

Original Article



Explaining medical students' perceptions of virtual assessment in the pandemic COVID-19: A content analysis study

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Abstract

Background: The COVID-19 pandemic has presented a significant challenge to education systems worldwide, disrupting traditional teaching and learning methods. This study aims to explore the perceptions of medical students at Abadan University of Medical Sciences regarding electronic assessment methods during the pandemic.

Methods: This qualitative study utilized conventional content analysis and involved medical students in their second semester of 2021 who had chosen a unit during the pandemic.

Results: Through the analysis process, the participants' experiences were categorized into six main classes, which included the following: information technology infrastructure, teaching methods of teachers, design of virtual exam questions, monitoring of online exams, psychological issues, and types of virtual assessment.

Conclusion: The medical students shared their experiences with virtual assessment during the pandemic, highlighting challenges related to internet infrastructure, communication issues between teachers and students, exam monitoring, psychological factors, reduced learning efficiency due to virtual summative assessment alone, and better learning efficiency through formative assessment alongside summative assessment. They also suggested improvements to online exams, such as increasing the number of questions on each page, allowing the possibility to return to previous questions, and ensuring non-randomness in clinical questions.

Introduction

In December 2019, a new respiratory virus appeared in Wuhan, the capital of Hubei Province, China. The virus can be spread among humans and is also believed to be caused by the transmission of β -CoVs in horseshoe bats.¹ The new coronavirus 2019 (COVID-19) was named the second pandemic of the 21st century by the World Health Organization (WHO) on March 11, 2020. COVID-19 is caused by the acute respiratory distress syndrome virus, a new strain of the family Coronaviridae.²

The COVID-19 pandemic in 2019 undeniably presented a predominant challenge to education systems worldwide, disrupting conventional teaching and learning methods. According to UNESCO, over 100 countries implemented temporary nationwide closures of educational institutions to curb the spread of COVID-19.³ Medical educators swiftly adapted their curriculum, with the majority transitioning to online classes and training to

enable students to finish their academic year. The primary objectives of these immediate alterations in teaching methods have been to uphold the standards in medical education and minimize the impact on assessments.⁴ Due to insufficient preparedness and the ongoing struggles against COVID-19, medical schools worldwide are confronted with the task of transitioning to fully online educational activities. Medical institutions in China were the first to close their campuses.⁵

In recent decades, particularly during the COVID-19 pandemic, digital and/or online educational tools have become integral components of medical curricula. In fact, digitalization is not merely a trend, but a fundamental shift that will transform both the medical profession and medical education. Contrary to lectures, seminars, or libraries, e-learning materials, when hosted online, are perpetually accessible. Consequently, their popularity among students is on the rise.⁶ Assessing medical students

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is a crucial component of curriculum development, particularly in the era of expanding virtual learning. The COVID-19 pandemic introduces fresh obstacles for educators, with examination and grading policies being among these challenges.⁷

During this pandemic crisis, it is crucial to ensure the safety and timely evaluation of medical students. Universities of medical sciences need to invest in individualized learning for competency-based education and the necessary technologies for virtually assessing students' clinical competence.

Maintaining standards in medical education, maintaining clinical learning, and minimizing assessment dysfunction are unprecedented challenges in a pandemic. Adapting to this new scenario is crucial for the training of future physicians.⁸

Evaluation is an integral component of the educational process. It reinforces learning and validates that students have successfully achieved the learning objectives of the course.

To fulfill both of these requirements, assessment methods must align with the curriculum and instructional approaches, and both formative and summative assessments should be employed.⁹ As it offers more feedback focused on quality enhancement and professional development, rather than just scores or rankings.

However, in this unique circumstance, formative assessment should be accentuated, as it offers more feedback focused on quality improvement and professional development, rather than just scores or rankings. Ideally, these evaluations should be based on high-quality evidence and theory-based evaluation and evaluation strategies.⁵ The summative assessment is used to determine the learning outcomes achieved by students at the end of the course. This evaluation strategy is helpful for educators in assessing students' learning, their competencies, and their academic achievement.¹⁰ Online assessment has the potential to make the teaching and learning process both practical (for distance education management, increasing class size, and staff workload) and educational (providing ongoing feedback to students and staff on progress) to improve learning goals.⁹ Most educational institutions were not entirely equipped to conduct evaluations for all their courses online. Technical shortcomings, lack of appropriate online tools, and lack of inexperience among educators and students in distance learning have emerged as the most crucial challenges that institutions have to confront.¹¹

Given that assessment is recognized as one of the primary and crucial components of any educational system, the importance of assessment and evaluation tools in an e-learning system is paramount and in light of the current circumstances (the coronavirus pandemic) and considering the complexity and significance of medical courses, this study aims to elucidate the perceptions

of medical students at Abadan University of Medical Sciences regarding electronic assessment methods.

