ORIGINAL ARTICLE

Exploring the Experiences of Undergraduate Medical Students with Online Open-Book Exams: An Exploratory Qualitative Study

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ABSTRACT:

Background: During COVID-19 medical education system in our ever-burgeoning societies thus saw a paradigm shift from in-person interactions to a virtual ones. In Pakistan, HEC also preferred online open-book exams (OBE) to closed-book exams (CBE) as an assessment strategy; issued guidelines accordingly. The absorption of this new assessment strategy proved daunting for undergraduate (UG) medical students. Careful understanding of their experiences proffers a seamless integration of online OBE in online assessment as a whole.

Methods: The Qualitative exploratory design has been utilized. The sampling technique includes purposeful sampling with maximum variation in sampling type. The sample size was eighteen students for three FGDs (six students in each group). Online FGDs were conducted and thematic analysis was done with verbatim transcription of data.

Result: Eight themes have been extracted from the data. The themes include understanding of students with online OBE, practice and training for online OBE, preparation for students for OBE, attempting online OBE, the spectrum of emotions, educational impact and benefits of online OBE, difficulties encountered during online OBE, and anticipated future of OBE in medical education.

Conclusion: Experiences of UG medical students in online OBE indicate its potential in future applications, such as formative assessment, teaching strategy, complementing conventional exams, and assessing real-life workplace situations. Relevant findings have enabled the furnishing of one model for the effective utilization of online OBE for institutions and students.

Keywords: Online Open-book exams, synchronous, undergraduate medical education, application of knowledge, problem-solving skill.

INTRODUCTION

The pandemic has altered the way of life as we know it, one of the casualties being the education system. This caused a paradigm shift from imparting face-to-face/ in-person education to online education[1]. Prima facie, changes in medical education brought upheaval in the life of a UG medical student. Assessment methods were also changed to align them with online medical teaching[2]. Few medical colleges used online assessment, but academic dishonesty was a concern in the traditional format of exams taken online[3]. Issue of academic dishonesty with online assessment could be resolved with the online OBE (open-book exams)[2]. Few medical colleges used online open-book assessments in their formative and summative assessments. Imperial College London was the first one to introduce the online open-book exam as an assessment strategy. The exam was introduced for final year students, this was adopted by other medical colleges also[4].

The cataclysm demanded rapid change and adaptation in the medical education of Pakistan. It also demanded seismic improvisations by all governing bodies in education/ medical education, institutes, teachers, students, and parents. Medical education would have suffered a long-term loss in case of failure to modification in teaching and assessment methods[5]. Higher Education Commission (HEC) the governing body of education in Pakistan has also provided new assessment guidelines during the pandemic. According to those guidelines, an online open-book exam was the recommended assessment strategy[6]. Since online medical education was a new experience, students faced many challenges[7]. It was challenging for students to appear in online OBE without any previous experience[8,9].

In reviewing the literature, there is lack of a well-designed qualitative research in understanding the use of online OBE in UG medical education[7,10]. The further need for a thoughtful exploration of online OBE in medical colleges has also been identified[10].

Apropos, pandemic being a global and an unpredictable phenomenon, merits adaptations akin to restriction gravitas on the education system. The experiences of students and faculty offer refinement to this evolution. The study has explored the experiences of undergraduate medical students with an online OBE, hence further guiding its implementation[10].

Traditional Closed Book Examination (CBE) are those during which students cannot use any learning material during the exam. Students have to cram for preparation and during the exam, they have to recall information[11]. In contrast to CBE, OBE allows students to use their learning expedients like books and notes. Further, there are two types of OBE; the *restricted type* permit students to bring only approved study material, whereas, ***the unrestricted type*** allows any learning resource to the exam[5,11]. Further, types of online assessments are, *asynchronous* or take-home exams and other is *synchronous* or real-time assessments. The synchronous online OBE is taken in real-time. The asynchronous or take-home online OBE is not conducted in real-time but can be attempted in the given time window[1,12].

The purpose of the study is to explore the experiences of undergraduate medical students (low, medium, and high scorers) with an online OBE. The selection was made as only the said batch underwent online OBE. Such a study, including all three groups of students, has been expected to offer a rich experience. It will be useful for helping students in the preparation and attempting an online OBE.

Research question
What are the experiences of an undergraduate (UG) medical student with the online open-book exam?

Secondary research questions
What are the pre-exam perceptions of UG medical students about online OBE?
What future placement of online OBE is anticipated by UG medical students in medical education?

Research objective of the study: To explore the experiences of undergraduate (UG) medical students with the online OBE.

