

Improve Student Learning Using Online Formative Assessment System

Shanshan Hu

School of Science
Waterford Institute of Technology
Waterford, Ireland
Selina0309@hotmail.com

Yonghua Xie

Institute of Computer Science
Nanjing University of Information Science & Technology
Nanjing, China
Yonghua@nuist.edu.cn

Abstract—This paper aims to explain the key factors of an online assessment system that can effectively improve student learning. Some of the key literatures with regard to the style of online assessment and feedback were reviewed. The goal of the study is to conduct a survey questionnaire in order to collect data for analysis to address the research question. The research results show that the key factors of an online assessment system that can effectively improve students learning are providing instant and detailed feedback, using formative style assessment, and providing a communication tool between students and teachers.

Keywords—online assessment; formative assessment; learning improvement; questionnaire feedback

I. INTRODUCTION

With the development of the Internet and multimedia technologies, online assessment systems become more and more popular and have been widely used in education and training. Online assessment is an entirely automated process of delivering and marking assessments using Web or Internet resources [1], compared with traditional assessment. It has many advantages, such as increasing the frequency of assessment, broadening the range of knowledge assessed, extending the range of assessment methods, increasing feedback to students and lecturers, decreasing marking loads and aiding administrative efficiency [2].

Nowadays, most of the online assessment systems are part of the functions within LMSs (Learning Management Systems). LMSs have lots of functionalities, such as course management, discussion board, message center, calendar setting etc, which focus more on supporting learning content management for instructors rather than providing a direct and efficient way to help learners to improve their learning. And also, some of LMSs are complicated to use and take long time to learn. The more feature-rich an individual tool becomes, the more it loses its usefulness to the average user [3]. Assessment systems dominate what students are oriented towards in their learning. Even when lecturers say that they want students to be creative and thoughtful, students often recognize that what is really necessary, or at least what is sufficient, is to memorise [4].

Previous research found that from lectures point of view, assessment can be as a means of motivating students, ensuring that students worked hard, covering the learning material in the syllabus and learning it. The importance of assessment is to grade students, give them feedback on how

well they were doing and point out the areas where students need to improve in future study [5].

This paper is organized as follows: Section 2 and 3 provides literature review for present research. Section 4 outlines the methodology used for gathering and analyzing the data. Section 5 presents the analysis of the data as per the various research objectives mentioned above and discusses the findings and results. Section 6 provides conclusions which summarise the implication of the research.

II. FORMATIVE ASSESSMENT VS SUMMATIVE ASSESSMENT

Assessment can be either formative or summative. The formative assessments are done during instruction to provide feedback to the instructors about the students' progression which allow them to respond to ongoing learning needs by modifying their instructional approaches. Formative assessments also provide immediate feedbacks to students which can enhance their learning [6]. While the summative assessment is a test which usually given at the end of a unit, the end of a course, or the end of the year, in order to summarize student learning and the effectiveness of the instructional program [7]. After a summative assessment, students are given a grade or score.

Light and Cox suggested that summative assessment measures student achievement and formative assessment enhances learning [8]. In addition, Brookhart summarised the difference between summative and formative assessment, summative assessment means information gathered and reported for use in judging the outcome of that development, and formative assessment means information gathered and reported for use in the development of knowledge and skills [9]. There is also a saying from Black and William, "When the cook tastes the soup, that's formative assessment; when the customer tastes the soup, that's summative assessment" [10].

David Boud and Nancy Falchikov argued that current assessments focus more on using summative assessment to assess students at the end of their learning period for purpose of certifying achievement than using formative assessment to help students to learn from assessment experience in order to improve their performance, so that makes student interested in how much results they get rather than the content they are studying [11]. Passing the exam becomes more important than learning knowledge in the subject. Assessment should be more than merely a test at the end of instruction to see

how students perform under special conditions; rather, it should be an integral part of instruction that informs and guides teachers as they make instructional decisions. Assessment should not merely be done to students; rather it should also be done for students, to guide and enhance learning [12].