Materials and Methods

This qualitative study utilized customary content analysis and focused on medical stagers students at Abadan University of Medical Sciences who had chosen a unit during the second semester of 2021, which was presented virtually due to the COVID-19 pandemic. Ten participants were selected through purposive sampling, where the researcher consciously chose participants who could provide rich and desired information (Table 1). The sample size was determined based on information saturation, and the interviews continued until new data was not obtained. The researcher concluded that the sample had reached saturation and closure when the conversations became repetitive, and no new codes or expansions were necessary. In other words, the semi-structured interviews were conducted until the researcher determined that continuing the interview would not yield any new solutions.

Through semi-structured questions, medical students were interviewed about various virtual assessment methods. The interviews were conducted over the phone due to the conditions of the COVID-19 pandemic. All interviews were recorded and transcribed verbatim immediately after each session. The interview consisted of 4 open-ended questions.

Questions

What was the quality of the virtual exams held in the current semester?

What is your suggestion for improving virtual exams?

In your opinion, how helpful can formative assessment be in your learning?

Explain the psychological issues you have created in the virtual assessment.

The results of this interview will be used to explain and provide solutions.

Table 1. Characteristics of the participants

	Age	Gender	The city of residence	marital status	Education
1	24	Female	Kazerun city	Unmarried	Medical stager
2	24	Male	Abadan city	Unmarried	Medical stager
3	24	Male	Abadan city	Unmarried	Medical stager
4	24	Female	Shadgan city	Unmarried	Medical stager
5	25	Female	Ahvaz city	Unmarried	Medical stager
6	26	Female	Ahvaz city	Unmarried	Medical stager
7	24	Male	Abadan city	Unmarried	Medical stager
8	26	Male	Khorramshahr city	Married	Medical stager
9	23	Female	Khorramshahr city	Unmarried	Medical stager
10	24	Male	Abadan city	Unmarried	Medical stager

Data analysis method

This study employed customary content analysis and focused on medical students at Abadan University of Medical Sciences who had selected a unit during the second semester of 2021, which was presented virtually due to the COVID-19 pandemic. Purposive sampling was used to select ten participants who could provide rich and desired information, and the sample size was determined based on information saturation. The semi-structured interviews were conducted until the researcher concluded that continuing the interview would not yield any new solutions. The interviews were conducted over the phone due to the pandemic, and all responses were recorded and transcribed verbatim. The interviews consisted of four open-ended questions about various virtual assessment methods.

Data analysis

Qualitative content analysis involves identifying and categorizing meaningful units within text to uncover themes and meanings. The process includes assigning codes to semantic units and grouping them into categories based on their similarities. Themes are then formed by connecting basic meanings within categories. The unit of analysis refers to the portion of the text being studied, while the unit of meaning is a set of words or sentences with similar meanings. Compression involves condensing the text while preserving its core semantic meaning, and the content area refers to specific sections of the text that pertain to the researcher's topic of interest. Codes are labels assigned to semantic units, and categories are formed by grouping similar codes. Primary and secondary classification of codes is based on abstract thinking derived from the data, and the results can inform educational solutions.¹² In order to examine the data collected from the interviews, the Greenham method was employed along with content analysis. This method involved analyzing the qualitative data by subjecting it to a systematic classification and coding process. The content analysis focused on assessing the quality of communication between various codes, beginning with the primary classification and subsequently followed by the secondary classification of codes. This process involved abstract thinking derived from the data itself. The results obtained from the secondary classification of codes were then utilized to identify potential solutions related to educational, technical, and specialized knowledge. The coding aspect of this study was carried out by one of the authors (ER). However, to ensure the accuracy and scientific validity of the findings, two other research members (SA and AH) were involved in the process of confirming the coding.¹²

Accuracy and scientific validity of the findings

To ensure the accuracy of the research findings, the researchers have adhered to four fundamental

criteria: credibility, dependability, transferability, and confirmability. By employing specific methodologies, they strive to present a faithful representation of the participants' actual experiences.¹³

Data credibility

The data's credibility is ensured through a meticulous review process. This includes manuscript reviews by the participants themselves and peer reviews conducted by the research team, who possess expertise in qualitative research. Following the analysis of each interview, a summary encapsulating the data analysis process and its findings is shared with the participants. The transcripts of the interviews, along with the codes and classes extracted, receive approval from multiple participants. Ultimately, their feedback and suggestions are integrated into the final analysis.¹³

Dependability

Dependability is achieved through a thorough and ongoing documentation of the researcher's activities. This encompasses the methodologies employed for data collection and analysis, as well as the provision of survey text excerpts corresponding to each category.¹³

Transferability

To achieve transferability, the classes extracted from the research are shared with a group of medical students who did not participate in the study. This is done to determine the degree of similarity between the research findings and their own experiences.¹³

Confirmability

To ensure confirmability, the transcripts of several interviews, along with the codes and classes extracted, are shared with research colleagues who are familiar with qualitative research analysis but did not participate in the study.¹³

Principles of research ethics

Ethical principles were stringently adhered to throughout the research process. This was achieved by maintaining the confidentiality of the information and obtaining informed written consent from the participants for the interview and its recording. The informed consent form is attached for reference. Confidentiality was strictly observed, and the ethical code is IR.VUMS.REC.1400.014.

