



# E-Assessment in Information Technology Education

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## ABSTRACT

Emerging trends and challenges in Information technology education are shifting instruction-based learning towards the use of the Internet, with its capabilities for flexibility, networking and distributed nature. Web-based educational systems and virtual learning environments foster interactivity and provide an excellent medium for distance education delivery. Certain aspects of Information Technology education such as assessment, marking, provision of feedback and communicating complex concepts and technical terms provide challenging research concerns. The study presented in this paper provides an analysis of an undergraduate student sample regarding an Information Technology module. Blended teaching mode through a supporting virtual learning environment provided mechanisms for e-assessment and feedback for geographically dispersed students residing in two different campuses.

## 1. INTRODUCTION

In early years of Information Technology (IT) teaching, it was very common for instructors to use Skinner's theory of transfer of knowledge from the instructor to the learners [5]. This approach was commonly known as the instructionist learning paradigm. With the proliferation of web based learning environments the constructivist learning paradigm emerged as a suitable alternative for IT instructors. According to this, learners construct their own knowledge by actively participating in the learning process. Constructivist instructional developers value collaboration, learner autonomy, generativity, reflectivity and active engagement and employ different learning techniques such as active learning, cooperative learning, collaborative learning and situated learning [6] [7] [12].

The underlying strategy for introducing pedagogical perspectives in IT education should reflect that focus is primarily on the learner supported by instructor-facilitators. This shift from instructionism to constructivism was triggered by the need to accommodate different learning patterns and the support learning modes involving part time study and geographical dispersion of instructors and learners. Earlier research suggests five key elements for supporting e-learning environments in IT education with no theory or paradigm barriers:

- Course Content,
- Assessment,
- Feedback,
- Course Management and
- Communication.

This paper presents attempts for improving assessment results through a suggested methodology for formative and summative online assessment. The study discussed in the paper presents innovative uses of the Middlesex University's Virtual Learning Environment (VLE) in place at Global Campus.

## 2. E-ASSESSMENT: ASSESSMENT CHOICES IN ONLINE LEARNING

Two commonly used assessment types are summative and formative assessment. Summative assessment checks student learning and provides

student ranking [2] [9]. Summative assessment tends to be the more comprehensive choice of the two types [3]. Formative assessment promotes student learning through the provision of feedback [1] [2] [8] [9]. Formative assessment enables instructors identifying how well the learning outcomes are being achieved and perform any required modifications [2] [3].

The use of computers in students' assessment process is also known as Computer Assisted Assessment (CAA) [11] or e-Assessment when web-based Virtual Learning Environments are used. Examples of tools used in e-Assessment include online surveys, online quizzes and tests, online submission of assignments, discussion forums. Assessment is typically based on true/false questions, label diagram questions and text entry questions, with the commonest approach being the use of multiple-choice questions (MCQ) [8] [9]. The constructivist learning approach is followed in such quizzes by providing immediate feedback [9].

## 3. BACKGROUND AND METHODOLOGY

This paper builds on existing work on (i) evaluating online assessment, (ii) investigating the role of feedback in learner-centered e-Learning, (iii) suggesting a methodology for enabling CAA, (iv) providing a comparative analysis of CAA for theoretical versus practical Courses and (v) evaluating support environments for e-Learning in developing countries [4] [8] [9] [10] [11]. These findings were used on Middlesex University's case study of distance education known as Global Campus (GC).

The school of Computing Science at Middlesex University (MU) in London teamed up with the Regional Information Technology and Software Engineering Centre (RITSEC) in Cairo to establish a project called Global Campus in May 1999. GC uses Web technologies to deliver learning in distance learning mode for both undergraduate and postgraduate programs [4].

By following the SCATE pedagogical model, Global Campus has provided a mechanism for preparing distance education content. The model focuses on reviewing and thinking activities as well as on the development of mini-assessment sessions with simple multiple-choice (MCQ) or true-false questions.

## 4. RESEARCH PROBLEM

This study is based on data gathering of online test attempts from undergraduate students taking a module on Methodologies and Techniques for Engineering and Information systems at two London campuses. e-Assessment was taking place through a developed prototype providing an online test with immediate feedback for students and an evaluation questionnaire for collecting perceptions of the e-Assessment experience (see figure 1).

