

# Medical Students' Perceptions of E-assessment: Multiple Choice Questions used as a Tool of Assessment for Preclinical Years

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## Abstract

**Background:** Assessments and examinations judge the learning capabilities and test the knowledge and skills that students have acquired during their academic courses. The general paper-pen exams are now slowly being replaced by online testing system. This online assessment is now widely used in medical colleges in western countries and is slowly being introduced in Middle East countries as well. The objectives of the present study were to assess medical student's perceptions on multiple choice questions (MCQs) based E-assessment and to analyze the strength and weakness of the online assessment method.

**Methods:** The study was done on 280 year 2, 3, and 5 students of Oman Medical College (OMC). A 23-item questionnaire that addressed different variables associated with attitudes, perceptions, user comfort factors and type of questions used for assessment about using online examinations was employed. Data were analyzed using the SPSS software.

**Results:** We included 125 (44.6%) students from 2<sup>nd</sup> year, 110 (39.3%) from 3<sup>rd</sup> year, and 45(16.1%) students from 5<sup>th</sup> year. The survey looked upon the four main domains about the use of online exams using multiple choice questions (MCQs): 1. Affective factors, 2. Validity factors, 3. Practicality, and 4. Reliability and Security. Most medical students were comfortable with the online assessment mode. They perceived that the use of MCQs was sufficient to test knowledge during their course. A major theme of concern was technical problems and security issues.

**Conclusion:** Our survey indicated that most students preferred MCQs based E-assessment. However it is evident that the exam system needs to be improved in areas of preparation of well-constructed MCQs, its reliability and validity, practical and technical problems and also regarding the security of the exam system to prepare medical students global competent.

**Keywords:** E-ASSESSMENT, UNDERGRADUATE MEDICAL COURSE, WELL-CONSTRUCTED MULTIPLE CHOICE QUESTIONS

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## Introduction

The teaching and assessment of medical students has always been a challenging process. Assessment of gained knowledge is always a challenge to teachers and examiners. Students'

assessment, either formative or summative has always played a key role at undergraduate and postgraduate levels to evaluate competence and ensure quality in medical education.

Although the term assessment was first introduced during the times of Hippocrates, it was in 1956 that Bloom gave the scientific explanation of assessment. During the past decades from 1965 to 1995 tremendous work had been carried out in field of education to introduce new and innovative methods of

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students' assessment with major emphasis on acquisition of skills (1). Miller introduced pyramid of educational objective (2), which in conjunction with Bloom's taxonomy for cognition (3) provided the basic frame work for scaffolding the new educational system in field of medicine in 1990s.

An ideal assessment method is reliable, valid, cost effective, feasible and acceptable to students, teachers and has good educational impact. No single method of assessment is ideal; every method of assessment has some strengths and weaknesses. Medical educationists' all around the globe are trying to find new and more reliable means of assessing students' knowledge level and critical thinking competencies.

Assessment also serves as an important feedback to the teachers through which they analyze whether the educational outcomes of any particular course are achieved or not. The main objective of the assessment is not only to increase students' learning and evaluate students' level of competency but to guide stakeholders in the field of medical education to analyze weaknesses and shortcomings in students' education and assessment outcomes. Also for the teaching faculty, computer based assessments have bloomed into the educational system and save time and facilitate assessment analysis especially when the students cohort is large, compared with the paper-based formative assessments.

Computer based testing (CBT) is not just an alternative method for delivering examinations. It represents an important qualitative shift away from traditional methods such as paper based tests. CBT was introduced to the US medical licensing exam in 1999, primarily to address concerns about the security of material with the paper test. It has several advantages, including the delivery of high quality images that can be used in questions, statistical analysis of student performance and question quality, automated assembly of tests, and include patient management simulations. The general paper-pen tests/exams are now

slowly being replaced by online internet based testing system. Online assessment is currently dominated by closed answer type questions (multiple choice questions [MCQs]) and is usually used to assess applied knowledge. This online assessment is now widely used in medical colleges in western countries and is slowly being introduced in the Middle East as well. Assessments always need further improvement for better preparation of medical students for their future role as physicians. (4) The purpose of this study was to explore:

- The perception and feedback of the students who are being exposed to online exams.
- Whether this type of assessment has improved the learning pattern and understanding of the subject.
- Whether this type of assessment aids in improving their performances in exams.

