



Student Perceptions of the Effectiveness of Formative Assessment in an Online Learning Environment

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Abstract

Assessment is an integral part of the teaching-learning process in both conventional and distance education contexts. Literature suggests that with the increase in the use of Information and Communications Technology in the delivery of learning, a number of institutions are resorting to formative assessment practices that are mediated by technology to not only provide flexible and more efficient means of assessment but also attain improved learning outcomes. This paper investigated student perceptions of the effectiveness of different types of formative assessment used in online learning environments. A 31-item questionnaire was used to gather data on student perceptions. On the level of difficulty, students generally perceived the various types of formative assessment as having no significant differences. Results further indicated that students received more prompt feedback from peer assessment and computer-marked assessment, compared to teacher-marked assessment. The findings of this study will support practitioners in eLearning to use formative assessment and feedback mechanisms more effectively to influence student engagement as well as learning outcomes.

Keywords: formative assessment, feedback, online learning, eLearning, student perceptions

Background

Instructors develop various teaching and learning methodologies or tools to enhance the effectiveness of online education. Examples of such methodologies are formative assessment and feedback (Hwang, Chu, Yin & Lin, 2008). Black and William (1998) define formative assessment as the process that provides both instructors and students with feedback on on-going teaching and learning with an aim to improve students' learning and attainment of the instructional objectives. Formative assessment is thus recognised as an important tool for enhancing student learning (Bell & Cowie, 2001). Formative assessment also manifests the paradigm shift in pedagogical strategies and technological use for effective delivery of instruction in distance education. The need to embed formative assessment in teaching and learning is thus viewed as a necessity in distance learning platforms (Black, Harrison, Lee, Marshall, & William, 2003; McTighe & O'Connor, 2009; Shepherd & Hannafin, 2008; William, 2011). An online learning environment embedded with formative assessment tools presents three key benefits to students (Zakrzewski & Bull, 1998). First, the timing is flexible enough to allow students to take the assessment at any time convenient to them, as long as it falls within deadline. Second, students can have several attempts at the assessment until they achieve the desired minimum grade. Third, online formative assessment provides students with prompt feedback needed to assess their learning and remedy weaknesses in instruction and their learning (Wang, Wang, Wang & Huang, 2006; Zakrzewski & Bull, 1998). Furthermore, online formative assessment can help reduce the level of anxiety among students before summative assessment (Cassady & Gridley, 2005). Due to the asynchronous nature of online learning contexts, instructors can use formative assessment to enhance interactivity between students and other students, and between students and the instructor (Vonderwell, Liang & Alderman, 2007). Achieving desirable levels of effective formative assessment

requires online instructors to rethink their online teaching strategies to support meaningful learning and assessment. In this regard, the current study set out to investigate the effectiveness of different types of formative assessment and feedback mechanisms in online learning environments.

Review of Literature

Online learning platforms present a myriad of opportunities for assessing students' learning progress (Anderson, 2008). These opportunities involve both the teacher and students. A Learning Management System (LMS) will tend to provide tools and opportunities to exploit the expertise and influence of students in assessing the progress and work of other students in the same course. This is commonly known as peer-assessed assignments (PAAs). Computer-marked assignments (CMAs), on the other hand, make use of machine algorithms to evaluate learning outcomes as well as allow students to reflectively assess their own learning. Results obtained from one study revealed that instructors can use asynchronous online discussions to assess students' self-regulatory activities, autonomy, communities of inquiry, and writing skills (Vonderwell et al., 2007). In another more recent study, findings suggested that online formative assessment is associated with gains in students' achievement scores (McLaughlin & Yan, 2017). Additionally, the study indicated that formative assessment promotes the development of complex cognitive processes like self-regulation. The study concluded that formative feedback has the potential to encourage student engagement, bolster student enthusiasm to learn, and lead to improved academic achievement (McLaughlin & Yan, 2017). This study adds knowledge to past research by focusing on student perceptions of CMAs, PAAs, and teacher-marked assignments (TMAs).