The main purpose of assessment is to provide learners with feedback about their performance to enhance their learning. Therefore, shifting the focus from summative assessment to formative assessment is required to support this purpose. For instructors, they need to change their instruction model from the traditional instructor-centered model to the student-centered model, integrate formative assessments into instruction, and help students to get more benefits from their assessment experiences, which can develop their learning skills.

III. IMPORTANCE OF INSTANT AND DETAILED FEEDBACK

Feedback is information about the gap between the actual level and the reference level of a system parameter which is used to alter the gap in some way [13]. It is the lifeblood of learning [14], and potentially the most important part to support student learning in online assessment process. Feedback offers the opportunity for students to identify specific difficult areas [15], which means it can reflect on what students have learned, and what they still need to learn in order to focus learning and improve learning outcomes.

Benson suggested that there are two key benefits of online assessments, which are the ability of every learner to respond to every question the instructor asks and the ability of the instructor to provide immediate feedback to each learner [16]. Compared with the traditional learning environment, when the instructor asks a question, the first student to answer is typically afforded the sole opportunity to provide an answer.

In the case of automatic feedback, in a program that is integral to several online delivery systems (e.g. WebCT and Blackboard), the learner is provided with a summative grade, as well as corrective feedback as the learner completes each question. For example, the feedback might provide additional information or direct the learner to related content for further study [16].

In addition, Buchanan suggested that instant feedback can improve interaction between student and instructional materials [17], and also Yorke suggested that feedback can contribute to student development and retention [18], however, Gibbs argued that instant feedback is time-consuming for many academic staff [19], but the features of online assessment that lead to instant gratification for students in the form of instant feedback [20].

As we can see from Gibbs and Simpson's eleven conditions in which assessment supports student learning effectively [21], seven of the conditions (condition 5 - 11) concerned feedback, which means feedback plays an extremely important role in assessment. Especially, condition 5 and 6 suggested that in order to support student learning effectively, sufficient feedback should be provided quickly and with enough details.

In the e-learning environments, learners work remotely from both instructors and peers, so it is important to provide them instant feedback to their assessments in order to improve their learning performance. Using assessment with instant feedback in e-learning environments means that after a learner answered the assessment question, he/she can receive the response and the answer to the question immediately and the response will show the learner if his/her answer is correct. This instant feedback to learners provides relevant learning experience which can help learners to effectively analyse on what they have learned and enhance their learning outcomes. In addition, learners understand and retain information most effectively when they acquire it actively and when they receive immediate feedback to validate knowledge they understand accurately and correct misconceptions [22]. Each stage of learning builds upon the previous stage, so the more immediate the feedback the better. If no feedback is given, then the next stage of learning may build upon misconceptions.

IV. RESEARCH METHOD

In current research, quantitative research methodology was used, a survey questionnaire was conducted to collect data and Excel was used to analyze data.

Using quantitative research method for present study is that the quantitative research can eliminate the subjectiveness of the qualitative method. The results from quantitative experiments can be seen as real and unbiased, as they are more accurate and objective. Quantitative research results are easy to be summarised and analysed, and researching a small group can give a reliable indication of the views of a large population. The first step in the quantitative analysis process is to count and rank the responses on the basis of frequencies. The second step is to calculate percentages.

The process of collecting the data used a specifically designed questionnaire in accordance with the research objectives. Firstly, 40 respondents were chosen randomly from students who are studying at WIT and IT Carlow, 20 from WIT and 20 from IT Carlow. The reason for selecting the respondents from the local county is to save cost and time and also for the ease of collecting data. The questionnaires were given to various respondents who were expected to fill the questionnaire and returned back to the researcher.