## Materials and Methods

The study was conducted among year 2<sup>nd</sup>, 3<sup>rd</sup> and 5<sup>th</sup> year, and students of Oman Medical College. The students in the study group were primed about objectives. Informed consent was obtained from the students by disclosing that the data collected was for research purposes, their responses would be confidential, and that their participation in the study will be voluntary. The perception and attitude of the OMC medical students towards online assessment was assessed using a Structured Questionnaire of 23 items which were pooled from scales by John Dermo (5) and Rajendra Kumar (6). The items were rated on a 5-point Likert scale. The questionnaire addressed different variables associated with attitudes, perceptions, user comfort factors and type of questions used for assessment with regard to using online examinations.

Data were analyzed using the SPSS software. Descriptive statistics was used to present data.

## Results

280 students took part in the survey and all

the students were from the preclinical years. These included 125 (44.6%) students from 2<sup>nd</sup> year, 110 (39.3%) from 3<sup>rd</sup> year and 45 (16.1%) students from 5<sup>th</sup> year. All the students have been giving their exams through online computer based exams with multiple choice questions as the primary mode of assessment. The survey looked upon the four main domains about the use of online exams using multiple choice questions. The questionnaire consisted of a series of Likert-type questions scored on 5-point scale ranging from 1 (strongly agree) to 5 (strongly disagree).

The four main domains of the study were as follows:

1. Affective factors; i.e. about how students feel about online exam associated stress, and anxiety.
2. Validity; i.e about the use of multiple choice questions as a tool of assessment in online exams.

3. Practicality; any practical challenges that students face while using computer based method.

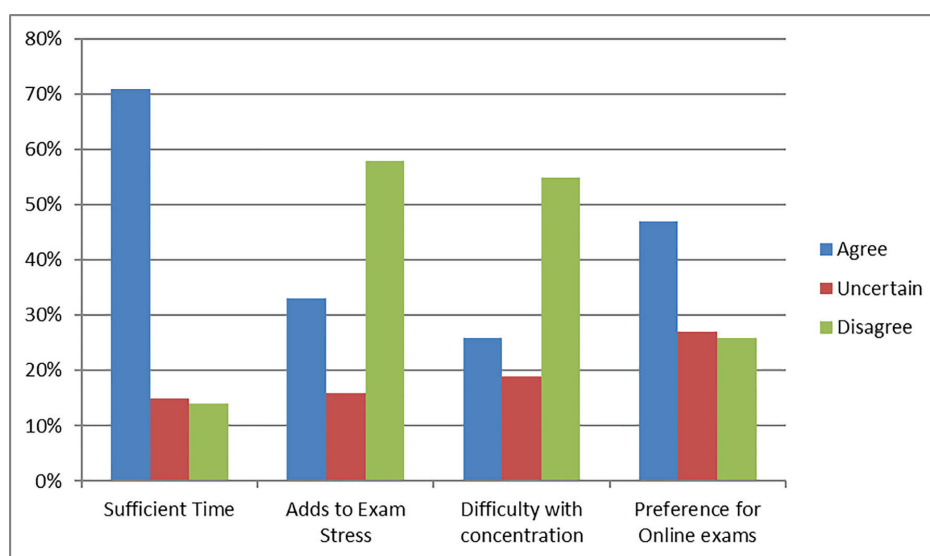
4. Reliability and security; Student's views on the reliability or security of online exams. Results presented in Table 1 and Figure 1 based on the four main domains studied. The data indicates the percentage of students who agreed, disagreed, and were uncertain.

According to Table 1, regarding affective factors i.e how students felt about the online examination; most students have given positive responses. That means they are comfortable in using computers for doing their E-assessments. From Table 2, regarding validity factors i.e about the use of MCQs as a tool of assessment in online exams, most students have given a positive response.

