Interdisciplinary Journal of Virtual Learning in Medical Sciences

Brief Report

Design, Implementation, and Evaluation of Online Open-Book Exams: Insights from Medical Students' Perspectives

Soleiman Ahmady[1,2], Nahid Zarifsanaiey[3*], Zahra Karimian[3], Sara Shahbazi[4,5]

[1]*Department of Medical Education, Virtual School of Medical Education and Management, Shahid Beheshti University of Medical Sciences, Tehran, Iran*
[2]*Department of LIME, Research Affiliated Faculty, Karolinska Institute, Solna, Sweden*
[3]*Department of E-Learning in Medical Sciences, Virtual School and Center of Excellence in e-Learning, Shiraz University of Medical Sciences, Shiraz, Iran*
[4]*Department of Medical Education, Vice of Center for Recruitment and Affairs of Academic Members and Elites, Shahrekord University of Medical Sciences, Shahrekord, Iran*
[5]*Department of School of Medical Education and Educational Technology, Shahid Beheshti University of Medical Sciences, Tehran, Iran*

ABSTRACT

Assessing students is a crucial aspect of the educational process, closely tied to the quality of their learning. Employing a one-group interventional study, we designed and conducted open-book online exams for doctoral students in medical education at Shahid Beheshti University of Medical Sciences (SBUMS), focusing on their perspectives regarding open-book online examination. This assessment spanned from April 2019 to August 2022. To gauge student satisfaction, we utilized Patrick's evaluation model, employing a researcher-developed questionnaire with confirmed validity and reliability. Additionally, a critique session was conducted for further insights. The analysis of participant satisfaction levels indicates positive feedback and agreement among students regarding the implementation of open-book online examinations. According to the majority of students, this assessment system provided them with valuable and novel experiences. They believed that the online environment stimulated their eagerness to respond to exams, and the ability to access resources enhanced their maneuverability to address all aspects of the questions and designed scenarios. Students expressed concerns during the exam about unforeseen issues typical of online exams, such as power outages, internet interruptions, malfunctioning of exam equipment, etc., potentially hindering their success. The results of this study demonstrate the satisfaction and agreement of doctoral students in medical education with the implementation of open-book online examinations.

Keywords: Medical education, Open-book online examination, Perspectives, Evaluation

*Corresponding author:
Nahid Zarifsanaiey, Department of E-Learning in Medical Sciences, Virtual School and Center of Excellence in e-Learning, Shiraz University of Medical Sciences, Shiraz, Iran
Email: nzarifsanaee@gmail.com

Please cite this paper as:
Ahmady S, Zarifsanaiey N, Karimian Z, Shahbazi S. Design, Implementation, and Evaluation of Online Open-Book Exams: Insights from Medical Students' Perspectives. Interdiscip J Virtual Learn Med Sci. 2023;14(4):330-336.doi:10.30476/IJVLMS.2023.101003.1276.

Received: 08-23-2023
Revised: 09-05-2023
Accepted: 09-19-2023

Interdisciplinary Journal of Virtual Learning in Medical Sciences (IJVLMS) is licensed under a Creative Commons Attribution-NoDerivatives 4.0 International License. https://creativecommons.org/licenses/by-nd/4.0

Introduction

Medical education is a multidisciplinary program that emphasizes applying educational concepts in the context of medical higher education (1). Graduates are expected to identify and address educational issues through research, offer logical solutions, assist in planning, and enhance faculty capabilities with effective teaching methods. Evaluation is crucial in ensuring graduates' competence, as it directly correlates with the quality of learning (2). The COVID-19 pandemic prompted a shift in the evaluation framework, with a focus on virtual methods. Concerns about exam security led to the adoption of open-book online examinations and online evaluations in medical schools and universities (3).