Secondary objectives: To explore the pre-exam perceptions of UG medical students about online OBE.

To explore the future placement of online OBE anticipated by UG medical students in medical education.

Conceptual and theoretical frameworks: Connectivism theory by George Siemens, Bloom's taxonomy, and Miller's Pyramid contain similar constructs to the online OBE[13–15].

MATERIAL AND METHODS

Study Design: The exploratory qualitative design was employed in this research. This design aims to understand how individuals take out the meaning of a phenomenon they have experienced[16]. *The central phenomenon in this study was the experience of undergraduate medical students with an online OBE[17]*. The study was conducted from Feb 2021 till July 2021 in Islamic International Medical College IIMC. Ethical approval was obtained from the ethical approval committee of IIMC Riphah International University.

Maximal variation sampling technique is selected for this study. In this sampling technique, individuals with varying characteristics are selected for the study[18]. Based on the range of scores in OBE three characteristics high, medium, and low scorers were included in the study to understand the complexity of central phenomena. A total of 18 participants(third year MBBS students) were selected for the study, with 6 participants in each focus group. The average age of participants was 23 years. The selection criteria are explained in table 1. A synchronous Online OBE was conducted through the LMS as formative assessment of Forensic and dermatology module; in Islamic International Medical College. It was proctored through a Zoom live session and the duration of the exam was 1 hour.Informed consent was obtained through whatsapp. *Written permission for accessing students' results* and online OBE was taken from principal IIMC[19]. *Participants were included voluntarily* after being assured for maintenance of confidentiality[19]. No incentives were offered to the participants.Codes were assigned to participants to maintain their *anonymity and confidentiality*[19]. *The researcher was* not a faculty member of IIMC. *The risk of students knowing their particular group*, especially in the case of low scorers was assessed before data collection. *Low scorer* students neither knew their scores nor were informed and have been accessed individually. The questions for FGD also did not hint/indicate any high, medium, or low scorer; FGD of low scorers was conducted before other groups.

After a thorough literature search, nine focus group questions were developed. Focus group questions were validated by five medical education experts and piloted before data collection. Data collection commenced after getting ethical approval from the ethics committee. Three online focus groups discussions were conducted through zoom by the corresponding author. The duration was 1 to 1.5 hours. Participants were given a participant information sheet. The Zoom meetings were recorded and saved in password-secured files by the researcher. Field notes were also taken by the researcher during FGDs. Thematic analysis was done manually, the six steps of thematic analysis are explained in figure-1 [20-22]. COREQ guidelines were used for reporting this study.

Table 1: Demographics of participants

Label	Focus Group	Age	Gender (Male - 35 % & Female - 65 %)	Range 1-13 (Total marks -20)	Classification
P1	G1	22	Female	11	High scorers Cut off 9.5 (90 percentile)
P2		21	Male	11	
P3		22	Female	11	
P4		22	Female	13	
P5		22	Female	11.5	
P6		23	Female	12	
P1	G2	24	Male	9.5	Medium scorer Cut off 8 (75 percentile)
P2		22	Female	7.5	
P3		22	Female	9	
P4		23	Female	9.5	
P5		22	Female	9.5	
P6		24	Female	10	
P1	G3	21	Male	2	Low scorer Cut off 7 (50 percentile)
P2		23	Male	3	
P3		23	Female	4	
P4		22	Male	3.5	
P5		23	Male	3.5	
P6		23	Male	6	

The study was ***credible*** (achieved by member checking, triangulation and prolonged engagement), ***transferable*** (achieved by transparent reporting of context, methodology and study conduct), ***dependable, conformable*** (the researcher discussed the decisions made during the research process, sampling techniques, findings, and data management in research meetings with the supervisor), and ***reflexive notes*** were written by the researcher. The role of the researcher was critically analyzed in notes during data collection, analysis, and write-up. It helped in ruling out the researcher's biases. These notes were not included in the analysis, to avoid the researcher's bias.
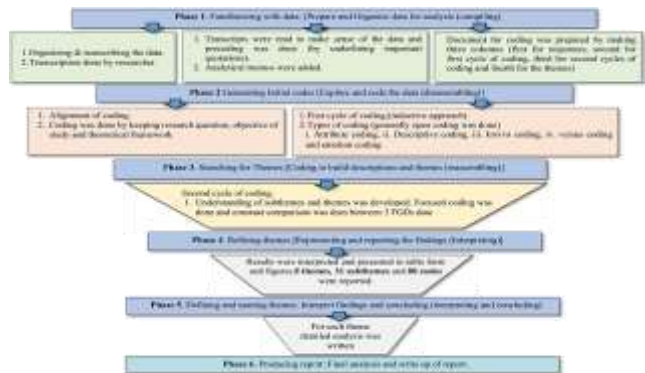

Figure 1 : Process of thematic analysis applied in this study

RESULTS

The transcripts of focus groups were manually analyzed and coded. After analysis of data, 80 codes were finalized, and grouped into 31 categories and these categories were further grouped into eight themes. Table-2 explains the overview of themes & subthemes extracted after thematic analysis.

