Effectiveness of E-Assessment Tools in Teaching-Learning Process of Higher Education System

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Abstract

In the present scenario of blended learning, it is most needed to have E-assessment approach to evaluate the teaching learning process among learners of higher education. Innovative tools have been evolving with emerging needs of education.

During the pandemic with physical distancing, no contact and restricted movement, people were left with no other option but to accept the process of undertaking learning and evaluating online. With this E-Learning gained momentum, but the Teaching-Learning process had flaws. With technology growing by manifolds, the flaws were also doubling up. To counter this, E-Assessment ensures to reduce the flaws and thus, make the online Teaching-Learning process more efficient and effective.

E-Assessment through online tools like quiz, assignment, surveys from LMS and a few online platforms like Kahoot, Google forms etc., are the most preferred ones. This research paper is focussed on studying the effectiveness of E-Assessment techniques like MCQ, QUIZ etc., from LMS, proctored examinations and other online platforms along with their advantages and difficulties. It is concluded that E-Assessment is the need of the hour and is successful only if all required criteria are satisfied by both examiner and examinee.

Index Terms: E-Assessment, innovative tools, effectiveness, Higher education.

1. Introduction

Online teaching and learning process was introduced to promote distant learners. During the lockdown situation, there was a drift from traditional class room teaching to online mode. Many tools were available for taking online classes, sharing and presenting the content but very meagre awareness was emphasized on evaluation tools.

E-assessment, stands for electronic assessment many a times found in synonym with computer-based assessment, digital assessment or online assessment is basically the method where information and communication technology (ICT) is used in the assessment (Electronic Assessment, 2020). Whitelock (2009) explained that e-assessment is a new approach that can transform higher education. UNESCO (2020) also recommended the use of ICT in delivering traditional assessment formats more effectively and efficiently to measure the latest and soft nuances of modern competencies. Jordan (2011) has specified the importance of considering and evaluating students' perceptions of e-assessment in several domains like awareness, ability, security, validity, teaching–learning, etc.

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"e-Assessment" is the use of digital technologies to create, dispense, evaluate, and deliver feedback for formative, summative, diagnostic or self-assessment Kocdar' (2018). Transition from Traditional to Online Teaching using Innovative Technologies Mamta Thakur (2021) discussed the need and process of transition including online tools to be needed. Osuji (2012) said e-assessment could be hypothesized as the use of ICTs to facilitate the entire assessment process, from the designing and delivering of assignments to marking, reporting, storing the results and/or making statistical analysis. Crisp (2011) used the term e-assessment to refer to all the assessment tasks conducted through a computer, a digital tool and/or the web. Advanced technologies enhanced and e-learning systems has put e-assessment on high demand Brink and Lautenbach, (2011). Geoffrey Crisp (2016) discussed how e-Assessment can enhance student learning outcomes.

This pandemic has forced the educational fraternity to switch onto online mode. For teaching-learning activities, ample awareness was created among the learners and teachers, but flaws were observed in implementation of approaches of e-assessment. With the emerging needs of e assessment different innovative tools were crafted. This paper studies the effectiveness of mostly preferred e-assessment tools in teaching-learning process of higher education system.

2. Methodology

E-evaluation process was not at all easy, as teachers were also not properly trained for the required purpose. Students also faced difficulties in attempting e-test. Later, proper training was provided to both the teachers and learners in accordance with the various e-assessment procedures. Here all possible methods of e-assessment have been discussed. Even drawbacks of certain most preferred methods are dealt in detail.

Types of e-assessment with Examples

There are different types of e-Assessment, which are framed on internet usage, device available, and the pattern followed.

A. Online Assessment

Online assessments are online tests conducted for the evaluation purpose, measuring, and documenting the academic readiness, learning progress, skill acquisition, or educational needs of the test takers. Nowadays, evaluation can be done online by sharing a link with the users. The test taker needs a proper internet connection with the required speed to attend the online assessment. The computer or the device on which they attempt the test should have the essential configuration to run the test. The main advantages of these tests are the test taker can attend the test from anywhere with immediate feedback and results.

Mostly online formative assessment is constructed by specific institutions to assess the learner's progress. Some assessments are time constrained, so that the learner can attend the test at the particular time in a particular place. Some tests are supervised and proctored with webcams.

B. Offline assessments

Offline assessments are used for summative, formative, and diagnostic assessments. The test taker attends the test in the computer lab of the Institution in which a particular test software is installed and work without any internet connection. In such cases, the feedback and results are immediate since it is predesigned in the software. It needs a lot of preparation from the

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teacher and administrators for the first time to run the test. Either the teacher or the computer or any other electronic device evaluates the answer scripts.