Results

Based on the participants' experiences in this study, several main classes were extracted through the qualitative analysis process. These classes represent the perceptions of medical students regarding virtual assessment during the COVID-19 pandemic. The classes include the following: Information Technology Infrastructure, Teachers'

Teaching Methods, Design of Virtual Exam Questions, Monitoring of Online Exams, Psychological Issues, and Types of Virtual Assessment (Table 2).

Information technology infrastructure

Certain individuals involved in medical examinations encountered difficulties related to internet slowdowns, unexpected internet disconnections, power outages, and insufficient power supply for their devices (cell phones or laptops). These issues caused significant stress and concerns among the participants. For instance, one participant expressed their worry about frequent internet disconnections during exams, causing them to fear it would happen again, thereby adding substantial stress to their already demanding situation. Another participant shared an incident where they were unexpectedly logged out of the online exam system and were unable to log back in. To exacerbate the situation, they were prompted to enter a new password, resulting in a substantial waste of time before contacting a training expert for assistance.

Moreover, one participant described an unfortunate scenario where a power outage occurred during one of their crucial exams. The power was restored only after the exam had concluded, and due to their phone not being adequately charged, they found themselves in a highly stressful situation. Additionally, some participants encountered difficulties with the online exam system itself. This included sudden system shutdowns and unexpected student disconnections. In such instances, it was suggested that allowing students to re-enter the exam system using the same password would be more beneficial. This recommendation aimed to mitigate the loss of valuable time experienced by students in these situations. Currently, if they are unable to regain access, the time lost during the disruption is not compensated, further aggravating the issue at hand. It is crucial to acknowledge the impact of technological challenges on the participants' experiences during medical examinations. These issues can lead to increased stress levels and potential disruptions

Table 2. Codes, sub-categories, and categories from content analysis of medical stager students' perceptions of virtual assessment

Category	Sub-category	Code
Information technology infrastructure	Internet access and speed	The possibility of disconnecting the internet Slow internet sometimes
	Factors related to the online exam system	Interruption of the online test system and sudden withdrawal of students from the system in some cases
The teaching method of professors	The proportion of virtual course content and virtual exams' questions	Incompatibility of some questions with the content taught by the professor
	Student-teacher communication in terms of virtual education	Reduction of verbal and non-verbal communication between professor and student in virtual conditions
	Quality of teachers' teaching	Teaching quality and the difference in teaching quality of professors in multi-professor courses
Design of virtual exam questions	Number of virtual exams' questions	The large number of virtual clinical questions
	Scheduling of virtual exams' questions	Lack of time to exam virtual clinical questions Allow at least one minute for each clinical multiple-choice question Determine the time for the exam in general Not allocating a specific time for a question
	Level of virtual exams' questions	The difficulty of virtual clinical exam questions due to the case-oriented nature of the questions
	Type of questions	multiple-choice questions are suitable questions for virtual clinical exams
Monitoring of online exams	Virtual exam space control	It is better to control the student's exam space through webcam
	Number of questions on each page of the virtual exam system	It is not appropriate to assign a question on a test page in the online exam system Assign at least 10 questions per page of the online exam system
	Do not return to the previous question	The solution of not going back to the previous question is not suitable in online exams and it is better for the student to have the chance to go back to the previous question. This was one of the advantages of the face-to-face exam.
	The randomness of the questions	The random nature of the questions is not suitable considering the case-oriented nature of the exam.
	Student Comments	Requesting opinions from students at the end of the virtual exam is a solution to find the problems of the virtual exam.
Psychological issues	Stress for virtual exam infrastructure problems	The stress of internet outages and power outages The stress of turning off the laptop and mobile phone during the exam The stress of suddenly leaving the online exam system
	Virtual exam location	Peace of mind of the student due to being in the safe environment of the student's home and city in the virtual exam
Types of virtual assessments	Virtual summative assessment	Reduction of learning efficiency due to virtual summative assessment alone
	Virtual formative assessment	The importance and better efficiency of formative assessment along with summative assessment

in the assessment process. Addressing such problems and implementing solutions to mitigate their occurrence can significantly improve the overall examination experience for these individuals.

The teaching method of teachers

The appropriateness of the course content taught virtually and virtual exams' questions

In certain clinical courses, there was a significant volume of extensive material to cover. As theory-based courses were conducted in a virtual format, the virtual exam questions did not align well with the course content, leading to a problematic situation.

One of the participants expressed concern about the exam content, stating, "Some teachers pose questions that weren't covered in the course material. These questions are challenging because clinical courses are intensive, and reviewing the same content is time-consuming. It would be more beneficial if the questions were derived from the course materials taught by the instructor".