Table 2: Overview of the themes and subthemes understanding of students about online OBE

Themes							
Understanding of students about online OBE	Practice and training for attempting online OBE	Preparation for online OBE	Attempting online OBE	The spectrum of emotions during the online OBE	Educational impact and benefits.	Challenges encountered during OBE	Anticipating future of online OBE in medical education
Subthemes							
Online exam with open books	Lack of proper orientation before exams	Role of teaching strategies	Collating information	Relax before the exam	Enhanced knowledge and focused learning	Time management	Formative assessment strategy
Assessment of knowledge application	Absence of mock exam	Planning & organizing information	Equal distribution of time	Anxious during exam	Long-term retention of topic	Technical problems	Teaching strategy
No effort is required	Post exam orientation	False sense of security	Consulting text during the exam	Dissatisfaction after the exam	Flexibility	The poor construct of questions & lack of clear instructions	Complementing traditional CBE
		Preparation technique and depth of preparation			Deep learning, reasoning and application of knowledge	Difficult information searching	Simulating real world
					Improved preparation technique	Lack of proper feedback	
						Unfamiliarity with format	

Understanding of Students about online OBE: This theme describes the understanding of students about online OBE. The students performed in online OBE according to their understanding. The difference in understanding among three demographically different groups is reflected in their performance and perception. For the high and medium scorer students, online OBE was an exam assessing location and application of knowledge. In contrast, according to low scorers, online OBE was not an exam for them in which there was no need to memorize.

"*We can use and take help of books for provided questions*". (P1G1)

"*We have an exam with an open book and are allowed to check the answers and correlate with any source available*". (P3G1)

"*Ma'am I agree that it is not an exam. In a closed book exam, we have to memorize and analyze but in an open book exam we don't have to put an effort, we just have to open books*". (P4G3)

Practice and training for online OBE: This theme reflects the familiarity of UG students with the online OBE format. The level of familiarity affected their overall experience with the online OBE. The practice of a new assessment strategy is mandatory before its introduction or implementation. Only a sample question was shown to them having no mock exam for online OBE.

"*There was no practice; that is why cannot perform well and no clear instructions also that is why it was quite difficult* (P4G2)

"*Honestly we were not given an orientation formally. College admin just mentioned that we need to appear in online OBE during the forensic lecture*". (P1G2)

Preparation: This theme reflects how the three different groups of students have prepared for online OBE. Different approaches for preparation were adopted by all three groups. Every assessment requires a different preparation technique. The depth of preparation and technique is also related to the previous understanding of the online OBE. The high scorers had prepared well, keeping in mind the purpose of the assessment. Medium scorers had prepared in the same way as the high scorers for OBE.

"*Open book exam needs deeper understanding and you should memorize important things also. .. pause one thing more which I learned was that I should have summarized and written information with me*". (P2G2)

Low scorers did not prepare for OBE as they did not consider it as an exam, having a false sense of security.

"*IF you ask for preparation the thing is that I would not personally prepare for OBE because it's written in words it is open book*". (P2G3)

Teaching has an important role in preparing students for online OBE. The recommended teaching methods were the practice-based scenario at end of the lecture, engaging lectures, CBL, PBL, and SGD. High scorer students also identified the importance of self-directed learning and taking responsibility for their learning.

Attempting online OBE: This theme describes different techniques adopted by three different groups of students for attempting an online OBE. Medium and high scorer students were able to locate and combine information for answering the question. They tried to manage time through equal distribution for each question. High scorer students had a comparatively well-prepared backup for consultation which helped them in locating required information to attempt questions. This technique helped them to complete the exam in a given short time limit. Searching online sources was time-consuming due to a lack of practice. High-scorers students also consulted the PowerPoint of lectures to save time during the exam.