Mostly the test taker has to come to one place to attend the exam. Sometimes it may be a performance-based assessment for which the learner has to develop are prepare the test content office and attend the viva. In such cases, the feedback and the results will be announced later because it takes time for the teacher to assess and give feedback to each student.

C. Computer Assisted Assessment(CAA)

Computer Assisted Assessment is transferring assessment questions and activities to learners through computers. Here, computers are tools which facilitate the assessment; they are not optional, which replace written-based assessment. In this assessment, computers are used only as supplementary tools. It can be used whenever it is necessary. It can be used as partial requirement such as online assignment, online quiz, etc. It can be used for formative, summative, diagnostic, norm reference, and criterion referenced assessments. Objective and subjective questions can be assessed through CAA. It can be used for structured assessment such as assessment under supervision either by the personals or electronic such as webcam, biometric, etc. or non-structured assessments, which the students can attend the assessment whenever they come to the computer lab or by using any software or link from wherever they are. It can either be online or offline.

D. Computer-Based Assessment

Other names for Computer-Based Assessment are computer-based exam and computer-based Test. In this assessment, the learner uses the mouse and keyboard to select the answer and to select the next question. In this assessment, computers are the main source to test the learner, for example, computer exams and online exams for the fulfilment of the degree. There are two types of Computer-based assessment. They are: *linear* and *adaptive*.

3. Most preferred tests used in e-assessment

While planning a test in Learning Management System, the teacher has wide range of options to choose. There are different types of question formats used in e-assessment like Multiple-choice questions, either / Or Questions etc.

Multiple-choice Questions

Multiple Choice questions are objective questions. MCQs, makes the learners choose one correct answer from several distracters to a question. Multiple-choice items can be used to access basic knowledge and complicated concepts. There are two different types of MCQs, they are, choose multiple answers and choose the right one which is commonly used. It used to be designed in such a way to click on the answer or select the answer. There are questions in which the learner has to select all the suitable answers from the given alternatives in some question the learner has to choose the only right answer.

The teacher has to construct the MCQ along with answers and distractors. Either the teacher or the technical assistant upload or type the questions in the required format. Then they upload the questions either online or in the software. They have to program to shuffle questions. If they fix the answer and score for each, the students will get the feedback and results immediately. It can be used for any assessment, such as formative, summative,

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diagnostic, norm reference, and criterion reference. It can be conducted as a quiz in the classroom to make it more effective.

a. Either/or Questions

It is a type of objective question. In this type, the question is presented to the learners in the form of a statement, and the students are asked to answer from two- choices. The two choice answers may be True/false, yes/no, agree/ Disagree, and right / Wrong. These types of questions are effective in assessing cause-effect and misconceptions.

Mostly, it is helpful to measure a low level of learning. It encourages guessing as it makes use of two alternatives alone. It is easy to prepare. The subject experts construct it and upload by the technicians in the software/app or online.

b. Short Answers

Short Answer questions are similar to essay questions. In both the test-taker has to type the answer. Short answers are the questions that need short textual responses one words or short phrases, but it should match the expected answer. It can be used for both subjective and objective tests. It helps to assess the basic level of knowledge of the student. It is easy to construct. Comparatively for MCQs the students are free to express their view. It will provide space to type the answer, and word limit set by the teacher, decide the limitation of words for the answer.

c. Essay type questions

In Essay questions, the learner has to type the answer in a text box, and the teacher has to evaluate these questions by themselves. The students are expected to type their answer in paragraphs. It helps to assess the writing skills and subject knowledge. Mostly these types of questions are subjective. The students are free to express their views with the restricted word limit. It is easy to construct by the teachers, but the teacher has to use rubrics to evaluate the essay types questions since it is subjective.

d. File Response Questions

In this type of question, the test-taker has to upload a file from the computer in which they take the test or mail or internet as a response to the question. Learners can prepare the content before the test and submit the file during the test as a response. It is very useful in case of large text and image designing. The teacher has to grade this type of questions manually. It is easy to construct. Higher order thinking skills can be assessed by using it. It takes time from students to prepare and teachers to evaluate. Rubrics will make the evaluation easier. The students and the teacher need a good internet connection for the students to upload the file and teachers to view the file.

e. Quiz Bowl Questions

The students had to choose the correct question for the given answer from the list of questions. It needs more work from the teachers. It is easy for the students to answer. It is like MCQ in which the students have to choose the question instead of the answer. The students are given the statement followed by several questions.

f. Ordering Questions

In this type of question, test-takers choose the right arrangement of a sequence of items. For example, it may be events from history, which the test-taker has to arrange in chronological order, or a story, which they have to arrange. It may be given in two forms such as each event

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followed by numerical options from which the students have to chick the position of the event to show its place and all the events followed by the numbers in space in which the students have to drag and drop the events in sequence.