Student-teacher communication in terms of virtual education

In face-to-face classes, the interaction between teachers and students typically fostered more effective communication. However, regrettably, in virtual settings, teacher-student communication was weak, resulting in a decline in the quality of learning. The lack of supervision from teachers further exacerbated this issue, leading to reduced student engagement throughout the semester, which ultimately resulted in a buildup of course material to be covered during exam time. Moreover, the decrease in such communication significantly diminished the opportunity for class discussions and Q&A sessions, which had proven to be highly beneficial for learning in face-to-face classes. Consequently, the overall quality of learning suffered in virtual environments. In this regard, a participant shared their experience, stating, "We encountered some challenges during the course. For instance, some of the content that was uploaded went offline. Since we didn't have face-to-face classes, we could not get to know or contact the teacher. This lack of interaction negatively impacted our learning experience."

Another participant expressed, "The limited interaction with teachers resulted in low supervision of the class and students. This lack of oversight diminished the importance of the lessons, leading us to procrastinate and only study on the eve of the exam."

Another participant shared, "For courses that offered both theoretical and practical components, we only interacted with the teacher during the practical sessions. This interaction positively impacted our performance in the practical courses. However, the theoretical courses were conducted virtually and lacked the appeal and importance of the practical courses, which were held in person. The presence of the teacher during these practical sessions greatly enhanced our learning experience."

Quality of professors' teaching

Professors uploaded a variety of educational content to the Navid learning system. However, according to medical students, virtual learning cannot replace face-to-face classes, and the quality of virtual learning is significantly lower. The content varied depending on the professor; some made an effort to make their material more engaging, while others did not. The students requested that university officials monitor the quality of the educational content more closely. In courses taught by multiple professors, a lack of coordination sometimes led to confusion due to discrepancies in course resources. A participant shared, "In some courses, there were multiple instructors who failed to coordinate with each other when designing the virtual test questions. This resulted in some questions being unrelated to the course content." Another participant shared, "Some professors invested time in preparing the course content and took the initiative to create educational videos. I found these engaging and eagerly followed these courses. However, some professors did not have enough time to provide offline content. This disinterest in their lessons significantly reduced the quality of my learning experience."

Design of virtual exam questions

Number of virtual exams questions

The virtual theory exams consisted of a substantial number of questions, ranging from 100 to 150. The nature of these questions, which were focused on case-oriented and clinical aspects, resulted in increased fatigue and stress among students, potentially leading to a decline in their overall scores. In light of this, many students recommended that the virtual clinical exam should comprise a more manageable number of questions, ranging from 20 to 50. Additionally, it was suggested that conducting multiple exams with a standardized set of questions for the course would enhance the quality of learning content, while simultaneously alleviating student fatigue and stress during the examination process.

A participant shared, "The exam for one of the clinical courses consisted of 150 extremely challenging questions. While they were all multiple-choice, they were conceptually difficult and required careful thought. The sheer volume of questions was exhausting, and towards the end, I found myself selecting answers randomly without thinking, simply because I was too tired to contemplate these complex questions."

Scheduling of virtual exams questions

Given that clinical and case-based questions are typically conceptual and demand more thoughtful analysis, it's highly unsuitable to allocate less than a minute per exam question.

In this regard, a participant expressed, "In online examinations, each question, particularly case-based

clinical ones that require thoughtful consideration, was allocated less than a minute. This time frame is not suitable for clinical questions. It would be more beneficial to allocate more than a minute for such questions, allowing us ample time to think and respond.”

It would be more beneficial to consider the total time allocated for the entire online exam. Given that some questions are more challenging and others are easier, having a total time allotment allows for flexibility. This way, time saved on easier questions can be utilized for more difficult ones that require deeper thought. If each question is timed individually, it could disadvantage the student.

A participant shared, *“In traditional face-to-face exams, we had a general time allotment for the entire exam. We could decide how much time to spend on each question, allocating more time for harder questions and less for easier ones. However, in these online exams, each question had a specific time limit. While this worked well for easier questions, and we might even have had extra time, it proved insufficient for more difficult questions.”*

Level of virtual exams’ questions

Most students expressed that the questions in virtual clinical exams are challenging and conceptual due to their case-oriented nature. The answers are not easily memorizable, and even the likelihood of cheating in such exams is extremely low due to their difficulty.

A participant suggested, *“Given that clinical exam questions are often case-based and thus conceptual and challenging, it would be beneficial to have a mix of difficulty levels. Not all questions should be hard and conceptual. Including some medium and easy questions could prevent mental fatigue from tackling difficult questions continuously, which in turn could lead to improved exam results.”*

Type of questions

Most questions in the theoretical section of the course were multiple-choice, a format that most students preferred. This type of question is well-suited for virtual clinical exams. Descriptive questions were considered the next best option after multiple-choice questions, provided the answers required were short and students were given ample time to write them.