"*The way I would do it is if I will try my best to equally distribute the time for time management. My formula for time management is if I had to attempt 10 questions and there were 20 min I would have given 2 min, for each question. I would look to the first resource if I am not able to find it, I will move to the next question*". (P6G1)

"*I had to refer to slides eventually find the answer from the PowerPoint lecture in class, since finding an answer from the book became difficult and used them in the exam*". **P4FG1**

"*Since it was first experience giving OBE in limited time. I did not refer google it was very time consuming*". **P2FG1**

The spectrum of Emotions during Online OBE: This theme reflects the state of emotions throughout the process of OBE. All three groups of students were relaxed before attempting an OBE. But as soon as they started attempting online OBE their feelings changed rather dramatically. The most common reason for the change of feelings from less anxious and relaxed to more anxious was due to lack of familiarity with OBE.

"*When I heard about open-book exams, I felt relaxed. I don't have to study… We were also excited that it is a new form of exam we are going to take*". (P2G3)

"*But during the exam, I found that it was not easy that we just had to remember a fact or formula it was about how we locate and apply the knowledge and skill that I should have at that time……. It was much harder*". (P6G1)

Educational benefits: This theme reflects the benefits and learning goals achieved with OBE. Students experienced increased knowledge about the topic and the three groups studied the topic in different ways. High scorers only consulted the relevant material. On the other hand, low scorers despite unsatisfactory performance identified that the benefit of deep learning could be achieved with OBE. The experienced benefits were deep study, a thorough understanding of the topic, and developing a habit of book reading. An interesting benefit identified by low scorers was that a topic can be prepared by the student while attempting an online OBE. Online OBE has been experienced as a focused learning activity by low scorers. OBE has been experienced as more flexible than CBE, if something is forgotten it can be consulted during OBE.

"*Online open book exam has helped me in increasing my knowledge*". (P4G2)

"*The point to be added actually while looking for the answers is that we got more focused… I would say that it has helped me in focused learning*". (P6G3)

"*Yes, I have started thinking critically after taking this exam even having MCQs and we are supposed to learn conceptually. Now we have to incorporate different things and then apply that information.*" (P6G1)

"*In OBE which you have not prepared you can prepare it at the time of test while attempting it, we are preparing it side by side, by going through the content. If you have not studied before only in that case*". (P4G3)

"*After the exam, the content was retained till the prof and it was a new way that helped me in retaining*". (P2G2)

"*In the closed book exam, if we don't know the answer then we don't know so we have to memorize everything. In OBE we have a margin that we understand, grasp the concept, and skim through the topic and if we are given questions at the end we can find easily and locate answers for OBE.*" (P3G1)

Challenges encountered during OBE

The theme reflects the difficulties encountered by students during the process of online OBE. The most common challenge was time management, faced by the three groups of students. A few students could not even complete the exam. The other challenges were internet connectivity, typing speed, functioning of LMS (technical issues), the unfamiliar format of OBE, lack of feedback, and poor construct of questions. The possible explanation for this is that faculty training is required to construct questions for the format of online OBE.

"*I was unable to manage time very well*" (P5G2)

"*For me managing the time while searching for the answers and typing was the most difficult challenge.*" (P3G2)

"*I am from a remote area had an internet connectivity issue I had to attempt an exam from the beginning when I joined it again*". (P2G1)

"*The questions were confusing it was not clear what are they asking. I thought they would be very specific in OBE, but they were not*". (P4G1)

"*Feedback was not given as it was expected owing to the fact as it was a new technique. The feedback was supposed to be different for OBE as it did not tell us where we lack*". (P3G1)

Anticipated future of OBE in medical education

This theme reflects the perception of students about the future place of online OBE in medical education. Students have suggested ways online OBE can be included in medical education. It has been suggested to include online OBE as a formative assessment strategy. Online OBE can be included as a teaching strategy rather than an assessment strategy. The explanation for this is that the low scorer students could not attempt and prepare it and they experienced learning about the topic while attempting the OBE. The place of OBE has been also anticipated as a decision-making activity carrying critical thinking and reasoning. Decision-making itself is an open book activity.

"As far as low stake assessment is concerned online open-book exam is ok". (P2G1)

"*Part of the traditional assessment can be taken with the online OBE, not the complete exam.*" P4G1

"OBE is helpful and can be applied in medicine if it is done after understanding it properly. We have to attempt it in a limited time.: This helps in applying knowledge in less time in actual practice at hospitals and clinics". (P1G1)

Table 3. Comparison between the experience of three groups

Similarities	Differences
• Absence of mock exam. • Lack of orientation. • Technical issues were common, especially typing issues was with all students. • Common feelings were their excitement, relaxation before the exam, anxiety, panic during the exam and lack of satisfaction, disappointment after the exam.	• The biggest difference is of approach toward OBE, which affected the overall performance throughout the phases of Online OBE. • False sense of security among low scorers. • High and medium scorers prepared for traditional closed-book exams.