Most students perceived that it is easier to score marks (59%), it is not just mere recall of answer but also allows for critical thinking

**Table 1.** Affective Factors regarding online exams

Sl. no	A. Affective factors (n=280)	Agree	Uncertain	Disagree
1.	Online exams give sufficient time to answer and finish the exam.	71%	15%	14%
2.	Using a computer adds to the stress of the exams.	33%	16%	58%
3.	I find it hard to concentrate on the questions when doing online exam.	26%	19%	55%
4.	I would rather do exams on a computer than on a paper because I am used to working online.	47%	27%	26%



**Figure 1.** Affective Factors regarding online exams

**Table 2.** Validity of multiple choice questions

Sl. no	B. Validity Factors- (n=280)	Agree	Uncertain	Disagree
1.	Multiple choice question type of E-assessment is easier to score marks for my subject.	59%	25%	16%
2.	My subjects are too complex to be dealt with by online multiple choice questions.	21%	27%	52%
3.	Online exams don't just test knowledge of subject but IT skills as well.	21%	23%	56%
4.	MCQ type of E-assessment is just mere recall of answer; it does not allow me for critical thinking.	18%	20%	62%
5.	The potential for immediate feedback with online exams could help me learn.	60%	26%	14%
6.	MCQ based E-assessment can add value to my learning.	54%	31%	15%
7.	MCQ based E-assessments sufficient for UG medical course.	55%	30%	15%

(62%), immediate feedback help them to learn (60%), and it can add value to their learning (54%). They also think MCQ-based assessment is sufficient for UG medical courses (55%). 27% of students were uncertain about the use if MCQs as a tool of assessment. Only around 16% of students disagreed on the use of MCQs as a tool of assessment.

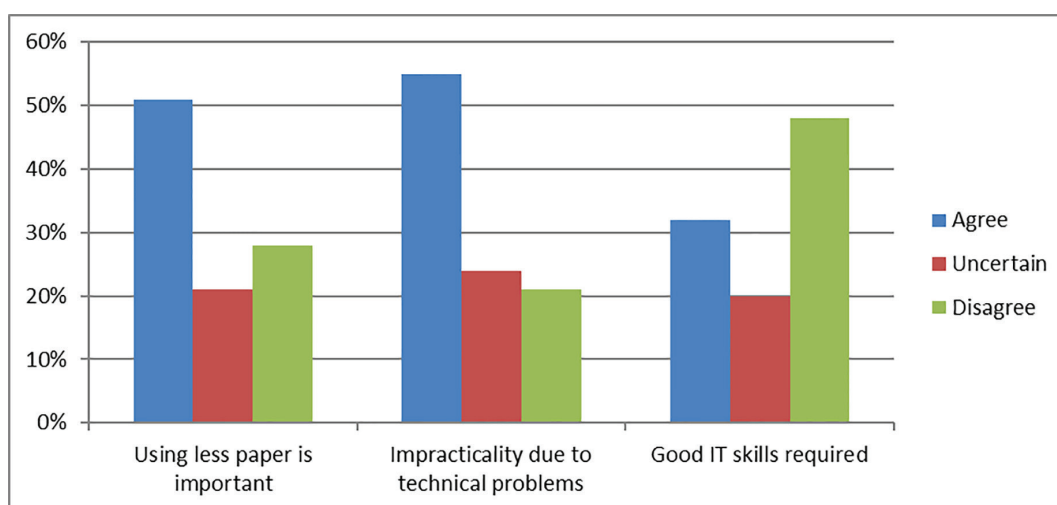
According to Table 3 and Figure 2 that assesses practicality, most students (51%) think online exams use less paper which was important to

them. 55% of the students agree that technical problems make the exams impractical. 48% of students disagreed that IT skills would help them to do online exams easier and faster but 32% of the students agree that IT skills has helped them to do online exams easier and faster.

