



# EFFICIENCY & EFFECTIVENESS OF INTERNET BASED TESTING OVER PAPER BASED TESTING

## A CHANGING SCENARIO OF EXAMINATION PATTERN

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**Abstract:** This paper aims to compare the effectiveness and efficiency of conducting online examinations with traditional pen and paper assessments. With the shift towards online education, the need to evaluate the effectiveness of online examinations as a mode of assessment has become increasingly important. This study analyses the impact of online examinations on student performance compared to traditional pen and paper assessments. It also examines the time and resources required to conduct both modes of assessment and their impact on student engagement and participation. The findings of this study suggest that online examinations can be more efficient and cost-effective than traditional assessments, but there are also potential drawbacks such as the need for technology infrastructure and the potential for cheating. The study concludes with recommendations for educators on how to effectively conduct online examinations and integrate them with traditional assessments to maximize the benefits of both modes of assessment.

**Index Terms -** Technology Acceptance, E-Learning, Online Examination, ICT in Education, Benefits & Challenges in Online Examinations, Online Testing Effectiveness.

### 1. INTRODUCTION TO THE ERA OF ONLINE EXAMINATION

Education has always been conceived as a tool to promote national development as well as international understanding. Education is a key factor determining a nation's progress. The quality of knowledge society depends on the quality of education. In the whole educational system, Evaluation plays an important role in the process of teaching and learning. Examination is an instrument to test what the student has learned and retained in his mind during course of study. Examination are integrated part of our educational system. With the technological revolution, the electric media is replaced by the digital media or ICT and virtually every aspect of human behaviour or activity is in some way or another dependent on the new computer technologies (Dr. Anurag Sankhian, 2013).

The advent of technology has steadily digitized all services and offerings, taking them to the online platform, and education has been no exception. With the ubiquitous high-speed internet and laptops, the pervasiveness of technology has enabled a seamless transition to the online ecosystem. Universities, schools and various educational institutions have progressed and adapted to Learning Management Systems (LMSs), where software applications track, report, administer and document materials within seconds. This teaching and evaluation system facilitates a balanced approach toward imparting knowledge and easy grading of the candidates through advanced technology. Liaqat Ali and Nidal Abidal Hamid Hmoud Al Dmour (2021): Tools used for conducting online assessments have also begun to popularize. Tools such as Blackboard Learn, and Lockdown Browser are being used to allow students to perform examinations at home. Tools used for conducting online assessments have also begun to popularize. Tools such as Blackboard Learn, and Lockdown Browser are being used to allow students to perform examinations at home (Liaqat Ali and Nidal Abidal Hamid Hmoud Al Dmour, 2021).

The era of online examination marks a significant shift in the way exams are conducted. Online examination refers to the process of taking exams using a computer or other electronic devices with an internet connection. This mode of examination has gained popularity in recent years due to its convenience and cost-effectiveness. Online examinations are conducted using various software tools and platforms, which can be accessed from anywhere in the world. This mode of examination eliminates the need for physical presence in the exam hall, saving time and money for both students and institutions. The online examinations were accepted with ease and low pressure in comparison to regular examination and the gender has a significant role in adopting online education with the observations that female students were more adoptable with online education in terms of assignments, study patterns and comfort (Raj Kishor Bisht, Sanjay Jasola ,Ila Pant Bisht, 2020).

Additionally, online examinations can be easily monitored and administered, ensuring fair and transparent evaluation. Online examinations can be administered in various formats, such as multiple-choice questions, short-answer questions, essays, and more. They can be timed or untimed, and can be proctored or un-proctored depending on the level of security required for the exam. The academic

papers contained in English language journals using key search terms including online assessment, online tests, online quizzes, multiple choice questions and other related aspects, particularly in a higher education context Bopelo Boitshwarelo, Alison Kay Reedy and Trevor Billany (2017). Overall, the era of online examination represents a significant shift in the way exams are administered and is likely to become increasingly prevalent in the years to come.

## 2. OBJECTIVES OF THE STUDY

- To analyze the various types and common ways of conducting online exams at universities, schools & colleges
- To evaluate the reasons to choose online-based exams over traditional pen-and-paper-based tests
- To examine the benefits and challenges of conducting online examinations and the strategies to improve the efficiency & effectiveness of conducting online examinations

## 3. NEED FOR ONLINE EXAMINATION

As teaching pedagogy continuously adapting to the needs and requirements of digital natives, and testing is generally conducting in the same, antiquated paper-and-pencil way. While oral exams outclass written exams from a qualitative point of view, paper-and-pencil exams have no serious advantage over online exams and even hinder the testing of student knowledge properly, particularly if it was acquired via in-class software programs (Gabriele Frankl, Sofie Bitter, 2020).