It is hard to construct. The students should know the whole content; they can't skip any portions. It can be used to assess both simple and advanced skills.

g. Fill in the Blanks and Fill in Multiple Blanks

Fill in the Blank question may be in the form of statement, sentence, or passage with a blank space where the students type answer. It is an open-ended objective type question. It is used to assess the knowledge and understanding of the students. It is easy to construct and evaluate. To type an answer, either the students have to type the answer in the given space directly in the question or the space given below. It may be a one-word answer or a phrase. Comparatively, with MCQs, it needs some time since the students have to type the answer. In this type of questions, there is a possibility for auto spellchecks. So, the teacher has to disable all those things before they conduct the test.

Small and big paragraphs with multiple blanks are used in Fill in Multiple Blanks questions. The students have to type a suitable answer in the given space.

h. Jumbled Sentence

A list of words or phrases is given to the students in which they have to choose one to complete a sentence. A similar list of options appears for all the blanks, which include both the right answers and distractors.

i. Drop-down

Drop-down questions are similar to multiple-choice questions. The responses in the drop-down will be inside a box; the test-taker must click the box and sort the answer. This type of response is mostly found in online applications for examinations.

j. Matching

Matching questions have a slight variation from MCQs. In this type of question, there will be two-column. The first one is test item or questions, and the second is for the corresponding responses. The test items will be on one left side of the page simultaneously; on the right side of the column; answers will be in a jumbled form.

k. Drag and Drop

Drag and drop is a method by which an image or an object can be dragged from one particular place and dropped in the desired location. The test-taker used to drag and drop the files from one folder to another in the computers. As a test item, it is used to reorder the puzzle cards, sequential ordering of numbers, dragging the picture of an animal near to their names.

l. Listening Comprehension

During this test, test-takers are made to listen to recordings of discussions, lectures, and speech of different personalities or to live ongoing discussions as podcast. Following each audio, a set of questions will be given from the audio. Based on the performance of the learner in the test, listening skills will be assessed. These type of tests are mostly used in English labs CAL lab

m. Google Forms:

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Most preferred quick assessment tool which can reaches masses and gives immediate feedback about the performance is Google form. In recent times every one is opting for Google Form. It has many wide options like Locked mode where respondents aren't allowed to open tabs or other applications while taking this quiz. This feature is only available to institute's using managed Chromebooks. To avoid cheating shuffling option is available where questions get shuffled for every new person who attempts it.

Code Checking Tool: Coding questions can be evaluated by choosing these type of tools where code is copied and language is selected. It will be easy for the evaluators to correct the answered codes.

Analysis of Effectiveness of these tools:

As all these are electronic-based tests there should be a proper device and good internet speed to access them.

1. While appearing for MCQ, drag n drop and other quiz like categories there is a possibility for copying or sharing of answers. If the test is remotely proctored, then it is very difficult to believe the authenticity of the test. One of the option to reduce cheating is to install apps which closes all other tabs on the system.

Since all the students don't have desktop or laptops, teachers can take the test in institute's computer lab.

2. In the tests like Essay Answers, students can write their answers and there is a provision to upload a document which they will scan after writing on the paper. Evaluation of uploaded document will be very difficult as it will be either in pdf or PNG form. In long answers there will be need to draw figures, circuits, curves etc,.it will be time consuming if the student uses any draw options.

If the essay answers are in word file then teacher can evaluate by writing a program for evaluation where 10-15 key words will be selected. If the answer has matching words then marks will be awarded depending on the number of words matching.

3. The drawback the Google form is that many a times teachers are not utilizing the mentioned features effectively which makes it a feeble mode of genuine evaluation.

Though these tests are technology oriented and need of the hour but traditional mode of writing exams cannot be completely replaced by these.

4. Modes of conducting E-assessment

Online Proctored Exams

 In this type of approach, the exam is remotely monitored to have a cheating free assessment process either by a person who will keep an eye on the examinee or an app which can be used to tap the movements in the person who is appearing for exam. IRIS sensor is also incorporated by the examiners to check the movement of the eyes and face of the student during online exam.

Many testing agencies are opting for the IRIS sensor to avoid any malpractices during exams. As major population of students lack basic necessities of computer and internet facility, National Testing Agencies have come up with an interesting a solution to this problem by initiating ION zones throughout the country. Thus in INDIA many ION zones have been set up to have hassle free conduction of e- assessment process. There are no flaws in this approach.

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5. Pros &Cons of e-Assessment

The comprehensive E-assessment methodology has been successfully implemented across the online education platform because of its effective and efficient evaluation process.