According to Table 4 on reliability and security, 47% students agreed that online exam was as secure as paper-based assessment, 34% of the students were uncertain, and 19% disagreed.

**Table 3.** Practical issues of online exams

Sl. no	C. Practicality- (n=280)	Agree	Uncertain	Disagree
1.	Online assessments use less paper which is important to me.	51%	21%	28%
2.	Technical problems make online exams impractical.	55%	24%	21%
3.	Good IT skills will help me do online exams easier and faster	32%	20%	48%


**Figure 2.** Practical issues of online exams

**Table 4.** Reliability and Security of online exams

Sl. no	D. Reliability and Security (n=280)	Agree	Uncertain	Disagree
1.	Marking / evaluation is more accurate because computers don't suffer from human error.	71%	10%	19%
2.	Online exams are fairer than paper based exams as no one can manipulate it.	63%	21%	16%
3.	Online assessment is just as secure as paper based assessment.	47%	34%	19%
4.	I am confident that my grades for online assessment are secure.	61%	23%	16%
5.	It is easier to cheat online exams than paper based exams.	9%	18%	73%
6.	The online exam is vulnerable to hackers.	31%	44%	25%
7.	Username and password login provide adequate security for online exams.	72%	19%	9%

61% students think their grade is secure in online assessment.

73% students disagreed that it is easier to cheat in online exams than with paper-based exams. 44% of the students were uncertain that online exam system was vulnerable to hackers, though almost equal number of students agreed (31%) and disagreed (25%) on this issue. 72% of the students think username and password login could provide adequate security for their exams. 19% of the students were uncertain and 9% disagreed.

## Discussion

The findings of the study showed that MCQ-based E-assessment was very well received by our students. For an assessment to be effective, there are a number of issues to be considered. The reliability and validity of an assessment is vitally important. A reliable assessment will provide consistent results if applied to equivalent cohorts of students. MCQs benefit from high reliability when questions are valid (7).

With the increasing development in the IT field in recent years, most of the students are being exposed to computers and gadgets in their early years. Many institutions are now following the E-learning method of teaching. The trend towards technology enhanced education/classrooms has escalated quickly especially during the past five years as students have become increasingly tech savvy. Research has shown that students' perception toward

the use of technology in education is positive and meaningful (8). Although course delivery methods across colleges and universities have evolved with the use of technology; assessment methods are often traditional paper-based examinations. Most of our students have given positive response regarding use of computers for their exams. Similar perception of students is also observed in other studies (5,9). However some students are uncertain about the views of online exams, maybe because they have given an exam online for the first time. In one of the study it was shown that more students stated preference for E-assessment after their first experience (10). Studies conducted have shown a trend of preference for E-assessment over paper-based assessment (11). Compared to paper-based MCQs, the use of online based E-assessment can significantly reduce the burden associated with testing large student cohort (12).

MCQs are very popular for the evaluation of undergraduate medical students. They are reliable and valid; moreover, they are easy to administer to a large number of students. Most of our students had given positive response towards the use of MCQs for their assessment. They feel their subjects are not too complex to be dealt with MCQs and at the same time they think is sufficient for undergraduate medical course. Most of them felt it is easier to score marks. Keeping this in mind it is important to know how to prepare well-constructed MCQs that have a greater ability to test knowledge and not just the factual recall of answer. MCQs



are less powerful in assessing the problem solving skills of the students. The advantages are that a large portion of the curriculum can be tested in a single sitting and the scoring is easy and reliable using computer (13-16).

A major disadvantage of MCQs is that they are often poorly written in a way that test memory recall of independent facts occurs rather than the application of knowledge (15). However, writing MCQs that evaluate application of knowledge can be challenging and most faculties are not formally trained (17); therefore, making it difficult to develop test questions that require application and critical thinking skills. This lack of training results in development of basic recall MCQs administered to students to assess their learning, whereas faculty should develop application of MCQs that require students to think through a series of steps and use their knowledge/learning in order to properly answer the questions (18).