The rise of open-book online examinations during the pandemic is not a new concept, as proposed in 1934, emphasizing deep learning strategies over memorization. open-book exams allow access to reference materials and require higher-level cognitive skills, such as analysis and synthesis (4). Despite their feasibility and the potential for assessing transferable skills, academic dishonesty remains a limitation. Nevertheless, open-book evaluations are deemed superior to closed-book exams, as they measure higher-level thinking skills and mirror real-life scenarios. Research supports the efficacy of open-book exams, indicating better performance compared to closed-book exams (5). Given the global trend toward online evaluations, this study investigates the design and implementation of online open-book examinations and evaluates the perspectives of doctoral students in medical education at SBUMS.

Methods

Study Design

The present study is a one-group interventional study. Between April 2019 and August 2022, we developed, implemented, and evaluated open-book online examinations for doctoral students in medical education, considering the students' perspectives.

Development

The design team, consisting of six medical education faculty, determined selected courses for the exams through multiple sessions and developed blueprints, question distribution, and various scenarios for each course. The questions were then formulated based on the principles of designing open-book online exams, considering real-life scenarios. To assess the face and content validity of the exams, the opinions of 15 experts were sought. For this purpose, questions were prepared for various courses, individually identified in a unified form, and made available to specialized instructors. The average weight of the experts' responses regarding the appropriateness of the exam questions was above 2.5, thus confirming the face validity of the exam. To evaluate content validity, two indices, Content Validity Ratio (CVR), and Content Validity Index (CVI), were utilized.

According to the Lawshe table, considering the input from 15 experts in the current study, a CVR value of 0.49 was deemed acceptable. In this exam, none of the questions had a CVR lower than 0.49. The CVI value was also found to be greater than 0.79. The results of CVR and CVI calculations in this study indicated that both indices for exam questions were above an acceptable level.

Based on these findings, the content validity of the research tool was confirmed. For assessing the reliability of the exam, the internal consistency method using Cronbach's alpha (α) was employed, resulting in a value of 0.79, thereby confirming the reliability of the exam.

The infrastructure required for electronic exams involved utilizing the LMS Navaid in the virtual school of medical education and management.

Implementation

In the implementation phase, doctoral students underwent a pilot session, answering an open-book online examination to alleviate exam anxiety. Then, the actual exam was conducted online and simultaneously in a supervised manner in the virtual school's computer site.

Evaluation

After the exams, the evaluation phase employed Kirkpatrick's level one model of educational evaluation as well as group discussion.

Participants

Eligibility Criteria for Participants

Requirements for participation in this study included being a second-year doctoral student in medical education at the Shahid Beheshti University of Medical Science (SBUMS) as well as a willingness to participate and the completion of an informed consent form. Participants who were unwilling to continue their involvement were excluded.

Data Collection Tools

Following the administration of the exams, the implemented program was assessed using the Kirkpatrick educational evaluation model. Based on the first level of the Kirkpatrick model, student satisfaction was measured through a researcher-developed questionnaire comprising 10 questions. To formulate the questionnaire, a 5-level Likert scale was utilized (ranging from very high to very low). Five proficient professors in medical education assessed both the face and qualitative content validity of the questionnaire. Furthermore, the reliability of the questionnaire was verified through a test-retest analysis with 10 students, and Cronbach's alpha indicated a reliability score of 0.78.

Furthermore, in a face-to-face session attended by members of the educational group and participating students, the methodology of this method was critically reviewed and discussed.

Sample Size

The participants comprised 13 doctoral students specializing in medical education, selected through the census method.

Results and Discussion

This developmental project in medical education is aimed at designing, implementing, and evaluating open-book online examinations for doctoral students specializing in medical education. Thirteen doctoral students participated over three consecutive years. The average age of the participants was 36±2.28. Of the participants, 11 (84.7%) were female, and 2 (15.3%) were male.

