

E-Assessment in Higher Education: A Review

Dr. Martin Appiah

*Lecturer of Information Technology
Vaal University of Technology
Vanderbijlpark, South Africa*

Dr. Fanus van Tonder

*Senior Lecturer of Higher Education Studies
University of the Free State
Bloemfontein, South Africa*

Abstract

The improvement of technology and e-learning systems, has resulted in a high demand for ways and means of assessing students in such a system. Assessment is indeed a critical part of the teaching and learning process in any higher education institution. The aim of this study is to provide a discussion on e-assessment which focuses on concepts such as definitions of e-assessment; e-assessment delivery platforms, tasks that can be accessed through e-assessment; benefits and challenges of e-assessment and principles of e-assessment. It is concluded that e-assessment can be effective if the assessment is credible and lecturers make a concerted effort to create assessment that is authentic, consistent, transparent and practicable. Higher-order assessment tasks can also be assessed through e-assessment.

Keywords: e-assessment, e-assessment tasks, e-assessment principles, learning management system, literature review

INTRODUCTION

Due to the advancement of technology and e-learning systems, there is also a high demand for ways and means of assessing students in such a system (Brink & Lautenbach, 2011). Assessment is indeed a very important aspect of the teaching and learning process in any higher education institution (Lafuente, Remesal & Valdivia, 2014; Joint Information Systems Committee (JISC), 2007; Brink & Lautenbach, 2011).

Globally, most institutions implementing traditional assessments in the form of high stake examinations are faced with various malpractices such as lecturers taking bribes to leak questions or invigilators favoring some students. Other issues faced by traditional assessments include the load on lecturers in terms of marking, organizing and recording of student scripts, costs involved in the printing of examination papers or assessments, security issues, etc. (Osuji, 2012). As student numbers increase in higher education institutions, logistics also become an issue. E-assessment may therefore be a good way of meeting this demand (Walker, Topping & Rodrigues, 2008). Assessment is often viewed as a key component in higher education. According to the JISC (2006), assessment portrays what students perceive to be significant and the time they invest in them. Rowntree (1987) states that one is able to determine the value of an institution by looking at its assessment policies and practices. Due to the significance of assessment, it is impossible for students to avoid it. Boud (1995:35) says: "Students can, with difficulty, escape from the effects of poor teaching, they cannot (by definition if they want to graduate) escape the effects of poor assessment."

Different researchers have diverse ways of defining e-assessment. Below are some definitions of e-assessment:

According to Crisp (2011); Howarth (2015); and Office of qualifications and examinations regulation (Ofqual) (cited in Winkley, 2010), e-assessment involves the use of any technological device to create, deliver, store and/or report students' assessment marks and feedback. Examples of devices that can be used to create and implement e-assessment tasks include laptops, desktop computers, smartphones, iPads, Android tablets, etc. Different media formats such as Word documents, portable document formats (e.g., pdf), videos, images, simulations, or games may be used to support e-assessment. With the advent of new technologies, students' abilities and skills can be tested through e-assessment (Crisp, 2011). The JISC (2007) states that e-assessment can be defined as "end-to-end electronic assessment processes" where "information and communications technologies (ICT) are used for the presentation of assessment activity and the recording of responses." These processes involve students, lecturers, institutions, and society as a whole. These definitions emphasise the importance of using technology in the implementation of assessment. This means that information and communications technologies (ICTs) are absolute necessities for e-assessment. The advancement of ICTs in higher education can also not be overlooked. These technologies have made it possible and easy to distribute learning material either online or offline. E-learning, which is the process of learning using ICTs such as desktop and/or laptop computers, software, digital cameras, etc., has become very popular in higher education (JISC, 2004). E-assessment (the electronic delivery of assessment) is therefore an element of e-learning that has the potential to become a preferred form of assessment, as opposed to the

traditional way of assessing students (JISC, 2004). This means that if technology is effectively applied in assessments, then students' learning might also improve.