Pros:

A few of the pros:

- E-assessment increases students' motivation level as they get immediate feedback, when compared with written tests.
- Encourages students to answer questions of higher order thinking levels.
- Boon for all those distant learners who find it very difficult to move to far off places to undertake written exams.
- Learning and assessment both are according to learner's feasibility, it provides a platform which is cost effective.
- Online platform allows innovative ways to control cheating during examination.
- Proper usage of the E-assessment platform enables good evaluation of the learning and ensure better management during online examinations. For instance, *Google Forms* is one of the more preferred platform for online assessment and provide inbuilt features. Proper usage of these enables smooth E-assessment process.

Cons:

- E-assessment is possible only when proper internet facility is provided and the device to be used should be of upgraded version. There are instances where students couldn't write their exam because their device was not able to support the online examination platform.
- Online examinations are expensive and is a financial burden on the learner.
- Lack of awareness or proper usage of setting up the E-assessment evaluation process triggers a lot of miscommunication and sometimes misuse of the evaluation.
- Difficult of time management while attempting online e assessment.
- The most common using technology to duplicate the answers during the online assessment.
- Misuse of technology and some apps to freeze the screen presuming that the examinee is taking exam, whereas the examinee is busy copying.

A survey was conducted to get the candid understanding about effectiveness of e - Assessment tools among engineering students based on their experience of lockdown time and the present situation where blended education is preferred. A topic from Linear algebra and calculus was taught to 60 students of sem -1 .Three groups were created from that population of 60 so that each group consist of 20 students. An online test was conducted on group-1 students through LMS in the college lab which was proctored by the teachers. Group-2 students were asked to take test remotely. in the stipulated time duration and the last students of Group-3 were asked to log in to the online meeting and asked to take up the test and were monitored through online mode.

The scores obtained by Group-1, Group-2 and Group-3 are:

S.No.	Group-1 (LMS + college lab)	Group-2 (Remotely)	Group-3 (Online meet + proctored)

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1	16	20	15
2	14	17	14
3	15	18	15
4	20	19	16
5	12	20	14
6	13	18	12
7	18	20	14
8	15	19	16
9	14	18	17
10	14	20	14
11	15	19	16
12	16	18	20
13	15	20	16
14	16	18	15
15	14	19	17
16	12	20	18
17	15	19	19
18	16	18	16
19	18	19	17
20	20	18	19

The following questions were included in the Google form. The mean and variances of three groups are discussed below.

	Group 1	*Group-2*	*Group-3*
Mean	15.4	18.85	16
Variance	4.9894	0.8710	4
Standard Deviation	2.3395	0.9333	2.0

The above values were obtained by writing a python code for the give data to evaluate mean, variance and standard deviation.

Hypothesis Testing

The significance of difference of means between the arithmetic mean of the marks secured by the students of the Group-1 and Group-2, Group-2 and Group-3 and Group-1 and Group-3 was analyzed using student's t-test. The hypothesis testing was done using Student's t-test.

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```
Means of data
15.4
18.85
16.0
Varance of data
4.989473684210527
0.8710526315789474
4
SD of data
2.2337129816094383
0.9333020044867296
2.0
G1 & G2
t value =    6.211944763586235
G2 & G3
t value =    5.628727830106313
G1 & G3
t value =    0.8722900490905464
```

The level of significance was chosen as 5% whose critical value was around 2.025. In case one where Group 1 and Group 2 were studied the test statistic 't' calculated is 5.6287(modulus of -5.6287) is considered. So the null hypothesis "means are equal" is rejected. Thus there is significant difference between the means of Group-1 and Group-2.

Similar hypothesis testing was done between Group-2 and Group-3 and it was observed that there is significant difference of means.

At the last hypothesis testing between Group-1 and Group-3 was done and it was found that there is no significant difference between means of the group-1 and Group-3 scores. The test statistic value is less than 2.025 so the null hypothesis is accepted.

After considering all the above analysis it can be concluded that the scores of group-1 and Group-3 are genuine and group-2 are not matching with the real score of students.

Thus only online exam which is conducted remotely is not completely reliable.

6. Conclusion

E-Assessment is a good tool for evaluation but need to be more user friendly with proper proctoring and some prerequisites. Blended mode of evaluation can contribute more for the proper assessment of the learning outcomes. Whether its online human proctoring or IRIS sensor every mode has its own pros n cons. Teachers or examiners should choose a particular method of e – Assessment based on the criteria to be evaluated and the availability of the facilities for smooth conduction of the same. In the coming future e–Assessment is going to be an integral part of assessment and evaluation process. E-Assessment is the need of the hour and is successful only if all required criteria are satisfied by both examiner and examinee.

Also, it emphasizes the blended form of assessment where summative evaluation can be conducted through traditional mode and formative in e-Assessment medium.

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