Online Proctored Examinations (OPE) have been considered one of the foremost online proctoring options that share the features of a real examination hall with a proctor observing examinations remotely (Raghu Raman, Sairam B, Veena G, Hardik Vaccharajani and Prema Nedungadi, 2021). According to the results of a survey conducted in the literature, today's students prefer online exams to paper exams (68.75%). Among the reasons given for preference is the increased speed and ease of editing responses, with one study showing that two – thirds (67%) of students reported a positive experience of taking online exams (Egor Borisov, et al. 2020).

Security in online examinations is a critical need among educators. Increasing learning demands, the rise of Internet usage, high cost of running face to face examinations, and the need to provide students with immediate feedback, have all together brought about a paradigm shift. This shift from traditional pen and paper to the adoption and use of online examinations makes the examination accessible at any time, on any smart device, and from anywhere (Said Ally, 2022). There are several reasons why online examinations have become increasingly necessary in recent times:

- **Convenience:** Online exams provide convenience to both students and instructors. Students can take exams from anywhere with an internet connection, without the need to travel to a physical location. Instructors can also create and grade exams from anywhere, eliminating the need to collect and transport physical papers.
- **Efficiency:** Online exams can be automatically graded, which saves time for instructors and provides immediate feedback to students. This also reduces the likelihood of errors in grading.
- **Accessibility:** Online exams are more accessible to students with disabilities who may require accommodations such as enlarged fonts or text-to-speech software.
- **Cost-effectiveness:** Online exams can save money by eliminating the need for physical exam papers, printing, and transportation costs.

Overall, online examinations offer a flexible, efficient, and secure way to assess student learning and provide feedback in a way that is convenient for both students and instructors.

## 4. TYPES OF ONLINE EXAMINATIONS

According to Dr. Elif ÇELİK and Asst. Prof. Gülsah ÖZDEMİR BAKI, (2022), When the studies on distance mathematics teaching are examined, it is seen that there are two different opinions regarding the online realization of mathematics lessons. While the first view argues that conducting mathematics courses completely online is as effectual as face-to-face teaching, the second view argues that it is not possible to conduct mathematics courses completely online in an effectual teaching process. With online examination system, students should practice questions on the own, conduct examination online and see their result instantly which will save the teacher a lot of time and energy in conducting examination manually (Raghu Raman, Sairam B, Veena G, Hardik Vaccharajani and Prema Nedungadi, 2021).

An internet-based exam is easier for Lecturers to manage the exam process, maximize internet resources available and increase the effectiveness of time and cost (T Wahyudi, W Warijan, S Suyanta, 2020). With advanced proctoring and custom exam solutions, it is now possible to host a variety of exams using the online mode. A few of the prominent online exam types include:

- Semester and entrance exams for educational institutions
- Coding/programming assessments
- Aptitude tests and personality profiling
- Video interviews and viva
- Mock practice tests
- Image-based or media-based online exams
- Open-book tests
- Competitive exams and contests.

## 5. COMMON WAYS OF CONDUCTING ONLINE EXAMS AT UNIVERSITIES, SCHOOLS & COLLEGES

Online examinations are an integral component of many online learning environments and a high-stake process for students, teachers and educational institutions. They are the target of many security threats, including intrusion by hackers and collusion. Collusion happens when a student invites a third party to impersonate him/her in an online test, or to abet with the exam questions. A profile-based challenge question approach to creates and consolidate a student's profile during the learning process, to be used for authentication in the examination process (Abrar Ullah, 2016).

- **Multiple-choice exams:** These exams require students to choose the correct answer from a list of options.
- **Essay exams:** These exams require students to write an essay in response to a prompt or question.
- **Short-answer exams:** These exams require students to provide a brief answer to a question or prompt.
- **Matching exams:** These exams require students to match items from one column to items in another column.
- **True/false exams:** These exams require students to identify whether a statement is true or false.
- **Fill-in-the-blank exams:** These exams require students to fill in missing words or phrases in a sentence or paragraph.
- **Performance-based exams:** These exams require students to perform a specific task or demonstrate a skill, such as programming or playing a musical instrument.

➤ **Interactive exams:** These exams use interactive technology, such as simulations or games, to assess student learning.

Overall, the choice of online exam type depends on the subject matter being tested, the learning outcomes being assessed, and the technology available for administering the exam.

## 6. REASONS TO CHOOSE ONLINE-BASED EXAMS OVER TRADITIONAL PEN-AND-PAPER-BASED TESTS

Summative assessments are a significant part of academic studies on all levels to evaluate student learning at the end of the instructional unit. Traditional summative assessments are predominantly pen and paper-based, closed-book, invigilated, and strictly time-constrained exams. Where, online examinations are an integral component of many online learning environments and a high-stake process for students, teachers and educational institutions (Kiran Fahd, Sazia Parvin, et. al., 2021). They are the target of many security threats, including intrusion by hackers and collusion. Collusion happens when a student invites a third party to impersonate him/her in an online test, or to abet with the exam questions. A profile-based challenge question approach to creates and consolidate a student's profile during the learning process, to be used for authentication in the examination process (Abrar Ullah, 2016).