The results of the evaluation and the frequency distribution of the satisfaction levels of the exam-takers with the administration of exams using the electronic open-book method are presented in Figure 1. The highest frequency in various items is at very high and high levels, indicating the students' agreement and acceptance of the exams. The item assessing students' satisfaction with the administration of exams using this method reflects very high and high satisfaction levels among the exam-takers. According to this table, all exam-

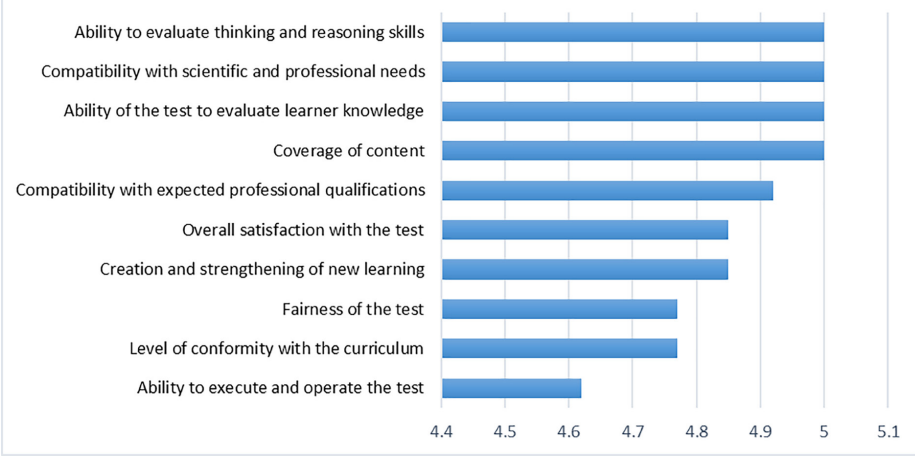

Figure 1: Frequency Distribution of Satisfaction Levels Among open-book online examination Participants"

takers unanimously agreed that the exams were comprehensive, successfully assessing their superior thinking skills to a significant extent. All participants acknowledged that the scenarios and associated questions in the exams were tailored to meet their future occupational needs. The majority believed that the exams targeted their expected competencies and that the questions were designed to impart valuable knowledge. Most participants expressed that conducting exams in this manner is executable, practical, and operational (Figure 1).

Additionally, the student's perspectives on the level of anxiety in open-book online examinations and routine exams were compared. The results indicated that, according to the majority of students, exam anxiety is lower in open-book online examinations (Figure 2).

In addition, following the execution of exams in this manner, students actively participated in an on-site session with exam authorities at the university. During this session, they presented their opinions, critiques, and suggestions. While expressing ease with the innovative exam approach, they remained concerned about potential technological issues that might arise during the exam. Regarding exam-related anxiety, they noted that their participation in a pilot exam had a minimal impact on their anxiety levels, emphasizing that the reported anxiety stemmed primarily from the inherent nature of exams. They perceived access to a variety of scholarly resources as a source of comfort and a foundation, contributing to a reduction in their anxiety levels.

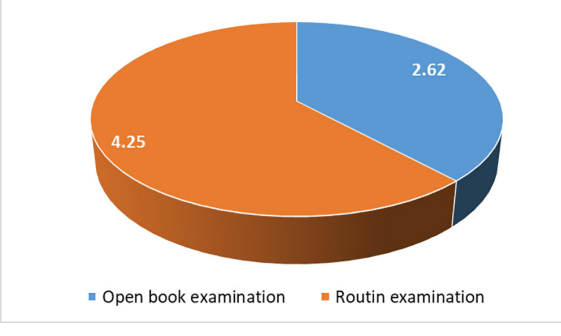

Figure 2: Comparing the students' perspectives on the level of anxiety in open-book online examinations and routine exams

According to the majority of students, this evaluation system successfully provided them with novel and valuable experiences. They believed that the electronic environment fostered enthusiasm for responding to exams and, with the possibility of utilizing resources, increased their maneuverability to address all aspects of the designed questions and scenarios. Students expressed concerns during the exam about unforeseen issues, such as power outages, internet disruptions, and malfunctioning of required equipment, potentially impeding their success in electronic exams.

Exam-takers believed that areas for improvement in the open-book online examination system included the time-consuming nature of the exam, concerns about potential technological issues, and the need for enhanced skills in designing open-book scenarios and questions.