Another study investigated the association between students' participation in unsupervised online quizzes and course outcomes in the summative examination (Kibble, 2007). Results showed that student scores in the online quizzes were significantly positively correlated with corresponding summative assessment scores. In addition, the study found that students who chose not to participate in the formative quizzes performed significantly lower on the same summative assessment compared to those students who used at least one online quiz to assess their learning progress. Students who repeatedly engaged in the reflecting, practising and revising process by participating in online formative assessment generally observed more gainful prompt feedback, and identified and corrected misconceptions that they might have held in a particular subject area (Wang, 2010). Research also indicates that effective instructional activities allow instructors to engage students in informal instructional dialogues as a form of formative assessment conversation (Ruiz-Primo, 2011). Online learning platforms offer a variety of asynchronous and synchronous tools like discussion fora and instant messaging to facilitate such informal instructional transactions. These findings concur with those from another study which suggested that formative assessment fosters collaborative learning as well as peer-feedback in cases where students are tasked with critiquing other students' submissions (McCarthy, 2017). The current study focused on discussion forums as one of the viable instructional dialogue platforms that instructors can use to assess student learning progress.

In an experimental study, Hwang and Chang (2011) found that formative assessment-based mobile learning approach had a significant effect on student learning interest as well as their learning achievement. Another experimental study found that students in the formative assessment test group generally learned more and showed more positive attitudes towards learning materials and future learning (Lawton et al., 2012). Therefore, using formative assessment that emphasise essential concepts can significantly impact learning outcomes in online courses (Lin & Lai, 2013; Wang et al.,

2006). In other words, effective online formative assessment can help achieve learner-centeredness in online courses and enhance student engagement in the course to realise meaningful learning experiences (Gikandi, Morrow & Davis, 2011). In blended learning settings, formative assessment is also shown to predict student course outcome (Klinkenberg, 2017). These findings are important as they give an indication that the use of formative assessment has the potential to motivate learners' interest in an online course as well as improve their learning outcomes.

Another study found significant differences in the way students and teachers perceived feedback practices (Havnes, Smith, Dysthe & Ludvigsen, 2012). Teachers rated the quality of feedback higher than students. Moreover, teachers also reported to have used more feedback than students did. It would seem, therefore, that what teachers considered as high-quality feedback did not necessarily translate to high-quality feedback for most students, leading to the conclusion that teachers overestimated the quality of feedback and usage of feedback by students. In addition, teachers in this study were found to lack systematic strategies required to implement feedback given to students. In this regard, the current study examined student perceptions of various assessment tools used in online education to help guide instructors' use of systematic strategies in assessment of online courses. Understanding student perception of different forms of formative assessment used in online courses is critical in helping teachers to utilise tools that students perceive positively. This can reduce biases that students might have towards a particular form of formative assessment.

Distance learning is characteristically different from other forms of education by the fact that students and instructors are separated by distance and sometimes by time. For this reason, instructors need effective instructional strategies which involve leveraging technological innovations like Computer-Marked Assignment (CMA) to increase student interest in distance learning (Tshibalo, 2007). Formative assessment tasks linked to CMA include interactive exercises and feedback mechanisms like onscreen marking, use of databases to keep students' progress report, and using email to send feedback to students on coursework. Another study found that technologies can be used in the classroom to impact the effectiveness and quality of teaching and learning in a way that improves metacognitive skills (Michael & Mayende, 2014). Online instructors can also use learning analytics to assess student behaviour and learning in online learning environments to improve instructional design and feedback in ways that promote meaningful learning (Martin & Ndoeye, 2016). To add onto this knowledge, the current study is based on the premise that online instructors need to take advantage of technological advancements in education to make formative assessment more effective.

Whereas eLearning is steadily growing and gaining popularity in Kenya, a study revealed that universities in Kenya are faced with infrastructural and economic challenges which inhibit the successful implementation of eLearning (Nyerere, Gravenir & Mse, 2012). Another study by Njoroge and Kibaru (2012) discussed the quality of educational processes, products, and services. Kenya, as an emerging economy and at its infant stages in online learning implementation, is faced with numerous challenges related to the development, design, and implementation of quality online learning environments (Njoroge & Kibaru, 2012). This paper holds that effective use of formative assessment is one of the critical ways needed to achieve the desired status and rigour that will make online education credible and authentic. While previous studies conducted in Kenya have highlighted infrastructural challenges facing eLearning implementation in higher education in the country, this study found it necessary to explore student perception of formative assessment. That decision was informed by the need to provide insight into the instructional practices employed in eLearning in a higher education institution in the country.

Sims, Dobbs and Hand (2002) noted that the level of understanding among teachers, students, and developers of formative assessment tools impacts the overall effectiveness of the learning process.

In this study, the effectiveness of formative assessment was gauged based on: (1) how students perceived the difficulty level of various types of formative assessment, and (2) how students perceived feedback provided by the eLearning system, peers, and course lecturers. The definition of formative assessment is largely operationalized from Blair and Valdez Noel (2014) study of formative assessment in higher education. Past studies have paid a great deal of attention to the effective use of feedback for enhanced student learning. However, the current study found no single research looking at effectiveness based on the specific forms of formative assessment and feedback mechanisms used in eLearning environments. Therefore, the current study aimed to fill this gap by investigating student perceptions of the different forms of formative assessment as well as the effectiveness of feedback mechanisms used in online learning environments.