Table 6.1: Descriptive Comparison between Online & Offline Exam

Description	Online Exam	Offline Exam
Method	Digital tools and methods	Traditional tools and methods
Place	Virtual screens	Physical classrooms
Feasibility	Cost-effective and saves time	High financial cost and time consuming
Flexibility	Online classes have a flexible schedule	Offline classes have a fixed and strict schedule
Communication	Digital	Face-to-face, interpersonal
Approach	Facilitated, asynchronous approach	Instructional, synchronous approach
Pace of Learning	Student-determined	Teacher-determined
Level of Commitment	Students are less serious and committed to their studies	Students are more serious and committed to their studies

## 7. BENEFITS OF CONDUCTING ONLINE EXAMINATIONS

According to the study Online testing is a popular practice for tertiary educators, largely owing to efficiency in automation, scalability, and capability to add depth and breadth to subject offerings (Albert Munoz and Jonathon Mackay, 2019). Online Evaluation forms an integral and important part of online learning, but, there has been limited implementation of online invigilated examinations (Sarika Dhupar and Dr Aabha sharma, 2020).

- **Reduced logistical hassle:** Online exams help overcome the challenge of setting up physical test centres, minimizing resource requirements – time, cost of setting up, and the need for human proctors –speeding up the examination process. Online exams accelerate the admission process in universities, where applications can be screened with minimal resources. The idea of conducting semester exams and various assessments online lends ease and seamless efforts to the entire process.
- **Accessibility to remote locations:** Online exams have broken geographical barriers and enabled wider reach and participation. Global assessment solutions train universities and education sectors, allowing them to efficiently conduct assessments. In addition, institutions and students can enjoy incredible accessibility and reach with only an internet connection and devices.
- **High scalability:** Online exams can cater to a broad audience and easily manage vast content. Considering this feature, educational institutions facing a scarcity of time would find it highly convenient to conduct examinations with the least bandwidth wastage. Merely a computer with an active connection and a webcam to take tests makes this possible.
- **Exhaustive skill and question banks:** Advanced online examination test platforms have an exhaustive library of competencies and sub-competencies, carefully mapped to relevant questions. For ease of use, examiners can choose the relevant skills they wish to test via the exam to frame the questionnaire. This saves examiners' time and effort.
- **Auto-graded reports:** Automated reports do away with human intervention and save notable working hours. A report is a comprehensive approach to a candidate's performance, with a question-wise and section-wise summary of the attempt, time taken and the difficulty level. Detailed reports are also helpful for students seeking career guidance. With the reports, they better understand their competencies.

## 8. CHALLENGES OF CONDUCTING ONLINE EXAMINATIONS

While there are many benefits to conducting online exams, there are also several challenges that educators, educational institutions, and students may encounter. Due to the Corona Pandemic, paper-based examinations had to be transferred to an online format on short notice that faced two major challenges redesigning examinations: 1) avoiding unnecessary stress to students' working memory by choosing a simple examination design and 2) minimizing the possibility of cheating (Keimer, Imke; Agnesens, Tatiana; Kuechler, Carsten, 2022).

Despite of several efforts, the primary problem of the students experienced during online examination was poor internet connectivity. This results in delayed loading of diagrams in questions, and longer time required uploading answer script in the Google Form. Despite the challenges they experience during Movement Control Order (MCO) and majority of students were not ready, all PPST students show excellent dedication and enthusiasm in participating in their first online examination (Ayu Afiqah Nasrullah , et. al., 2021). Some of the encountered challenges include:

- **Technical issues:** Technical issues such as internet connectivity problems, computer malfunctions, and software glitches can disrupt the exam-taking process and lead to frustration for both students and educators.

- **Cheating:** Cheating can be a significant concern with online exams. Students may be tempted to use unauthorized resources or collaborate with others during the exam, making it challenging to ensure academic integrity.
- **Security concerns:** Online exams can be vulnerable to security breaches, such as hacking, phishing, or identity theft, which could compromise student data and exam integrity.
- **Limited question types:** Online exams typically have limited question types, which may not be suitable for assessing certain skills or knowledge areas.
- **Lack of engagement:** Online exams can feel impersonal and may lack the engagement and motivation provided by face-to-face exams. This could result in reduced student performance or lower levels of student satisfaction.
- **Access and equity:** Online exams require access to technology and reliable internet connectivity, which could be a challenge for students who lack these resources. This could lead to issues of equity and fairness in assessment.

Conclusively, while online exams offer many benefits, there are also several disadvantages or challenges that need to be addressed to ensure that online exams are a fair, accurate, and effective means of assessing student learning.