“Thankfully, despite the difficulty of most questions, they were multiple-choice. With these complex clinical concepts, if the questions were descriptive, we wouldn’t have scored well at all.” A participant suggested, *“For case-based exams, given the complexity of these courses, multiple-choice questions are the most appropriate format. This is followed by short descriptive questions and true or false questions.”*

Monitoring of online exams

Virtual exam space control

A minority of students expressed the viewpoint that it would be beneficial to monitor the location of students during virtual exams. They suggested implementing measures such as webcam surveillance at home to minimize the likelihood of cheating or utilizing unauthorized resources. This perspective stemmed from the belief that certain students may engage in collaborative exam responses or exchange information through virtual messaging platforms. Conversely, the majority of students held the belief that the extensive number of questions, their level of difficulty, and the limited time allotted for completion left no opportunity for cheating.

One of the participants stated that: *“Some of the clinical and case-based questions were challenging and conceptual. Various scenarios were presented that were so complex, I couldn’t answer them even with my notes open beside me. The only way to answer was to think critically. We had a group on a virtual messenger platform that we relied on during virtual exams. However, it wasn’t very effective for case-based exams due to the high volume of difficult questions and the limited time allocated for the exam.”*

Number of questions on each page of the virtual exam system

All students participating in this study agreed that having only one question per exam page was not an effective measure to reduce cheating. Instead, it was viewed as a waste of time as students had to navigate from one page to another. They suggested that there should be at least 10 questions per exam page.

One of the participants stated that: *“One method implemented to reduce cheating was to display only one question per page during online exams. However, I don’t believe this had any significant impact on curbing dishonest practices. Instead, it merely consumed students’ time as they navigated from one page to the next. A more efficient approach would be to either present all questions on a single page or, at the very least, include ten questions per page.”*

Do not return to the previous question

All surveyed students unanimously opined that the practice of disallowing revisiting of previous questions is unsuitable, asserting that students should be afforded the opportunity to revisit prior questions. This particular advantage was exclusive to face-to-face examinations, as virtual tests did not permit students to review previously encountered questions.

One of the participants stated that: *“Previously, during face-to-face exams, we had the opportunity to revisit and revise our answers if we realized a mistake. However, this option was not available in online exams, which did not contribute to reducing cheating. It would be beneficial if the online exam system allowed students to edit their responses.”*

Dissatisfaction with the lack of appropriateness in the randomization

The participants of the study unanimously expressed their dissatisfaction with the lack of appropriateness in the randomization of the questions, which was deemed incongruous with the case-oriented nature of the tests. An illustrative example of this issue is the inclusion of a question that commences with the phrase “according to the case raised in the previous question...” In order to address this predicament, it is advisable for professors to refrain from posing such questions. However, the most optimal and expeditious resolution would involve the complete elimination of the randomization of the questions. One of the participants stated that: “*The practice of ‘randomizing questions’ is not appropriate for online clinical exams. Some questions are contingent on the context established in previous questions. When these questions are shuffled, it becomes challenging to answer them, leading to confusion. This strategy might be effective for non-clinical exams where there’s no connection between questions.*”

Student comments

Several students proposed that to apprise the authorities of the issues pertaining to the virtual examination and expedite their resolution, a survey questionnaire ought to be appended to the conclusion of the virtual examination. One of the participants stated that: “*It would be highly beneficial to include a survey form at the end of each test. This would allow students to share their feedback on each exam, providing officials with insights into the conditions of each test. Such a measure would undoubtedly be effective in identifying and addressing potential issues.*”

Psychological issues

Stress for virtual exam infrastructure problems

The entire cohort of participants in the research expressed consistent concerns regarding potential disruptions such as internet outages, power failures, internet slowdowns, and device malfunctions, which they perceived as sources of significant stress. This particular form of stress was absent in traditional face-to-face examinations. Furthermore, certain instances were reported where an abrupt termination of the online examination platform occurred, causing considerable distress for the students. Consequently, they experienced a substantial loss of time until the reconnection was established.

Peace of mind of the students due to being in the safe environment of the student’s home and city in the virtual exam

The students under examination universally expressed their appreciation for the unique convenience offered by the home environment. Particularly, non-native students expressed contentment in being exempted from the arduous journey from their hometown to the city of study

for the purpose of taking the exam. This arrangement not only alleviated the financial burden associated with travel expenses, but also mitigated the potential hazards associated with long-distance travel. One of the participants stated that: “*For us non-native students, the online exams were very beneficial. We didn’t need to travel from one city to another to take the exam, eliminating the risks associated with travel. Instead, we were able to take the exam in the comfort of our own homes. This was a significant advantage.*”

Another participant stated that: “*The home environment offers a certain level of tranquility that is incomparable to a face-to-face exam session with multiple supervisors present. This calmness undoubtedly has a significant impact on improving scores and making the exam experience more enjoyable.*”