The questionnaire requires each of the respondents to grade a perceived/expected requirement on 1-5 Likert scale. A Likert scale consists of several declarative items that express a view point on a topic. Respondents were asked to indicate the degree to which they agree or disagree with the opinion expressed by the statement [23]. The statements are related to students' level of agreement on instant and detailed feedback, preference on continue assessment and final exam, and level of importance on different functions in an online assessment system. The respondent's perception to the level of agreement on instant and detailed feedback and the preference on continue assessment and final exam have the following possible responses out of which he/she has to choose one.

- 1 = Strongly Disagree
 2 = Disagree
 3 = Neither
 4 = Agree
 5 = Strongly Agree

The level of importance on different functions in an online assessment system which he/she considered has the following five possible responses out of which he/she has to choose one.

- 1 = Completely unimportant
 2 = Not important
 3 = Neither
 4 = Important
 5 = Very important

All the respondents were asked to finish the questionnaires personally and independently within 15 minutes. After collection of all the questionnaires, the researcher checked each questionnaire to make sure whether it is valid to be analysed or not, and the researcher was able to collect usable data only from 33 respondents, so this is the effective number of respondents for the present research.

The data collection using the questionnaire for the present research study was a collection of non-numerical data. All these non-numerical data were converted into numeric values, then recorded and calculated using Excel Spreadsheet for the purpose of analysis.

Descriptive statistic analyses are used in current research as it is aimed primarily at describing the data. The major concern of descriptive statistics is to present information in a convenient, usable, and understandable form. Once data have been collected, the first things that the researcher did was to calculate their frequency.

V. FINDINGS AND RESULTS

This section describes the analysis of the data that were taken from the questionnaire.

A. Level of agreement on instant and detailed feedback

In order to prove that instant and detailed feedback can improve student learning, respondents were asked to give the level of agreement with the statements which are related to instant and detailed feedback based on their experience.

In table I, three questions are listed for the students as follows. Q1: If the feedback can not be given instantly after assessment, I may forget what I have been assessed soon; Q2: If feedback can be given immediately after assessment, It will be effectively for me to validate knowledge that I understand accurately and correct misconceptions; Q3: Detailed feedback comments can help me to better understand learning material. It can be seen that 30.3% of the respondents strongly agreed and 33.3% agreed that if there is no instant feedback given after assessment, they may forget what they have been assessed soon. In addition, almost half (42.4%) of the respondents strongly agreed and 36.4% agreed that the instant feedback can effectively help them to validate knowledge that they understand accurately and correct misconceptions. These figures indicate that the importance of timely feedback. Table I also shows that 39.4% of the respondents strongly agreed and 45.5% agreed

that the detailed feedback can help them to better understand learning material. According to the eleven conditions in which assessment supports student learning [21], condition 5 mentioned that sufficient feedback should be provided with enough details to improve student learning. Furthermore, condition 6 mentioned that the feedback should be provided quickly enough to be useful to students in their study before they move on to next stage. Based on the analyzed data in table I, we can find that for most of the respondents, instant and detailed feedback can improve their learning.

TABLE I. LEVEL OF AGREEMENT ON INSTANT AND DETAILED FEEDBACK

Question	Strongly Disagree	Disagree	Neither	Agree	Strongly Agree
Q1	0.0	6.1	30.3	33.3	30.3
Q2	0.0	6.1	15.2	36.4	42.4
Q3	0.0	0.0	15.2	45.5	39.4

B. Preference on continue assessment and final exam

As mentioned in section two, formative assessments are done during instruction [10], which are the continue assessments. Blackhart identified that the summative assessment is a test usually given at the end of a unit, the end of a course, or the end of the year which is the final exam [7].