Howarth (2015) states that an e-assessment system usually consists of two major components. These are:

- An assessment engine, which consists of the hardware and software needed to design and deliver the assessment task (AT) or test.
- An item bank, which contains the questions and/or instructions. Questions and instructions in an item bank are generated randomly by the assessment engine to deliver the AT or test.

E-ASSESSMENT DELIVERY PLATFORM AND TASKS THAT CAN BE ASSESSED THROUGH E-ASSESSMENT

E-assessment delivery platform

E-assessment can be delivered in two ways. The first is web-based delivery, where students use the Internet to access the assessment tasks (online e-assessment) (Algahtani, 2011; Naidu, 2006; Romiszowski, 2004). The second option is download delivery, where the assessment tasks/tests are downloaded onto the students' computers in the appropriate assessment centres at the correct date and time and released when the student arrives for the assessment (offline e-assessment) (Algahtani, 2011; Naidu, 2006; Romiszowski, 2004). The download approach is mostly used for high-stakes assessments. With this approach, more security measures are implemented to avoid undesirable exposure of the assessments (Howarth, 2015).

The major difference between the two approaches (online and/or offline) is that web-based assessments, as is the case with e-learning activities, can be done anywhere at any time as long as there is an Internet connection; downloaded or offline assessments, on the other hand, can take place with a computer anywhere and at any time (Algahtani, 2011; Naidu, 2006; Romiszowski, 2004; Howarth, 2015). Crisp (2011) supports Howarth by saying that institutions can place their assessments on their servers for students to access at any time and from anywhere, provided they have access to the server.

Institutions can decide to use e-assessment facilities that are already built into a learning management system such as Moodle or Blackboard, or they can use a standalone assessment tool such as Test Pilot, Questionmark Perception, A-Tutor, or Maple T.A (Osuji, 2012; Winkley, 2010). Typical assessment tasks supported by the Moodle LMS include calculation questions, calculated multi-choice questions, calculated simple questions, cloze questions, essay questions, matching questions, multiple-choice questions, numerical questions, random short-answer matching questions, short-answer questions, true/false questions, and description questions (Alkhateeb, Almaghayreh, Aljawarneh, Muhsin & Nsour, 2010). Regarding A-Tutor, the questions supported include Likert-type questions, matching (graphical) questions, matching (simple) questions, multiple-choice questions, open-ended questions, ordering questions, and true/false questions (Osuji, 2012). It is important to note that institutions can customise their own e-assessment platform to meet their particular needs. For example, Moodle is an open source tool which can be customized to fit an institution's policies, procedures, and regulations. Institutions can add additional features to the LMS to suit their needs (Alkhateeb, Almaghayreh, Aljawarneh, Muhsin & Nsour, 2010).

Tasks that can be assessed through e-assessment

The JISC (2006) and Department for Education and Skills (DFES, 2005) both state that there is an assumption that e-assessment tasks mainly comprise multiple-choice questions (MCQs) and cannot be used to assess higher cognitive order thinking skills. Various studies have also shown concern with regard to the integrity of e-assessment tasks (Conole & Warburton, 2005), in particular as to whether e-assessment tasks can test higher order learning, and whether staff have enough time to develop good ATs (Hepplestone & Helm, 2003). Gibbs (2006) also adds that there is a concern that e-assessment activities encourage a surface learning approach (Biggs & Tang, 2011), and that any implementation of e-assessment must consider this. However, Farrell and Rushby (2016), the JISC (2006), and Jordan (2011) dispute the above assumptions by saying that if MCQs are properly designed, they can still assess higher order skills. Various authors such as Crisp (2011), Craven (2009), the JISC (2006), and Howarth (2015) concur that there is more to e-assessment than only MCQs because Wikis, blogs, self-reviews, peer-reviews, scenario questions, simulation software, role plays, and observations can all be used in e-assessments to assess students' higher order thinking abilities as well as their hands-on skills. Winkley (2010) agrees that e-assessment tasks have the potential to require students to implement a deep approach (Biggs & Tang, 2011) in performing tasks.