Figure-2 is the model developed for guiding undergraduate medical students to prepare for OBE. The model is based on findings of the study.
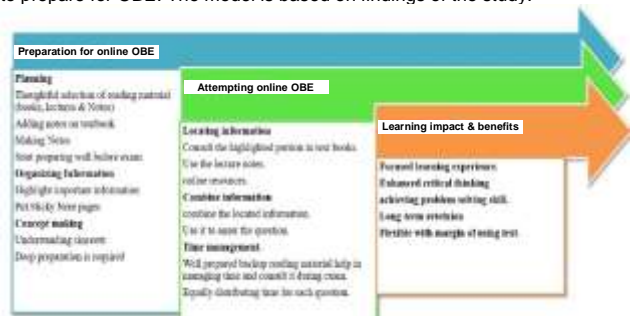

Figure 2 : Model for guiding students in understanding process of OBE

DISCUSSION

The study aimed to explore the experiences of undergraduate (UG) medical students with the online OBE. The students had been selected from three different groups based on their scores in OBE. Experiences of the high, medium and low scorers provided insight into the process of OBE; themes were extracted from their experiences to understand them in detail.

As perception and understanding about a process affect the approach, exploring the same with the three groups (about online OBE) was imperative. Their perspective indicated how they acted throughout the process of OBE[24]. Understanding of low scorers had a direct relation to their perception of not even considering it as an exam, thus failing the exam. This finding has been supported by Karagiannopoulo and Milienos[25]. They have identified that misperception of students about OBE made them fail the exam.

In this study, the *students regardless of their scores* could not display satisfactory performance in OBE due to lack of

practice. Lack of experience with a new assessment strategy made that exam a stressful experience. This finding is in line with the study in which the role of mock exams in changing the study habit of students is identified[26]. Students could not exactly predict the nature and format of a new assessment method which led to difficulties while attempting[9]. *High and medium scorer* students have also identified the absence of a mock exam before the online OBE. Also, they emphasized how a mock exam could have saved their time while attempting the same in actuality. Students need orchestrated training for attempting OBE since CBE orientation and exposure has been attained since childhood by default. In literature, the importance of practice has been identified for a better experience[3,27]. Less time was spent answering OBE questions due to previous experience and practice[28]. These findings from the literature support the findings of this study, identifying the importance of practice before OBE.

The three groups of students had different approaches during preparation for online OBE. The expected exam format also affects the preparation of students[3]. Since, **low scorer** students developed the understanding that the OBE does not require any preparation, led to an inflated/ false sense of security leading to a severe deficit in preparation. Some studies have reflected that students who do not study for OBE were having a false sense of security[3,29]. This was one of the disadvantages of online OBE identified in the literature[30]. The **high scorers** in OBE prepared by selecting the relevant study material, highlighting & demarcating important pages, and utilizing PowerPoint lectures/ notes. This approach of preparing relevant references helped them in attempting an online OBE. Few students among high scorers also focused on understanding the concepts. In literature, focusing on understanding concepts than memorizing facts for OBE had been emphasized[31]. Also, the importance of well-prepared backup/ ready-reckoners for the exam has been supported in the literature. A well-developed backup makes access to reading material easy during OBE[32]. Michael and colleagues reported the ideal approach for preparation. According to them a student reads a chapter well before the exam, understand the concepts, highlight or flag important pages, know about the table of content, use lecture notes, and add points from the lecture on the textbook[11]. All these are in line with the findings of this study. An interesting finding by scrutinizing high scorers was that they understood the importance of the precise location of information in determining for economizing on time.

Preparation for any assessment strategy starts right from a student attending a lecture. High and medium scorer students had identified the role of teaching strategies in the preparation of OBE. Inclusion of scenario-based questions at the end of the lecture, contextual-based teaching, and interactive engaging lectures would help them in learning at a higher cognitive level. The recommended teaching strategies for OBE were PBL (problem-based learning), CBL (case-based learning), and SGD (small group discussion). This problem-solving approach of teaching for online OBE in this study is supported by the results of a study by Heijne[34]. SGD as one of the most aligned teaching strategies is a unique finding in this study.