Methodology

Based on the need to examine student perceptions of the effectiveness of different formative assessment tools used in online education, descriptive design was deemed a suitable choice for the study. Descriptive research captures participants' attitudes, behaviours, beliefs, and perceptions regarding current issues and trends (Lodico, Spaulding & Voegtle, 2010). The study was conducted in 2015 among undergraduate students enrolled in online programs offered by faculties of science and business at the eCampus, which is a virtual campus of Maseno University in Kenya. A total of 100 undergraduate students were randomly selected to participate in the study from a possible 451 undergraduate students enrolled in eLearning courses. Students were aged between 20 and 24 years. Out of a sample of 100 students, 72 students completed and submitted the online survey. This translates to 72 per cent response rate. The online questionnaire contained 31 closed-ended question items. Questionnaire items were constructed from concepts related to formative assessment and feedback mechanisms identified from existing literature. Subject experts in eLearning, distance education and measurement and evaluation helped in the determination of construct validity of the questionnaire items. A reliability of .76 was obtained for the questionnaire using the test-retest method. The questionnaire items required students to respond to statements relating to: (i) perceived level of difficulty of quiz types, (ii) perceived level of difficulty of assignment types, (iii) immediacy of feedback, and (iv) preferred feedback mechanism. The first 12 closed-ended questionnaire items relating to perceived difficulty of quiz types were based on a 5-point Likert-like scale ranging from very difficult (=1) to very easy (=5). The second 12 items testing perceived level of difficulty of assignment types were rated on a 5-point Likert-like scale ranging from very difficult (=1) to very easy (=5). The third three items on immediacy of feedback were rated on a 6-point Likert-like scale ranging from never (=1) to instantly (=6). The last four items on preferred feedback mechanisms were rated on a five-point Likert-like scale ranging from never (=1) to always (=5). Rating scales such as those used in this study help the researcher to determine the extent to which respondents agree or disagree with the survey items (Johnson & Christensen, 2008; Muijs, 2010). The quantitative data were analysed using SPSS to gain an insight into student perceptions of effective formative assessment and feedback mechanisms used in online learning environments.

Findings

Findings are presented using descriptive statistics based on mean scores (M), standard deviation (SD), frequency counts, and percentages. Students were asked to rate the following five different types of quizzes on a 5-point Likert-like scale (1=very difficult, 2=difficult, 3=somewhat difficult,

4=easy, and 5=very easy) to determine the level of difficulty students attached to each quiz type. Students rated the different quiz types as follows: multiple choice quizzes (M=3.74, SD=.949), true or false quizzes (M=3.71, SD=.941), matching quizzes (M=3.47, SD=.888), and gap filling (M=3.40, SD=.850). These findings are further summarised in Table 1. Based on these findings, most students favoured the use of multiple choices and true and false statement type of quizzes compared to teachers' use of matching quizzes and gap filling for formative assessment.

The second set of closed-ended items revealed that students perceived assignment type as follows: posting on discussion forums (M=3.76, SD=.831), peer-assessed assignments (M=3.57, SD=.885), offline assignments (M=3.51, SD=.993), essay-type assignments (M=3.36, SD=.909), ePortfolio type assignments (M=3.31, SD=1.043), wiki-type assignments (M=3.24, SD=1.055), reflection-type assignments (M=3.19, SD=1.043), and database-type assignments (M=3.08, SD=1.004). Table 2 gives a summary of these findings. From the data, it is apparent that students positively perceived graded online discussions and peer-assessed assignments compared to other types of formative assessments.

Finally, the researchers sought to establish student perceptions of the promptness of feedback from teacher-marked assignments (TMAs), computer-marked assignments (CMAs), and peer-assessed assignments (PAAs). The items were rated on a 6-point Likert-like scale including never = 1, in a month = 2, in a week = 3, in a few days = 4, in a few hours = 5, and instantly = 6. The following were their responses: receiving feedback on CMAs (M=4.07, SD=2.009), PAAs (M=3.93, SD=1.523), and receiving feedback on TMAs (M=2.19, SD=1.206). The frequencies of these are contained in Table 3. Evidence from this section suggests that students felt that CMAs provided the most prompt feedback to completed assignments followed by peer-assessed assignments. Students indicated that they were less likely to receive feedback from TMAs.