A lecturer might decide to create an easy assessment that requires less time or effort to grade, or to take his/her time to create an assessment that requires higher order thinking from the student. It is therefore believed that e-assessment tasks have the capability to encourage a deep learning approach (Biggs & Tang, 2011) and assess higher order thinking. This is, however, only possible if the lecturer has the experience and training to create high quality questions or tasks that will not only require students to merely recall concepts but to apply, analyse, evaluate, and create. Thus, lecturers should be able to provide tasks that enhance student learning, and maintain high expectations.

According to Crisp (2011), it is not difficult to construct MCQs. However, generating well-constructed MCQs involve considerable effort. MCQs are easy to mark by means of the appropriate computer software and then provide instant feedback. With regard to short questions, however, it is relatively difficult to grade student responses automatically because the lecturer (assessor) must make some decisions in terms of unforeseen responses that may be deemed acceptable. If a lecturer does not consider all possible students' responses to a question or task, the computer software might mark most of the students' responses as incorrect. E-assessment is supported by Craven (2009); who emphasizes that in an "objective or convergent assessment" where the marking scheme is based on only one correct answer, automatic marking is very effective. On the other hand, in "subjective or divergent assessment" where different answers might be acceptable, automatic marking can be very difficult. In terms of subjective assessment, technologies are built into e-assessments in order to ease the assessment delivery process, but that process is not automated. There should not be a misconception that objective e-assessments are bad, but rather that they can be very detrimental if not created in an effective way (Craven, 2009). Boyle and Hutchison (2009) and Bennet (1998) state that the type of questions or tasks that will be assessed in e assessment may change completely from one generation to the next. It be concluded that the most significant point is for lecturers to ensure that they do not replace authenticity when designing an e-assessment task with convenience (easy marking).

BENEFITS, CHALLENGES AND PRINCIPLES OF E-ASSESSMENT

The following section discusses the benefits and challenges of e-assessment

Benefits of e-assessment

There are many benefits that come with e-assessment, whether used for formative or summative purposes. In e-assessment many students can be assessed within a given timeframe, especially if their answers are marked automatically. Other pedagogical benefits include immediate student and lecturer feedback; the ability to repeat and randomize ATs/tests; the consistency and fairness of computer-marked assessment; students' ability to complete assessments anywhere and at any time (time saving); and opportunities for students to take responsibility for their own learning (Chalmers & McAusland, 2002; Morris, 2008; JISC, 2006; Howarth, 2015).

Other literature also indicates that students can be enabled through e-assessment to identify and reflect on what they have been taught and have learned in the context of blended learning (which includes e-assessment as a component) (Naidu, 2006; Romiszowski, 2004; Gunasekaran, McNeil & Shaul, 2002), thus improving the quality of the student learning experience (Dermo, 2009). Ideally, any assessment, if implemented correctly, may assist in improving teaching and learning outcomes (Bennett, 2011; Clements & Cord, 2013). Various studies point out that the innovativeness and significance of e-assessment depend largely on automated marking and to what extent it eases lecturers' workload (Noorbehbahani & Kardan, 2011; Stödborg, 2012).

Howarth (2015) also indicates that it is less costly to develop e-assessment tasks; it is easy to implement since there is no need to hand out question papers and mark them afterwards; students with special needs or disabilities can adjust the font size and change colours; voice notes can be created for students to listen to, using their headphones; ATs are delivered securely, and marking is more reliable.

The preceding information shows that many studies make mention of similar benefits such as immediate feedback, access anywhere and anytime, improved learning, etc. These benefits are realised if e-assessments are designed properly and accurately. Sim, Holifield, and Brown (2004) make a profound statement, namely: "The perceived benefits of computer assisted assessment (CAA) (e.g., freeing lecturers' time) can be illusive if no institutional strategy or support is offered; successful implementation may be left to chance, and CAA may be developed in an anarchic fashion. In order to utilize the features within software packages, staff training and development is necessary and this may not be feasible without institutional support." It is also clear that ICT can play a vital role in the area of assessment, which could eventually lead to improved student performance. Due to these benefits, higher education institutions should not shy away from implementing e-assessment in their courses.