The approach followed by high scorer students reported in the study was that they equally distributed time for each question, an important skill in time management during the exam. In a study, it has been reported that students spend 5 minutes on average to answer 30 OBE questions in 3 hours[28]. The second strategy was to prepare backup in a way that the student exactly knows the location of information. This finding is aligned with the findings of Westerkamp and colleagues for answering an OBE question knowing and then locating information in the textbook are important skills[28]. The reading material utilized by students was textbook and lecture notes. This has been supported by the findings of Al-Kilidar[33]. High scorer students consulted the text and reading material at different stages during an online OBE

Students experienced anxiety, panic, and anger during online OBE; possibly, led by difficult questions, lack of preparation, lack of experience, and technical issues. This finding is similar to

the findings from studies that the cognitive component of anxiety is increased during online OBE[35,36,37]. Another possible explanation for anxiety during online OBE is due to a lack of ability to locate and apply knowledge; supported by the study of Westerkamp and colleagues[28]. All groups up to a varying degree had faced this challenge.

The educational benefits reported in this study are enhanced knowledge, focused learning experience, deep learning, long-term retention, flexibility, simulating real work environment, encouraging note-taking, better preparation of the topic, application of knowledge, and reasoning. Low scorers identified focused learning, deep learning, and assistance in the preparation of topics during the exam as few benefits. In literature, deep learning enhances knowledge; supported by a study[32]. Also, the finding from a study the author supports the association between formative OBE and enhanced knowledge[38].

Benefits experienced by high and medium scorers were enhanced knowledge, deep learning, long-term retention, the flexibility of consulting reading material, encouraging note-taking, application of knowledge, and critical thinking. The benefit of deep learning has been supported by a study[39]. The benefit of long-term retention is supported by Swart and Sutherland reporting the relation between difficult retrieval and long-term retention[26]. Swart and colleagues also supported the flexibility with OBE and logical reasoning in his study. He has reported that OBE carries flexibility for the students with memory difficulties and inductive learners with logical reasoning[26]. Achievement of higher-order thinking skills improves critical thinking skills and problem-solving; supported by studies[26,37].

Time management, technical problems, a poor construct of questions, unfamiliarity with the format, information searching, and lack of appropriate feedback were the findings of this study. Time management was the biggest challenge faced by **low scorers** due to lack of preparation. In a study, it is reported that difficulty of time management faced by students due to wasting time in information searching[32]. **High** and **medium scorer** students faced challenges of time management, typing challenges, the poor construct of questions, lack of clear instructions and information searching. Effective instructions by teacher on using textbook during OBE has been emphasized in literature[11,27].

Typing during OBE was another technical issue experienced by undergraduate students. Due to a lack of typing practice, students could not manage time. This finding is contrary to the finding in the literature. Myyry and Joutsenvirta have reported that students found typing to be helpful, it helped them in managing time. Typing was a factor that made attempting online OBE easier for them, by sparing time to think and apply knowledge[35]. The contradiction in finding is because, in Pakistan, medical students are not accustomed to frequent typing during their UG years. Another difficulty reported in this study during attempting OBE was the difficult and poor construct of the question. This is aligned with the findings in a study on undergraduate medical students, which emphasizes the importance of well-orchestrated questions for OBE[40]. She has also emphasized the training of faculty for properly constructing questions. Unfamiliarity with the format and lack of appropriate instructions further stacked the difficulty during the exam. This finding in the study supports the finding by Durning and colleagues in which they have related better performance with instructing students and practice exams for OBE[3]. Lack of post-exam feedback was another challenge, due to which students could not carry out self-assessment. The importance of feedback in OBE as FA has been reported by explaining the relationship between feedback and enhanced knowledge about the topic[38]. However, the importance of feedback on the result and performance of students has not been reported in the literature.

The anticipated future of online OBE by all three groups of students varies. They could foresee online OBE as a formative assessment strategy, complement assessment with CBE, teaching strategy, and assessment strategy to train for decision-making. **Low scorer** students anticipated OBE as a formative assessment

strategy in medical education; supported by Minder and colleagues. According to them, online OBE as a formative assessment improves the quality of the curriculum. They have made this recommendation based on the achievement of in-depth knowledge and increased knowledge of script[38]. **Medium scorers** have anticipated that the online open book can teach decision-making in short stressful situations. By reflecting on real practice scenarios, students are trained for professional life. Stowel in his study has reported that by carefully designing and implementing online OBE, a medical student learns skills required in professional settings. On the other hand, the CBE environment is not aligned with real workplaces like hospitals and clinics[41]. Medical students in the majority did not prefer online OBE in the future, which is contrary to the literature. In contrast to the findings of this study students preferred online OBE in ultrasound physics due to less stress during OBE[11].

Limitations: The study was qualitative and only one basic science subject was included. The students from one medical college were included. The students of clinical subjects were not included. The experiences of faculty with online OBE were not be explored. Due to the limited range of marks, percentile scores were considered for the selection of low, medium, and high scorers.