Results further revealed that students enrolled in eLearning courses preferred to receive feedback in certain forms. Table 4 summarizes the findings. Students preferred to receive feedback from the instructor on formative assessment tasks in the form of summary of key areas to improve on (M=4.50, SD=.856), word processed documents with tracked comments from the instructor (M=4.42, SD=1.071), comments from peers (M=3.82, SD=1.155), and face to face to feedback (M=2.68, SD=1.442). The findings are discussed in depth in the subsequent subsection.

Table 1: Summary of Student Perceived Level of Difficulty of Quiz Types

Quiz Type	Descriptive	Very Difficult	Difficult	Somewhat Difficult	Easy	Very Easy
Multiple-Choice	Frequency	2	6	14	37	13
	Percentage (%)	2.8	8.3	19.4	51.4	18.1
True/False	Frequency	3	4	15	39	11
	Percentage (%)	4.2	5.6	20.8	54.2	15.3
Gap Filling	Frequency	3	6	24	37	2
	Percentage (%)	4.2	8.3	33.3	51.4	2.8
Matching	Frequency	3	4	27	32	6
	Percentage (%)	4.2	5.6	37.5	44.4	8.3

Table 2: Summary of Student Perceived Level of Difficulty of Assignment Types

Assignment Type	Descriptive	Very Difficult	Difficult	Somewhat Difficult	Easy	Very Easy
Essay	Frequency	2	11	22	33	4
	Percentage (%)	2.8	15.3	30.6	45.8	5.6
Offline	Frequency	3	8	19	33	9
	Percentage (%)	4.2	11.1	26.4	45.8	12.5
Peer-Assessed	Frequency	3	3	23	36	7
	Percentage (%)	4.2	4.2	31.9	50.0	9.7
ePortfolio	Frequency	6	7	24	29	6
	Percentage (%)	8.3	9.7	33.3	4.3	8.3
Reflection	Frequency	6	9	28	23	6
	Percentage (%)	8.3	12.5	38.9	31.9	8.3
Discussion Forums	Frequency	2	2	17	41	10
	Percentage (%)	2.8	2.8	23.6	56.9	13.9
Wikis	Frequency	6	8	28	23	7
	Percentage (%)	8.3	11.1	38.9	31.9	9.7
Database	Frequency	5	15	24	25	3
	Percentage (%)	6.9	20.8	33.3	34.7	4.2

Table 3: Summary of Student Perceived Immediacy of Feedback

Assessment Type	Descriptive	Never	In a month	In a week	In a few days	In a few hours	Instantly
Computer-Marked Assessment	Frequency	8	18	5	5	2	34
	Percentage (%)	11.1	25.0	6.9	6.9	2.8	47.2
Teacher-Marked Assessment	Frequency	25	26	6	12	3	0
	Percentage (%)	34.7	36.1	8.3	16.7	4.2	0.0
Peer-Assessed Assignments	Frequency	19	12	9	22	7	3
	Percentage (%)	26.4	16.7	12.5	30.6	9.7	4.2

Discussion

A summary of student responses to types of online formative quizzes in Table 1 shows that most students perceived the various types of formative assessment as easy, and also very easy to attempt. More particularly, students perceived multiple-choice quizzes and true/false assignments as easy to attempt. This can be explained by the fact that these two types of assessment offer them

Table 4: Delivery Mechanism of Feedback on Formative Assessment

Feedback Mechanism	Descriptive	Never	Rarely	Sometimes	Most of the Time	Always
Face-to-Face Delivery	Frequency	39	17	9	7	0
	Percentage (%)	54.2	23.6	12.5	9.7	0.0
Tracked Word Comments	Frequency	5	0	2	18	47
	Percentage (%)	6.9	0.0	2.8	25.0	65.3
Summary on Areas of Improvement	Frequency	1	2	5	16	48
	Percentage (%)	1.4	2.8	6.9	22.2	66.7
Comments from Peers	Frequency	5	3	16	24	24
	Percentage (%)	6.9	4.2	22.2	33.3	33.3

the opportunity to make a reasonable choice of the option that best answers the question items provided. Instructors can take advantage of students' positive attitude towards multiple-choice and true and false formative assessment types to repeatedly engage students and have them reflect on their learning and align their perspectives with facts covered in a course and assessed through a well-thought out comprehensive assessment that tests all the key areas covered in a course (Wang, 2010).