Types of virtual assessments

Virtual summative assessment

All surveyed students expressed the belief that the extensive number of clinical courses leads to a situation where only the summative assessment format results in certain topics being overlooked, while others are studied in great depth. This phenomenon, however, does not contribute to effective learning and diminishes the overall quality of the learning experience. The summative examination format is perceived as burdensome and anxiety-inducing due to the sheer quantity of questions and the extensive coverage of course materials. One of the participants stated that: “*Unfortunately, most clinical courses had only one virtual exam at the end of the semester. The volume of course material was extensive, dense, and very challenging, with a high number of questions. Some courses were taught by multiple professors, each contributing a large number of questions. Given the sheer volume of course material, we were unable to review all of it for the final exam. We didn’t have the opportunity to revise as much content as we had studied, which hindered our learning of the course material. The multitude and difficulty of the questions resulted in lower grades.*”

Virtual formative assessment

All students held a positive belief regarding the efficacy of formative assessment in enhancing learning outcomes. Specifically, the participants recommended the implementation of a formative assessment approach that involved multiple iterations of exam topics in an eliminating format for large-scale clinical courses. This approach was deemed advantageous as it allowed for a more manageable volume of subject matter to be covered in each exam, thereby facilitating a more efficient and effective learning process. Additionally, the reduced number of exam questions in such an approach was perceived to alleviate the stress associated with high-stakes testing. In this regard, one of the participants stated that: “*I wish the extensive curriculum were condensed into*

a series of comprehensive exams. This approach would allow us to gradually absorb the material, enhancing our learning experience. It would also eliminate the need to answer 150 questions in a limited time during the exam.”

In addition to comprehensive exams, other methods such as volunteering conferences, graded volunteer question-and-answer sessions, and class assignments can significantly enhance the learning process.

One of the participants stated that: *“In one of our classes, the teacher implemented a unique teaching method. Each student was tasked with presenting a session based on the conference curriculum. This presentation contributed to our overall class grade. I found this approach highly effective and engaging, which significantly enhanced my learning experience.”*

Most students questioned the efficacy of using a logbook as a form of formative assessment for learning. They argued that it was time-consuming and did not significantly contribute to their learning process.

One of the participants stated that: *“The logbook did not enhance my learning experience. It felt like additional work and was time-consuming. The task of filling in the logbook seemed to only consume the student’s time without significantly impacting learning. Furthermore, it lacked appeal and engagement.”*

Discussion

The COVID-19 pandemic has necessitated the implementation of mandatory distance education by universities. Nevertheless, a significant number of institutions were ill-equipped to provide online courses in their entirety. The prevailing challenges encountered by these establishments primarily revolve around technical inadequacies, a dearth of proficient online tools, and the limited experience of both educators and students in the realm of distance education.¹⁴

“Every student in the study expressed constant concern over potential technical issues such as internet outages, slow connectivity, power failures, or their laptops and cell phones shutting down. These concerns added a significant amount of stress. Additionally, instances of sudden disconnections from the online exam system were particularly distressing. The time lost until reconnection further exacerbated the situation and negatively impacted their performance.”

In their study, Ocak and Karakuş identified that the most prevalent issues students faced during the online exam preparation process were internet-related problems, lack of focus during online exams, and insufficient information about the exams. Internet issues were deemed the most severe as they were beyond the students’ control. The anxiety levels of students increased due to the technical problems they might encounter during the exam, and if the test involved uncertainty, their motivation to work decreased.¹⁵ Studies have indicated

that university students have experienced symptoms of anxiety and depression due to the COVID-19 pandemic, which may be partially attributed to its impact on their studies.¹⁴

This study examines the perceptions of students regarding the effectiveness of teacher-student relationships in face-to-face and virtual classroom settings. The findings indicate that students believe that face-to-face classes foster a more effective relationship between the teacher and the student. However, in virtual settings, the teacher-student relationship is perceived as weak, leading to a decline in the quality of learning. Furthermore, the level of professorial supervision is reported to be inadequate, resulting in decreased student engagement throughout the semester and a buildup of course material for exam preparation. Additionally, the reduced level of communication in virtual environments has significantly diminished the frequency of class discussions and question-and-answer sessions, which were previously deemed highly beneficial for learning in face-to-face classes. Consequently, the overall quality of learning has been significantly compromised in virtual conditions. The extent to which students are able to access and engage in communication with teachers directly impacts their level of competence in evaluating academic material. The interaction between students themselves, as well as the relationship established between students and distance education, holds significant importance due to the absence of traditional classroom settings. Students who actively engage with professors in these circumstances tend to exhibit higher levels of satisfaction with the quality of assessment methods employed. This underscores the criticality of formative evaluation and feedback in the context of distance education assessment.¹⁴

In Qorbanpour Lafamajan’s study, another drawback of virtual teaching methods was identified as the lack of interaction and feedback. This deficiency led to a decrease in motivation and comprehensive participation in education, ultimately diminishing the quality of learning.¹⁶