Recommendations: Based on the findings of the study following recommendations have been made for major stakeholders. The study can be replicated in clinical subjects and higher medical education. Similar qualitative research can be conducted to explore the experiences of faculty with the online OBE. Problem-solving skills can be assessed in medical education by adding online OBE. OBE can complement CBE in medical education. Institute should train faculty, have efficient LMS and a well-equipped computer lab before implementation of online OBE. A pilot online OBE should always be conducted before the actual implementation of online OBE. The post-pilot OBE feedback of faculty, students and assessment committee will provide further direction in the implementation of online OBE.

CONCLUSION

The study has explored the experiences of UG medical students with the online OBE and proffer advantages and disadvantages of OBE as per the understanding of low, medium, and high scorers. Accordingly, future applications of online OBE, online OBE as a formative assessment strategy, teaching strategy, and assessing real-life workplace situation has been anticipated by the students. Further, OBE can be part of an assessment along with CBE. A model based on the findings of the study has been developed for guiding the students about the process of online OBE.

The pandemic has allowed us to identify and adopt innovations in medical educations. Since the pandemic is expected to last for a considerable time, online OBE has the potential to complement CBE in online medical education. A new assessment strategy can only make its place if the experiences are successful.
Conflict of interest: Nil

REFERENCES

1. RA K, Masood J. Technology Enhanced Assessment (TEA) in COVID 19 Pandemic. PJMS. 2020;36(COVID19-S4):3.
2. Monaghan AM. Medical Teaching and Assessment in the Era of COVID-19. J Med Educ Curric Dev. 2020;7:238212052096525.
3. Durning SJ, Dong T, Ratcliffe T, Schuwirth L, Artino AR, Boulet JR, et al. Comparing open-book and closed-book examinations: A systematic review. Acad Med. 2016;91(4):583–99.
4. Giordano L, Cipollaro L, Migliorini F, Maffulli N. Impact of Covid-19 on Undergraduate and Residency Training. Surg [Internet]. 2020;19(5):199–206. Available from: http://www.sciencedirect.com/science/article/pii/S1479666X20301694
5. Fatima SS, Idrees R, Jabeen K, Sabzwari S, Khan S. Online assessment in undergraduate medical education: Challenges and solutions from a LMIC university. Pakistan J Med Sci. 2021;37(4):945–51.
6. On U. HEC Policy Guidance Series on COVID-19. 2020;(6):1–8.
7. Farooq F, Rathore FA, Mansoor SN. Challenges of online medical education in Pakistan during COVID-19 pandemic. J Coll Physicians Surg Pakistan. 2020;30(1):S67–9.
8. Damania T, Sharma S, Joegi A. Remote online open book exams – students'

view. Clin Teach. 2020;1–2.

9. Jervis CG, Brown LR. The prospects of sitting 'end of year' open book exams in the light of COVID-19: A medical student's perspective. Med Teach [Internet]. 2020;42(7):1–2. Available from: https://doi.org/10.1080/0142159X.2020.1766668

10. Zagury-Orly I, Durning SJ. Assessing open-book examination in medical education: The time is now. Med Teach [Internet]. 2020;0(0):1–2. Available from: https://doi.org/10.1080/0142159X.2020.1811214

11. Michael K, Lyden E, Custer T. Open-Book Examinations (OBEs) in an Ultrasound Physics Course: A Good Idea or a Bad Experiment? J Diagnostic Med Sonogr. 2019;35(3):174–80.

12. Bengtsson L. Take-home exams in higher education: A systematic review. Educ Sci. 2019;9(4).

13. Er HM, Nadarajah VD, Wong PS, Mitra NK, Ibrahim Z. Practical Considerations for Online Open Book Examinations in Remote Settings. MedEdPublish. 2020;9(1):1–7.

14. Prasad K, Education RA-J of E, 2017 U. Benefits and challenges of Open Book Examination as Assessment Model for Engineering Courses. JournaleetOrg [Internet]. 1970;4. Available from: http://www.journaleet.org/index.php/jeet/article/view/111682

15. Downing SM, Yudkowsky R. Assessment in Health. 2009. 317 p.

16. Merriam S. Basic Qualitative Research. 2009;12.

17. Rendle KA, Abramson CM, Garrett SB, Halley MC, Dohan D. Beyond exploratory: A tailored framework for designing and assessing qualitative health research. BMJ Open. 2019;9(8).