Challenges in e-assessment

Despite the benefits reported above, there are also some challenges that institutions, lecturers, and students face in the context of e-assessment. According to Brink and Lautenbach (2011), the most significant challenge in an e-assessment system is security. Due to the fact that students can access e-assessments from anywhere, some institutions are reluctant to implement e-assessments for high-stake examinations. Nevertheless, according to Crisp (2011), there are some security measures that could be put into place to secure e-assessments in high-stakes examinations. These may include individual passwords or encrypted smart cards, restriction to particular computers by specifying Internet protocol addresses; live remote monitoring of students using webcams, keystroke biometrics, and fingerprint and facial recognition systems (Crisp, 2011). Crisp emphasizes that only authorized participants should have access to the e-assessment system and its contents.

I fear that since e-assessment activities might be intercepted by hackers and that students might be impersonated during e-assessment activities, these security measures should be in place when assessing high-stakes examinations. Studies done by Osuji (2012) and Craven (2009) show that other challenges include the cost of a computer or laptop; Internet cost (cost of buying data); power supply problems, and lack of sufficient technical infrastructure to support e-assessment. Measures such as high-speed Internet infrastructure and cameras in assessment rooms are expensive. Possible failure of equipment and lack of quality are also challenges that should be considered carefully. In the research done by Walker, Topping, and Rodrigues (2008), they identified the use of spontaneous types of questions, the formulation of assessment instructions, the phrasing of questions, and the clarity and flexibility of marking as assessment design challenges. The JISC (2007) divide challenges in e-assessment into three parts: challenges for institutions, for lecturers and for students.

Some challenges in e-assessment for institutions include the development of an e-assessment policy that integrates pedagogical and practical aims; the introduction of viable approaches to support computer-based assessment; the setting up of a viable IT infrastructure to support e-assessment; and the compilation of policies and procedures to ensure reliability and validity of e-assessment.

The challenges lecturers face in e-assessment include making e-assessments available to all students; integrating the e-assessment design with learning outcomes and student needs; a possible lack of experience to have full control of the use of e-assessment methods; and adapting to changes in assessment practices.

The challenges for students are the possible inability to access assessment tasks on some computer operating systems; possible inability to access assessment tasks at particular times, when required; and combining the possibilities of new technologies in the assessment process.

Other studies have also identified the following challenges of e-assessments:

- a. The time needed to create e-assessment tasks cannot be overlooked. The creation of e-assessment activities require time and experience on the part of the lecturer since the lecturer needs to ensure that the activities continue to be of a high standard (JISC, 2006).
- b. Another challenge is “misleading clues.” When students notice that specific areas of the course are often assessed through e-assessment activities, they tend to devote more of their study time to those areas. This relates to what Biggs and Tang (2011) refer to as the backwash effect on student learning (Biggs & Tang, 2011; Elton, 1987); this can be alarming if it encourages a surface approach to learning (Clarke, Lindsay, McKenna & New, 2004).
- c. Since a substantial amount of time is required to design quality questions, some lecturers might create questions or tasks that assess only lower-order skills. Lecturers who are not comfortable with the use of an e-assessment system also tend to design poor assessments (Mackenzie, 2003).
- d. Another challenge is inequality. According to a study done by Clariana and Wallace (2002), higher performing students did well in computer-assisted assessment tests as opposed to traditional assessment tests. They observed that the higher performing students easily adjust to new assessment methods. Based on this, Noyes, Garland, and Robbins (2004) argue that computer-assisted assessments might not be fair to lower-performing students since they might feel that it takes too much effort and time to complete e-assessments.

The above-mentioned challenges may hinder accessibility and the implementation of e-assessment. Institutions should therefore take into consideration their students' and lecturers' experiences and perceptions well before and during the implementation of an e-assessment system. Since the teaching approaches of lecturers and the way in which they manage e-assessments differ from the way they teach in the classroom, it is important for lecturers to have adequate training on how to implement e-assessment effectively. When lecturers have full knowledge and experience of the e-assessment facilities they are using, it encourages them to be in charge of their teaching and assessment. When this happens, lecturers will be able to deal with the challenges that they might face and look more qualified from the students' point of view (Brink & Lautenbach, 2011). For academic staff, e-assessment must add value to the processes of learning and teaching to warrant changing from conventional assessment practices (JISC, 2007). Institutions also need to review their courses and assessment practices frequently if they want to ensure the effective implementation of e-assessment (Bull, 1999).