For assignment types, Table 2 indicates that most students rated posting on discussion forums, peer-assessed assignments, offline assignments, and essay-type assignments higher than other types of formative assignments. These findings can serve as student voices on what types of formative assessment they perceive to be effective in testing the knowledge and skills they have acquired in a particular subject area. This can help online instructors to gain insight into the types of assignments students prefer in virtual learning environments (VLEs) as well as inform pedagogical practices in such diverse learning environments. As Blair and Valdez Noel (2014) note, this is critical for sustaining effective teaching and learning processes. In addition, these findings are consistent with the findings of studies which identified the use of projects, self-assessment, weekly assignments, peer evaluations, discussion forums, and portfolios as effective online assessment techniques (Gaytan & McEwen, 2007; Gikandi et al., 2011).

Findings of this study imply that CMAs provide students with more immediate feedback than PAAs and TMAs. Most students who participated in the study reported that they received instant feedback from CMAs. This is possibly so because CMAs, especially multiple-choice tests, are designed to randomize test items and provide prompt feedback (Thelwall, 2000). According to Thelwall, this can substantially improve a student's motivation to study as well as have a positive impact on his study strategy to include increased revision. The implication, ostensibly, is immediacy of feedback to motivate students to study beyond the normal classroom hours. This is tied to research which emphasises the need to have online instructors deliver prompt feedback to students to facilitate meaningful learning.

For meaningful learning to occur, online instructors need to provide feedback packaged in a manner that makes sense and allows students to correct their misconceptions. Good practice, therefore, should help set apart high performance from low performance (Nicol & Macfarlane-Dick, 2006). Based on the findings summarised in Table 3, this study found that students perceived receiving

feedback as a summary of key areas for them to improve on as most effective. Students also rated highly the feedback received as comments made on word processed assignments. It is, however, important to note that students rated receiving feedback from their peers and through face-to-face sessions as less effective. Packaging feedback in this way provides scaffolding to students (Fluckiger, Vigil, Pasco & Danielson, 2010). This finding is also consistent with the assertion that effective feedback should aim to help students to fully understand their own learning as well as keep track of their progress and attainment of educational goals (Elwood & Klenowski, 2002; Fluckiger et al., 2010; Russell, Elton, Swinglehurst & Greenhalgh, 2006).

The findings also indicated that students perceived feedback from CMAs as more prompt compared to that from PAAs and TMAs. Online instructors should, therefore, find ways of using computer-aided marking technologies to ensure that students receive immediate feedback which provides a variety of opportunities to examine their learning progress and close gaps between their current and future academic performance (Gikandi et al., 2011). Feedback provided to students need to be self-referenced to motivate them towards making improvements. Additionally, peer assessors are likely to provide timely feedback than teachers because they are available to students and are easily perceived as non-threatening. In cases where peer assessment is well designed, it promotes reflection among students. Feedback from peer assessors is rich and open to negotiations to achieve better understanding of concepts that one might have previously misunderstood (Topping, 2010).

Conclusion

This study has yielded significant findings for instructors in tertiary and higher education institutions who would like to vary the type of formative assessment they use while leveraging on positive student perceptions of the effectiveness of the assessment tools used. The findings suggest that students perceive the use of multiple-choice quizzes, true/false quizzes, matching quizzes, gap filling quizzes, e-portfolio, peer assessment, wikis, weekly assignments, offline assignments, essay types assignments, reflection, and database type assignments as effective tools of formative assessment in online learning settings. Instructors should therefore take advantage of the affordances associated with learning management systems to enhance their teaching as well as student learning experience. This, as the findings indicate, is achievable by providing prompt and meaningful feedback to student completed tasks, encouraging students to engage with their peers in peer-assessed assignments, as well as leverage computer-assisted technologies to mark and give feedback to students in a way that ensures immediacy and subsequently enhances student learning experience.

Implications for Practice

Instructors can use online formative assessment types, especially practice tests, to ease students' anxiety towards exams while preparing them for summative course exams. Effective use of formative assessment can thus aid undergraduate online instruction in ways that improve student confidence. Additionally, formative assignments like CMAs can be used to increase instructional time, and help students revise and challenge their misconceptions. Finally, it is imperative that instructors explore the use of CMAs and PAAs to ensure prompt and meaningful feedback, and support collaborative learning and reflection among undergraduate students enrolled in online courses. The results of this study can also be relied upon by instructional designers to design more interactive and engaging eLearning courses. However, the results of this study are limited to the extent of their generalizability to settings with more advanced educational technology tools and more innovative and integrated

transition models from traditional instructional methods to twenty-first century instructional strategies that guarantee student autonomy.

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