18. W.CressWell J. EDUCATIONAL RESEARCH. Edition, F. Paul A. Smith, Christina Robb KM, editor. Boston; 2016. 1–230 p.

19. Munhall PL. Ethical Considerations in Qualitative Research. West J Nurs Res. 1988;10(2):150–62.

20. Castleberry A, Nolen A. Thematic analysis of qualitative research data: Is it as easy as it sounds? Curr Pharm Teach Learn [Internet]. 2018;10(6):807–15. Available from: http://dx.doi.org/10.1016/j.cptl.2018.03.019

21. Nowell LS, Norris JM, White DE, Moules NJ. Thematic Analysis: Striving to Meet the Trustworthiness Criteria. Int J Qual Methods. 2017;16(1):1–13.

22. Braun V, Clarke V. Using thematic analysis in psychology. Qual Res Psychol. 2006;3(2):77–101.

23. Merriam SB TE. Qualitative Research: A Guide to Design and Implementation. Fourth. Sons JW&, editor. San Francisco, USA: Jossey-Bass; 2016. 1–371 p.

24. Karagiannopoulou, E. and Entwistle N. Influences on personal understanding : Intentions , approaches to learning , perceptions of assessment , and a ' meeting of minds '. Psycology Teach Rev. 2013;19(2):80–96.

25. Karagiannopoulou E, Milienos FS. Exploring the relationship between experienced students' preference for open- and closed-book examinations, approaches to learning and achievement. Educ Res Eval. 2013;19(4):271–96.

26. Swart AJ, Sutherland T. Student perspectives of open book versus closed book examinations-A case study in satellite communication. Int J Eng Educ. 2014;30(1):210–7.

27. Green ST, Ferrante SG, Heppard CJ. Using Open-Book Exams to Enhance Student Learning, Performance, and Motivation. J Eff Teach. 2016;16(1):19–35.

28. Westerkamp AC, Heijne-Penninga M, Kuks JBM, Cohen-Schotanus J. Open-book tests: Search behaviour, time used and test scores. Med Teach. 2013;35(4):330–2.

29. Dale VHM, Wieland B, Pirkelbauer B, Nevel A. Value and benefits of open-book examinations as assessment for deep learning in a post-graduate animal health course. J Vet Med Educ. 2009;36(4):403–10.

30. Anaya L, Evangelopoulos N, Lawani U. AC 2010-2137 : OPEN-BOOK VS . CLOSED-BOOK TESTING : AN Open-Book vs . Closed-Book Testing : an Experimental Comparison. Am Soceity Eng Educ. 2010;11.

31. du Preez H, du Preez CS. Taxation students' perceptions of open-book assessment prior to the qualifying examination of South African chartered accountants. South African J Account Res. 2012;26(1):119–42.

32. Du Preez H. Taxation students' perceptions of open-book assessment: a follow-up interactive qualitative analysis. South African J Account Res. 2015;29(1):84–99.

33. Al-kilidar H, Sixsmith A, Leveaux R, Mooney G. Student Perceptions of Open-Book and Closed-Book Exams in Postgraduate Engineering Management Subjects. Aust Assoc Eng Educ confrence Proc. 2018;(2).

34. Heijne-Penninga M, Kuks JBM, Hofman WHA, Muijtjens AMM, Cohen-Schotanus J. Influence of PBL with open-book tests on knowledge retention measured with progress tests. Adv Heal Sci Educ. 2013;18(3):485–95.

35. Myyry L, Joutsenvirta T. Open-book, open-web online examinations: Developing examination practices to support university students' learning and self-efficacy. Act Learn High Educ. 2015;16(2):119–32.

36. Cassady JC, Johnson RE. Cognitive test anxiety and academic performance. Contemp Educ Psychol. 2002;27(2):270–95.

37. Johanns B, Dinkens A, Moore J. A systematic review comparing open-book and closed-book examinations: Evaluating effects on development of critical thinking skills. Nurse Educ Pract [Internet]. 2017;27:89–94. Available from: http://dx.doi.org/10.1016/j.nepr.2017.08.018

38. Minder SP, Weibel D, Wissmath B, Schmitz FM. Do students achieve the desired learning goals using open-book formative assessments? Int J Med Educ. 2018;9:293–301.

39. Heijne-Penninga M, Kuks JBM, Hofman WHA, Cohen-Schotanus J. Directing students to profound open-book test preparation: The relationship between deep learning and open-book test time. Med Teach. 2011;33(1):16–21.

40. Heijne-Penninga, Kuks JBM, Schönrock-Adema J, Snijders TAB, Cohen-Schotanus J. Open-book tests to complement assessment-programmes: Analysis of open and closed-book tests. Adv Heal Sci Educ. 2008;13(3):263–73.

41. Stowell JR. Online Open-Book Testing in Face-to-Face Classes. 2015;1(1):7–13