They identified the strengths of the open-book online examination as an opportunity to experience highly specialized and professional exams, requiring advanced levels of thinking in responding to questions and providing a sense of calm due to the accessibility of informational resources.

Students suggested that during the educational period and course instruction, questions with this structure should be introduced, obliging students to respond to these questions electronically. This approach aims to enhance their readiness for time management and responding to exams during the final evaluation (Figure 3).

Evaluations are increasingly transitioning to electronic formats, necessitating a thorough understanding of the environment for electronic exams. Recognizing strengths, weaknesses, threats, and opportunities, considering audience needs, and fostering learning communities ensures exam success (6, 7).

Open-book online examination stands out for promoting student learning and significantly impacting educational outcomes (8). They stimulate creativity, innovation, and

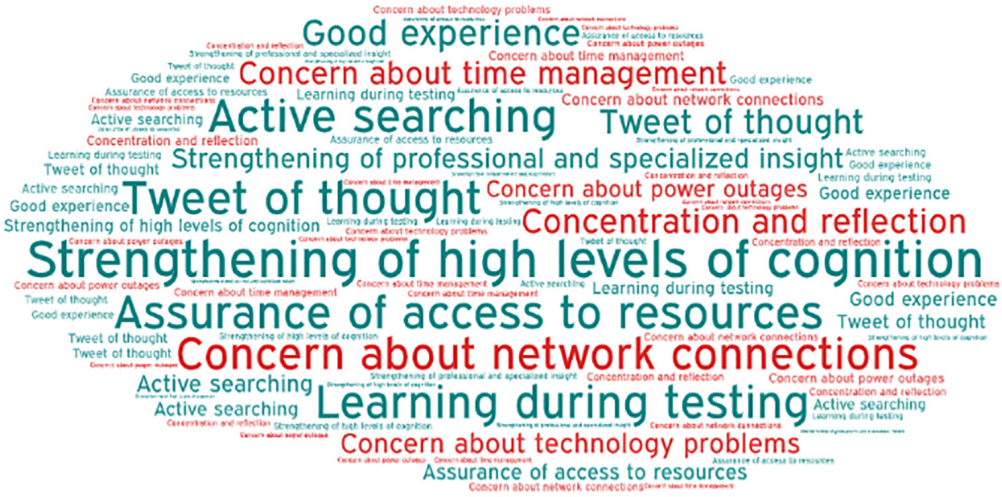

Figure 3: Students' viewpoint on the Positive and Negative Features of open-book online examination

purposeful scientific exploration, encouraging targeted research and the essential skills of analyzing and paraphrasing content for active and independent learning (9).

Abu-Snoubar et al. found that students in an English literature course achieved higher grades in open-book online examinations than in closed-book exams (10). Tatari et al. studied open-book exams in online learning, showing significantly higher midterm scores for the experimental group. Carrasco et al. reported higher average scores for open-book online examinations in medical school admissions (11).

Contrary studies suggest students perform equally well in open-book and closed-book exams (12, 13). Durning found no significant difference in scores between open-book and closed-book exams in a child psychology program (14). The results from the included research differ significantly, which may be attributed to differences in the learning environment, the type of majors studied, as well as the nature of the questions that were asked.

The study did have certain limitations such as the limited sample size, short time frame, and selection bias from a single location. Therefore, to address these concerns, future studies should consider expanding the scope of the research by investigating the effectiveness of open-book online assessments over a longer time frame, with larger and more diverse sample sizes and locations.

Conclusion

Open-book online examinations demonstrate unique capabilities in fostering learning, stimulating students' creativity and innovation, and promoting the analysis and interpretation of content. Choosing this examination method for assessing doctoral students, who are expected to have advanced critical thinking skills throughout their academic journey, would be a highly suitable and commendable option. The overall result of this research indicates that the higher the quality of these types of electronic exams, the greater the satisfaction of students. Given the appropriate electronic assessment infrastructure at SBUMS, it is recommended to extend the use of open-book online examinations for learning assessment, including quizzes, classroom exercises, midterm, and final exams, to other educational groups and faculties within the university.