An important part of assessment is a way of promoting student learning by providing the students with feedback, normally to help improve their performance (19). If assessment and in particular feedback can be applied properly, it can make a great contribution to effective learning (20). In this study most students felt that immediate feedback had helped them in learning and also online assessment had added value to their learning. Hence one of the main benefits of E-assessment is that it enables feedback to be delivered instantaneously. This provides an opportunity for students to take immediate action to close the gap between their current level of knowledge and a reference point and thus the feedback is effective (21).

There are various methods to assess the knowledge domain which include long essay questions, short essay questions, modified essay questions, MCQs, and problem solving questions involving short vignettes. Some of the studies have said that no single method of evaluation is superior to another and probably a reliable and valid evaluation requires a

combination of these methods (22,23).

It is currently a subject of controversy in the research literature as to whether or not online assessment is associated with higher or lower costs than traditional forms of assessment. Online assessment will enable the savings of certain costs (for example printing cost and paper cost) but will incur its own unique set of costs (software costs) (24,25). Although it is a onetime investment. Online assessment is currently conducted in computer-aided learning rooms. Regulation and authentication systems have become more secure and sophisticated that exams can be conducted even for remote and distant students with significant savings (26). According to our study most students thought online exams save paper which is important to them.

Another practical challenge is technical problems that make online exams difficult to conduction. Most (51%) students in this study agreed and 24% of them were uncertain about this issue, maybe because they were given additional time to complete their exams and so they might not worry about it until and unless their grades are affected by this problem. Technical problems which make online exams impractical are computer glitches, contact error, computer or server crashes, unable to login to the exam site and also internet connectivity (27,28).

Regarding good IT skills required to do online exams, 32% of our students agreed that IT skills helped them to do online exams easier and faster, though most of them disagreed on this. Some studies and surveys have indicated a preference for online assessment over paper-based assessment (29).

Online security has become more important in all walks of life and it is clearly of vital importance when it is used for assessment purposes. Online examinations are reported to be more vulnerable to academic dishonesty and authentication attacks due to lack of physical interaction (30). Recent studies indicate that unethical conduct have intensified in online learning due to uncontrolled environment for

cheating in the online examinations as a result of use of technology and the internet. Lack of security may be caused by physical setting; large screen offers obvious temptations to candidates who might cheat. Measures are to be taken in data analysis that enable assessors to see if the candidates who consistently gave the same wrong answers to questions were located closely to each other in the examination hall. In our study 73% of students disagreed that it is easier to cheat on online exams than paper-based exams, mainly because physical arrangement and the system adopted in computers in the examination hall. Most of our students were uncertain about online exam being vulnerable to hackers but 72% students believe that username and login password could provide adequate security. Student's authentication in online examination has been an active research area and a number of authentication procedures have been evolved overtime to ensure secure authentication.

It is also important that these results should be interpreted with awareness of some of the limitation of the study design especially due to random sampling of the students. Students' views on assessment mechanisms may sometimes be at variance with the published literature, their perceptions influence the acceptability of an assessment tool (31). However fairness of the students, objective testing of knowledge, the capacity of students to respond in electronic mode and the possibility of online impression and cheating are significant challenges for E-assessment research and practice.

## Conclusion

From the current study it is found that students are in favor of MCQ-based E-assessment. E-assessment has many advantages as it can be used for large cohort of students and students from distant places with cost effectiveness. Large portion of the curriculum can be covered. Exams can be smoothly conducted even in institutions with less faculty

members, as burden of correcting bundle of papers making results sheets and uploading it manually will not be an issue with exams on online. However certain issues like validity and reliability of MCQs, practical technical problems and security of the online system needs to be addressed. It is suggested that the use of well-constructed peer-reviewed MCQs or combination of assessments can be incorporated in computer system with advanced technology to help medical students prepare better for any competitive exams globally.

**Study Limitation:** The result cannot be generalized as this study is conducted in one medical college and only for preclinical years. Further research is required in clinical year students and at different medical colleges at different level in a larger sample size.

## Conflict of Interest

The author declares no conflict of interest.

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