The CAA tool initially collects demographic data of participants as well as information on the level of preparedness of participants for the specific online test and participants' previous experience on e-Assessment. The following feedback mechanisms are provided: (i) Multiple Choice Questions (MCQ), (ii) Automatic grading, (iii) Immediate Feedback and (iv) Ranking. The final component of the e-Assessment tool is an evaluation questionnaire to record student perspectives in terms of usability and functionality.

Figure 1. CAA system and evaluation questionnaire

## 5. DISCUSSION ON E-ASSESSMENT FINDINGS

From a total of 40 students participating in the study, 24 took the online test while 16 registered but did not attempt the test. It seems that these students had an initial feel of the questions but avoided submitting, intending to return at a later stage of their revision, better prepared. The level of preparedness by these students seems to back this up with 9 out of these 16 students indicated that they were not prepared, 3 said they were prepared and 4 were not quite sure. Only 1 student indicated taking an online test before leaving 15 with no previous online test experience.

Out of the 24 students taking the test, only 5 indicated that they had previous experience in online testing. The majority (19) did not have any experience with online tests. In terms of preparation, most students declared not prepared for the test. More specifically, 13 were not prepared, 7 indicated that they were prepared and 4 were undecided.

From these 24 students, only 8 attempted taking the test more than once with one student attempting the test six times. Only one student got a distinction mark albeit after more than one attempt. The same student was the only one to get maximum marks.

It seems that only 3 students out of the 8 attempting more than once, improved their grades on successive attempts. One of these students took the test 5 times, initially scoring 6. On the fourth attempt she scored the maximum 20 points. On the fifth attempt she again scored maximum points. This is a strong indicator that she was using the online test as a study tool for improving her performance.

Some students repeating the test scored lower than the initial attempt, with some going as low as 0 or 1. Even more interesting is the fact that this would happen on the same day. Examination of some of the records with the subsequent low score showed that most (sometimes all) of questions were left unanswered. This leads to the speculation that these students were interested in the summary page which came after the online test. This page gave, for each question, links to related content, including slides, lecture notes and further study suggestions

An interesting pattern in repeated attempts is that some students would repeat the test immediately or on the same day while others chose to let a few days elapse before retrying the test. The assumption is the subsequent attempts were done after more preparation. The patterns in the grades seem to support this because the grades attained were mostly equal to or better than those at previous attempts.

## 6. EVALUATING E-ASSESSMENT

Usability of the e-Assessment tool was evaluated against response/load time, ease of use and whether the online test was informative. Overall, 8 out of 10 participants agreed that the initial load time of the online test was satisfactory. For ease of use, 6 out of the 10 participants thought that the text was easy to see, 2 disagreed and another 2 were not decided. A similar pattern was seen for the question on whether messages displayed were relevant to the user's task at the time.

Functionality was evaluated against delivery, assessment and feedback. For the question 'The online test provided is suitable for assessing my learning performance', 6 students agreed, 2 disagreed and 2 remained neutral. There wasn't much variation in response to the question 'Automatic grading of the online test is essential in an online learning system environment'.

The feedback criteria also got a favourable response with most of the students agreeing to the usefulness of the provided suggestions in their learning process (6 out of 10 agreed, 3 disagreed), the usefulness of the provided correct answers to learning online (similar pattern to previous question), whether the links to explanation of correct answers improves students understanding and teaches him/her what s/he doesn't know (6 agreed, 3 disagreed and 1 neutral).

Previous studies lead to a series of lessons learnt with respect to e-Assessment and the role of feedback in learning online communities [4] [8] [9] [10] [11]. Most comments and suggestions of participants convey three main messages: usefulness of online tests for assessing performance, need for frequent and repetitive assessment and necessity for more and richer feedback.

## 7. CONCLUSION

The research presented in this paper focuses on CAA in e-Learning environments. It attempts to evaluate online tests and in particular the role of feedback in such CAA. The paper discussed the various components of an online test and the corresponding online evaluation of the CAA process with respect to usability and functionality.

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