Acknowledgments

We are grateful to the research counselor of SUMS for supporting this study. The authors wish to thank all students for their sincere help and cooperation in conducting the present study.

Authors' Contribution

NZ, SA, ZK, and SS devised the study

concept, designed the study, ran the study intervention, data collection, and analysis, participated in the coordination of the research, writing and critically revised the manuscript. All authors have read and approved the content of the manuscript.

Conflict of Interest: None declared.

Ethics Approval and Participants' Consent

The present study was approved by the local ethics committee of Shiraz University of Medical Sciences (decree code: IR.SUMS.REC.1402.226). Following ethical principles, the researchers explained the aims, methods, and conditions of the study to the participants, and written informed consent was obtained from them. Participants were assured of the confidentiality of their data, and that only general statistics would be presented.

Funding

Not applicable

References

1 Sousa M, Dal Mas F, Pesqueira A, Lemos C, Verde JM, Cobianchi L. The potential of AI in health higher education to increase the students' learning outcomes. The potential of AI in health higher education to increase the students' learning outcomes. 2021(2):488-97.

2 Tsvetkova M, Saenko N, Levina V, Kondratenko L, Khimmataliev D. Organizing Students' Independent Work at Universities for Professional Competencies Formation and Personality Development. International Journal of Instruction. 2021 Oct;14(4):503-28.

3 Itani M, Itani M, Kaddoura S, Al Husseiny F. The impact of the COVID-19 pandemic on on-line examination: Challenges and opportunities. Glob. J. Eng. Educ. 2022;24:105-20.

4 Cummings BA. Exploring the role of open book high-stakes examinations in 2021 and beyond. Canadian Medical Education Journal. 2022;13(4):49-52.

5 Kaidy BA. Do GPA, Age, and Credits Completed Result in Statistically Significant Differences in MSLQ Total Scores? (Doctoral dissertation, Capella University).

6 Maki PL, Shea P, editors. Transforming digital learning and assessment: A guide to available and emerging practices and building institutional consensus. Taylor & Francis; 2023 Jul 3.

7 Wong JT, Bui NN, Fields DT, Hughes BS. A learning experience design approach to online professional development for teaching science through the arts: Evaluation of teacher content knowledge, self-efficacy and STEAM perceptions. Journal of Science Teacher Education. 2023 Aug 18;34(6):593-623.

8 Ashri D, Sahoo BP. Open book examination and higher education during COVID-19: Case of University of Delhi. Journal of Educational Technology Systems. 2021 Sep;50(1):73-86.

9 Bansal D. Open book examinations: modifying pedagogical practices for effective teaching and learning. The Law Teacher. 2022 Jul 3;56(3):354-67.

10 Abu-Snoubar TK, Aldowkat I, Al-Shboul Y, Atiyat MA, Al-Hyari H. The attitudes of Jordanian English language and literature undergraduate students toward open-book exams. InFrontiers in Education 2022 Dec 19 (Vol. 7, p. 1050587). Frontiers.

11 Tatari F, Raoufian H, Mashhadi M, Gazerani A. Effect of group open-book assessment on students' learning and satisfaction: a quasi-experimental study. Neuropsychiatria i Neuropsychologia/ Neuropsychiatry and Neuropsychology. 2021;16(1):87-91.

12 Carrasco GA, Behling KC, Lopez OJ. Evaluation of the role of incentive structure on student participation and performance in active learning strategies: a comparison of case-based and team-based learning. Medical teacher. 2018 Apr 3;40(4):379-86.

13 Wenzel K, Schweppe J, Rummer R. Are open-book tests still as effective as

closed-book tests even after a delay of 2 weeks?. Applied Cognitive Psychology. 2022 May;36(3):699-707.

14 Durning SJ, Dong T, Ratcliffe T, Schuwirth L, Artino Jr AR, Boulet JR, Eva K. Comparing open-book and closed-book examinations: a systematic review. Academic medicine. 2016 Apr 1;91(4):583-99.