Principles of e-assessment

Tinoca (2012); JISC (2007); and Brink and Lautenbach (2011) concur that an e-assessment activity is considered credible if it is authentic, consistent, transparent, practical, accessible, timely, appropriate, and accurately measures the required results and quality of the supporting system.

Various authors have identified a number of principles pertaining to e-assessment:

Authentic

An e-assessment activity is deemed authentic if it is sophisticated/challenging, related to real world situations, and depicts the skills needed in real life (Bartman, Bastiaens, Kirschner & Vleuten, 2007; Dierick & Dochy, 2001; Gulikers, Bastiaens & Kirschner, 2004), and are of importance to students, lecturers and institutions

(Bartman *et al.*, 2007; Gulikers *et al.*, 2004). Authenticity of e-assessment might also relate to the validity of assessment (Davidson & McKenzie, 2009; Quality Assurance Agency (QAA), 2012:6-7)).

Consistent

An e-assessment activity is deemed consistent if the activity is aligned with the learning outcomes, assessment criteria, and the relevant e-assessment policies (Tinoca, 2012). It should also involve different e-assessment approaches, tasks, and assessors (Dierick & Dochy, 2001). If e-assessment is considered consistent, it can by extension be viewed as reliable (South African Qualifications Authority (SAQA), 2001)).

Transparent

An e-assessment task/activity is transparent if it encourages students to actively engage in the e-assessment task/activity. This can be achieved by making all the e-assessment policies and criteria known and clear to students and all other participants (Tinoca, 2012). The assessment criteria being used for the e-assessment activity should be made available before the e-assessment task commences (Dierick & Dochy, 2001), and must be clear and unambiguous in order that students understand what is expected of them. In addition, the assessment criteria should be applied consistently when assessing different students' work. In essence, transparency relates to fairness as an important principle (SAQA, 2001; QAA, 2012).

Practicability

The practicability or feasibility of e-assessment activities is highly significant since e-assessment requires numerous resources such as time and cost of training (SAQA, 2001, Tinoca, 2012). Institutions considering using e-assessment should be equipped with the necessary resources (time, digital equipment, expertise, etc.) in order to create and implement e-assessment that supports the above-mentioned criteria (SAQA, 2001, Tinoca, 2012). Some assessors often design e-assessment tasks that are virtually impossible for students to complete. When that happens, students become hesitant to attempt any subsequent e-assessment questions/tasks.

CONCLUSION

This paper conducted a literature review on e-assessment in higher education and discussed some important concepts that are significant to e-assessment. The review confirms that e-assessment has the potential to support and even improve student learning, provided that the assessment tasks are properly designed. It was also evident in the review that high order assessment tasks can also be assessed through e-assessment. The review also confirms that students will be willing to participate in an e-assessment task if the results count towards their semester marks since it will motivate them to engage with what they have to learn. For this reason, students' perceptions of e-assessment should be taken seriously. In addition, it is important to observe the way in which students react to e-assessment and subsequently make changes to e-assessment tasks whenever necessary and applicable. Based on the principles of e-assessment, it is evident that for assessment to be credible, lecturers should make a concerted effort to create assessment that is authentic, consistent, transparent and practicable. Credible assessment will enhance students' learning because it encourages students to be sincere about their own learning and apply a deep learning approach. Lecturers' teaching will also improve if they consider and balance these principles of good assessment. It will require more knowledge and understanding from lecturers to carefully design and implement assessments. Institutions should therefore ensure that their lecturers create assessments that are appropriate and ethical. This is only possible if the institutions put appropriate assessment policies and procedures in place. E-assessment might currently be more suitable as opposed to traditional assessment since it has the potential to minimize stress among students, improve decision making among administrators, and reduce costs and time. As an innovation, it has the possibility of enhancing learning and teaching at higher education institutions.

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