to assessment in Tehran University of Medical Sciences. iran J Med Educ. 2015; 14(12): 107-111.

10. Driessen EW, Van Tartwijk J, Govaerts M, Teunissen P, van der Vleuten CP. The use of programmatic assessment in the clinical workplace: a Maastricht case report. Med Teach. 2002; 34 (3): 226-231.

11. Thomas J, Harden A. Methods for the thematic synthesis of qualitative research in systematic reviews. BMC Med Res Method. 2008; 8(1): 45-55.

12. Lawshe CH. A quantitative approach to content validity. PePs,1975; 28 (4): 563-575.

13. Polit DF, Beck CT. The content validity index: are you sure you know what's being reported? Critique and recommendations. Res Nurs Health. 2006; 29 (5): 489-497.

14. Wass.Val, Bowden.Reed, Jackson. Neil. The principles of assessment design. Assessment in Medical Education and Training. Oxford: Radcliffe-Oxford. 2014;11-26.

15. Van Der Vleuten CP, Schuwirth L, Driessen E, Govaerts M, Heeneman S. Twelve tips for programmatic assessment. Med Teach. 2015; 37 (7): 641-646.

16. Malekan.rad E, Einollahi B, Hosseini SJ, Momtazmanesh N. Cilinical Teaching and Assessment (What Every Cilinial Teacher Must Know).book. tohfeh and Boshra publisher. 2006: 159-249.

17. MortazHejri.Sara, Jalili.Mohammad, Labaf.Ali. Setting Standard Threshold Scores for an Objective Structured Clinical Examination using Angoff Method and Assessing the Impact of Reality Chacking and Discussion on Actual Scores. iran J Med Educ. 2012; 11(8): 885-894.

18. Sales.David, Sturrock.Alison, Boursicot.Katharine, Jane D. Blueprinting for clinical performance deficiencies – Lessons and principles from the General Medical Council's fitness to practise procedures. Med Teach. 2010; 32: 111-114.

19. Van der Vleuten CP, Schuwirth L, Driessen E, Dijkstra J, Tigelaar D, Baartman L, et al. A model for programmatic assessment fit for purpose. Med Teach, 2012; 34 (3): 205-214.

20. Jalili M, Khabaz.mafinejad M, Gandomkar R, Mortaz.Hejri S. Priniciple and Methods of Student Assessment in Health Profession (book). The Academy of Medical Sciences Islamic Republic of Iran. 2018:757-788.

21. Board T. Developing and maintaining an assessment system-a PMETB guide to good practice (guidline). 2007. Avaliable: https://www.research.ed.ac.uk/portal/en/publications/developing-and-maintaining-an-assessment-system

22. Dijkstra J, Galbraith R, Hodges BD, McAvoy PA, McCrorie P, Southgate LJ, et al. Expert validation of fit-

for-purpose guidelines for designing programs of assessment. BMC Med Educ. 2012; 12 (1): 20-30.

23. Chandratilake M, Davis M, Ponnamperuma G. Evaluating and designing assessments for medical education: the utility formula. Int J Med Educ. 2010;1(1): 1-17.

24. Shumway.J.M, Harden.R.M. AMEE Guide No. 25: The assessment of learning outcomes for the competent and reflective physician. Med Teach. 2003;25 (6): 569-584.