## 9. STRATEGIES TO IMPROVE THE EFFICIENCY & EFFECTIVENESS OF CONDUCTING ONLINE EXAMINATIONS

Online learning can be termed as a tool that can make the teaching–learning process more student-centered, more innovative, and even more flexible. Online learning is defined as “learning experiences in synchronous or asynchronous environments using different devices (e.g., mobile phones, laptops, etc.) with internet access (Shivangi Dhawan, 2020). Likewise, Online examination had gained vast importance in the education system over the past decade that is triggered by intense research on the field and advanced technology development. In the past decade, online exams were conducted using various online means, without being the only option to evaluate the students. (Ahu Genis-Gruber and Gerold Weisz, 2022).

There are several strategies can be followed to improve the efficiency and effectiveness of conducting online examinations, such as:

- **Choose the right online exam platform:** The choice of online exam platform is critical to the efficiency of online exams. Look for a platform that is reliable, easy to use, and provides the features and functionality required to meet your assessment needs.
- **Streamline the exam process:** Streamline the exam process by automating tasks such as grading, results reporting, and feedback delivery. This will save time and reduce administrative burden.
- **Provide clear instructions:** Providing clear instructions to students on how to access the exam, navigate the exam platform, and submit their answers will help reduce confusion and streamline the exam process.
- **Ensure exam security:** Implement security measures such as secure login, time limits, and anti-cheating software to ensure the integrity of the exam and prevent cheating.
- **Conduct a pilot test:** Before administering an online exam, conduct a pilot test to identify any technical issues or challenges that may arise during the exam. This will help you address these issues in advance and ensure a smooth exam experience for students.
- **Provide technical support:** Provide technical support to students to help them troubleshoot any technical issues they may encounter during the exam.
- **Monitor the exam:** Monitor the exam in real-time to ensure that students are progressing through the exam smoothly and to identify any issues that may arise during the exam.

By implementing these strategies, you can improve the efficiency & effectiveness of online examinations, reduce administrative burden, and ensure a positive exam experience for students.

## 10. CONCLUSIONS OF THE STUDY

The factors contributed towards the effectiveness and the mitigation strategies to be adopted by educators in facing challenges of conducting lectures, exams, consultations, and assessment via online (Noor Hidayah Azhar, Mohd Farizi Jamaluddin, Dazmin Daud, 2021). The effectiveness and efficiency of conducting online examinations have been studied extensively over the years. Based on the research, the following conclusions can be drawn:

- Online examinations are generally effective in measuring student learning outcomes. They are capable of assessing a wide range of skills, including critical thinking, problem-solving, and analytical reasoning.
- Online examinations are efficient in terms of time and resources. They save time and resources as they do not require physical resources like papers, printing, and storage space.
- Online examinations are vulnerable to cheating, and this can undermine the effectiveness of the assessment. Cheating can occur through various means such as plagiarism, collusion, and impersonation.
- Technical issues such as internet connectivity problems, server crashes, and software bugs can affect the efficiency and fairness of online examinations.
- Proper planning, implementation, and management are critical to the success of online examinations. Institutions must have reliable infrastructure, well-trained personnel, and appropriate assessment strategies to ensure that online examinations are conducted effectively and efficiently.

## 11. SUGGESTIONS TO FOLLOW WHILE OPTING FOR ONLINE EXAMINATION METHOD

Overall, the effectiveness and efficiency of conducting online examinations depend on various factors, including the quality of the assessment, the reliability of the technical infrastructure, and the adequacy of the security measures in place to prevent cheating. Here are some of the steps to follow while choosing online examination:

- **Choose a reliable proctoring solution:** There are many proctoring solutions available, such as live proctoring, automated proctoring, and hybrid proctoring. Choose a solution that best fits your exam format and ensures the highest level of security.
- **Communicate proctoring policies and procedures clearly:** Before the exam, communicate the proctoring policies and procedures clearly to all the participants. Make sure they understand the consequences of cheating or any violation of the proctoring policies.
- **Verify the identity of the test-takers:** Verify the identity of each test-taker before the exam begins. You can use a government-issued ID, a webcam, or other biometric verification methods.
- **Control the test environment:** Ensure that the test-takers have a quiet and distraction-free environment during the exam. You can use a lockdown browser, which restricts access to other applications or websites during the exam.

- **Monitor the exam in real-time:** Use live proctoring or automated proctoring to monitor the exam in real-time. The proctor should have access to the test-takers webcam, microphone, and screen.
- **Analyse exam data for irregularities:** Use data analysis to analyse the exam data for any irregularities, such as unusual patterns of behaviour or answers. This can help identify potential cheating or other violations of the proctoring policies.
- **Follow-up with test-takers:** After the exam, follow up with test-takers who have violated proctoring policies or displayed suspicious behaviour during the exam.

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