The current study explored the perceptions of students regarding clinical courses. The findings revealed that students perceived the content of clinical courses to be dense and complex. Furthermore, some students reported that virtual exam theory courses did not align well with the course content due to non-attendance conditions. This issue was identified as a significant challenge associated with virtual exams. Notably, professors in the Navid learning system uploaded diverse educational content. However, medical interns expressed that virtual learning cannot replace face-to-face classes, and the quality of virtual learning is inferior to that of face-to-face instruction. Despite this, the type of content provided by professors varied, with some attempting to make the content more engaging than others. The students

recommended that university officials should monitor the quality of the educational content provided more closely. Additionally, in multi-professor courses, some students reported a lack of coordination among professors in designing exam questions, resulting in questions from different sources. The findings from research conducted by medical education researchers indicate that the quality of clinical education is subpar. This inadequacy can be attributed to various barriers and influential variables in clinical education. One significant obstacle is the reluctance of educators to adopt new evaluation systems.¹⁷ Ghorbankhani and Salehi found that effective virtual educators employ a variety of electronic materials to keep students engaged. They also provide opportunities for face-to-face interaction with professors, foster active student involvement, apply a range of teaching strategies, and offer motivation that extends beyond traditional lectures.¹⁸

In this study, most students expressed skepticism about the effectiveness of using logbooks as a formative assessment tool for learning. They also mentioned that it was time-consuming. The unfamiliarity of teachers with the objectives of using logbooks, coupled with some students' misconceptions about the tool's ability to evaluate trainees, has led to its underutilization. This is despite the logbook's high efficiency and low cost. Additionally, the lack of precision in filling out the logbook has further hindered its widespread adoption.¹⁷ The portfolio, as acknowledged by experts, presents certain drawbacks, namely the potential for cheating and plagiarism from peers, as well as the likelihood of someone else completing the assigned tasks on behalf of the student. Conversely, experts also recognize several advantages associated with the portfolio approach. These include affording students ample opportunity to engage in homework assignments, and fostering student participation in activities and homework, particularly when accompanied by effective teacher supervision. Furthermore, portfolios facilitate a more comprehensive understanding of the subject matter and homework activities, while also allowing for flexibility in terms of time and location, catering to a diverse range of students. Additionally, portfolios have been found to alleviate stress and anxiety associated with traditional testing methods.¹⁹

The findings of this study indicate that allocating less than one minute to each clinical and case-based question is highly inappropriate, given their conceptual nature and the need for deeper contemplation. It is advisable to take into account the overall duration of the entire examination, recognizing that certain questions are inherently more challenging while others are relatively easier. By considering the total time available, the surplus time from the easier questions can be utilized for the more intricate ones that demand greater cognitive effort. Conversely, if a fixed time limit is imposed on

each question, it would disadvantage the students. The embedded countdown timer in the black-board based online assessment was identified by students as an additional source of stress, a factor not present in traditional paper exams. Furthermore, students reported poor time management during online exams. A high incidence of misinterpretation of questions displayed on the screen was also reported, which can be partially attributed to the inability to underline or highlight key words within the question.⁹

This study reveals that a majority of students expressed their perception of virtual clinical exams as challenging and conceptually demanding. This difficulty arises from the nature of case-oriented questions, which require a deep understanding of the subject matter. Furthermore, the answers to these questions are not easily memorized, making cheating during such exams highly improbable.

The course theory section predominantly comprised multiple-choice questions, a format favored by students. This type of question is deemed appropriate for virtual clinical exams, alongside descriptive questions that require concise responses. Students appreciate having sufficient time to compose their answers, particularly in ranking questions. Consequently, the inclusion of such questions after the multiple-choice section is deemed acceptable. Klûfa stated that multiple-choice questions have some advantages in the test. For example, it is easier to provide scoring reliability in crowded groups with these quizzes, and the ability to include a large number of items allows it to cover important content in the subject area with high content validity. Especially in mass exams where thousands (sometimes tens or hundreds of thousands) of students take the same test. Simultaneously, multiple-choice questions are considered to be the most reasonable, reliable, and cost-effective type.²⁰ Multiple-choice activities and tests, when aligned with the principles of good feedback, can be an effective online strategy to support student learning and independence.⁹ One of the disadvantages of multiple-choice questions is that students who do not know the correct answer may guess the correct answer. Low-quality multiple-choice questions need to be removed before testing. An effective way to improve the quality of multiple-choice questions is to train teachers in the design of such questions.²¹

Limited number of students expressed the view that the implementation of webcam surveillance in their homes would facilitate the regulation of exam conditions, thereby reducing the likelihood of academic dishonesty, such as cheating and the use of unauthorized materials. Conversely, the majority of participants maintained that the sheer volume and complexity of the exam questions, coupled with the limited time allotted for completion, precluded the possibility of cheating. Surveys suggest that most students perceive that instances of academic dishonesty are more prevalent in online courses, and that

these courses provide an easier environment for cheating to occur. Before enrolling in an online course, it's crucial to thoroughly evaluate the assessment methods.²² In a study conducted by Josien et al, 256 students and 52 instructors were surveyed using 16 different scenarios. The findings revealed a discrepancy in perceptions: while instructors viewed home exams as an individual effort, students considered them a collaborative task to be undertaken with their peers.²³ In a study conducted by Chen et al, they surveyed 25 faculty members and 257 students regarding the validity of online exams. The findings revealed that a significant majority, with 80% of teachers and 98% of students, expressed doubts about the accuracy of scores from online exams.²⁴

The current investigation revealed that all participants held the belief that limiting exams to one question per page did not serve as an effective measure to mitigate cheating. Rather, it was perceived as a superfluous exercise that consumed valuable time as students navigated from one page to another. Participants advocated for a minimum of ten questions per exam page. Additionally, participants expressed that the randomization of questions was not suitable for case-oriented exams. For instance, questions that began with phrases such as "according to the case presented in the previous question..." were deemed inappropriate. To address this issue, it is recommended that instructors refrain from posing such questions.

Research has proposed various modifications to assessment types and online approaches to combat academic dishonesty. These include the implementation of multiple, brief assessments throughout the course, the use of open book assessments for core courses, and the incorporation of time limits and randomized online questions.²²

Research findings indicate that the randomization of exam questions can be somewhat effective in deterring students from engaging in questionable activities. However, creating completely randomized exams poses a significant challenge for instructors. Utilizing the same exam questions in an unsupervised online learning environment may inadvertently provide students with more opportunities to cheat. This could occur through various means such as sharing exam answers via email, text messages, phone calls, or even by sitting next to each other.²⁵

In the current study, it was found that all participants held the belief that the solution of not allowing the option to return to a previous question is unsuitable, and instead, it is preferable for students to have the opportunity to revisit previous questions. This particular advantage was observed in the context of face-to-face examinations.

Numerous students expressed that the inability to return to previous questions posed the greatest challenge during online assessments, as it hindered their ability to employ their usual test-taking strategies for revisiting

difficult questions. The randomization of question order may have further exacerbated this issue for certain students, as they could potentially encounter the most challenging questions at the outset of the examination. This, in turn, negatively impacted their self-confidence and time management skills.⁹

All participants in this study expressed the belief that the extensive number of clinical courses necessitates a more comprehensive approach to assessment in order to ensure that all subjects are adequately covered and that the overall quality of learning is not compromised. The reliance solely on summative assessment was deemed burdensome and anxiety-inducing due to the sheer volume of questions and extensive content. Consequently, all participants advocated for the implementation of formative assessment methods, specifically endorsing the use of multiple elimination exams for large-scale clinical courses. The smaller scope of each exam was perceived to facilitate easier and faster learning. Furthermore, the reduced number of questions in such exams alleviated the stress associated with examinations. In addition to elimination exams, voluntary conferences, question and answer sessions, and class assignments were also identified as effective tools for enhancing learning outcomes. In Rezaei's study, it was found that relying solely on one method of assessment for virtual exams can compromise the validity of the evaluation. Therefore, it is essential to employ multiple (or combined) methods to accurately assess what learners have acquired.¹⁹ Given that students are engaged in distance learning where the potential for interaction is limited, it is reasonable to expect that formative assessment would take on a more significant role in this educational setting.¹¹ In summary, the elements of "monitoring" and "feedback", which are integral to formative assessment in distance education, gain increased importance. Feedback can be viewed as the primary mechanism for communication and interaction between students and teachers.¹¹ The findings suggest that homework is the most frequently utilized assessment tool, and students generally express satisfaction with the quality of the assessment methods.¹⁴

Formative assessment is often regarded as a crucial instrument that can shape curricula to optimize learning outcomes.²⁶ From the viewpoint of first-year medical students, the combination of online formative assessment tests and online classes is seen as a valuable educational endeavor. This approach provided students with valuable feedback on their learning progress and motivated them to delve deeper into their studies. It also helped them identify areas of weakness in their learning, thereby encouraging them to further their studies.²⁷

Conclusion

This study examines the experiences of medical students in utilizing virtual assessment during the covid-19 pandemic.

The study addresses various challenges encountered, such as issues pertaining to internet infrastructure, the compatibility of virtual course content and questions, limited communication between teachers and students in virtual settings, and factors related to question design. These factors include the abundance of virtual clinical questions, time constraints for the virtual clinical questions exam, the difficulty level and type of exam questions, as well as monitoring measures and strategies to mitigate cheating in the virtual exam system. Psychological factors, such as heightened stress resulting from infrastructure problems during the virtual exam, the tranquility of the home environment, and the location of residence for the virtual exam, are also considered. Additionally, the study explores the impact of relying solely on virtual summative assessment on learning efficiency, and suggests that incorporating formative assessment alongside summative assessment may enhance learning outcomes.

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Competing Interests

Authors declare no conflict of interests.

Ethical Approval

The Ethics Committee of Smart Medical University verified this study (Ethical approval ID: IR.VUMS.REC.1400.014).

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