TABLE II. PREFERENCE ON CONTINUE ASSESSMENT AND FINAL EXAM

Question	Strongly Disagree	Disagree	Neither	Agree	Strongly Agree
Q1	0.0	12.1	30.3	24.2	33.3
Q2	0.0	12.1	24.2	27.3	24.2
Q3	0.0	12.1	15.2	24.2	48.5
Q4	9.1	18.2	30.3	27.3	15.2
Q5	0.0	0.0	0.0	27.3	72.7
Q6	0.0	0.0	0.0	3.0	97.0
Q7	3.0	6.1	21.2	30.3	39.4

Table II compares the preference for continue assessment and final exam, and the analysis was used to validate formative assessment can better enhance student learning than summative assessment. The questions cover seven aspects which include Q1: Using continue assessments to make up the total marks makes me to spend more time on study rather than only take the final exam; Q2: If there is no continue assessment, I will only study hard few weeks before the final exam; Q3: The feedback of a continue assessment is very helpful to improve my study; Q4: Normally, I can get detailed feedback after continue assessment; Q5: It takes few weeks to get the result of the final exam; Q6: The feedback of a final exam is only a score, no detailed comments at all and Q7: I don't care if there is any detailed feedback of the final exam except I failed, as I have already finished. It shows that most of the respondents strongly agreed (33.3%) or agreed (24.2%) that the continue assessment can make them to spend more time on study than only take the final exam, and there are 24.2% of the respondents strongly agreed and 27.3% agreed that if there is no continue assessment, they will only study hard for few weeks before the final exam, which means that using formative assessment can make students spend more time on study than summative assessment. Based on the "time on task" principle [24],

Gibbs and Simpson argued that if students don't spend enough time and effort on something they won't learn it [21].

Furthermore, it can be inferred from this table that 48.5% of the respondents strongly agreed and 24.2% agreed that the feedback of continue assessment is very helpful to improve their study. In addition 15.2% of the respondents strongly agreed and 27.3% agreed that they can get detailed feedback from continue assessment, which means that almost half of the respondents thought that the formative assessment can provide them with detailed feedback.

However, 72.7% of the respondents strongly agreed and 27.3% agreed that it takes few weeks to get the result of the final exam, in addition 97% of the respondents strongly agreed and 3% agreed that the feedback of a final exam is only a score, no detailed comments at all, which means that the summative assessment can not provide students with instant and detailed feedback. However, 39.4% of the respondents strongly agreed and 30.3% agreed that they do not care if there is any detailed feedback of the final exam except they failed, as they have already finished, which shows that most of respondents ignore the detailed feedback from summative assessment, as they think they will never be asked to re-do the same task. According to the eleven conditions in which assessment supports student learning [21], condition 10 mentioned that in order to improve student learning, feedback should be received by students and attended to. The purpose of assessment and feedback is to help students to address their weakness in order to improve their learning, if students ignore the feedback, they will lose the opportunity to identify specific difficult areas that they still need to focus to improve their learning outcomes.

The results of analyzed data in table II reveal that using formative assessment can make students to spend more time on study rather than summative assessment, which improves student learning. Moreover, formative assessment provides students with more detailed feedback, and summative assessment can only provide students with score and students normally ignore the feedback from summative assessment. Research results from table I which argues that instant and detailed feedback can improve student learning, therefore formative assessment can better enhance student learning than summative assessment.

C. Level of importance on functions in online assessment system

In order to find out what functions should be included in the online assessment system to satisfy users' needs, respondents were asked to rate the level of importance on functions in an online assessment system.

Table III presents eight possible topics of level of importance on functions in an online assessment system, which include T1: Feedback from the system after assessment; T2: A communication tool; T3: Easy-to-use interface; T4: Review past assessments; T5: Able to give feedback to instructors; T6: Security of the system; T7: Accessible at anytime & anywhere and T8: Speed of the system. It shows that all (100% = 63.6% + 36.4%) of the respondents considered that it is very important / important

to provide feedback from the system after assessment. 90.0% (69.7% + 21.2%) of the respondents considered that it is very important / important to provide a communication tool within the online assessment system. 100% (72.7% + 27.3%) of the respondents considered that it is very important / important for the system to have an easy-to-use interface. 78.8% (45.5% + 33.3%) of the respondents considered that it is very important / important to allow users to review past assessments. 72.8% (36.4% + 36.4%) of the respondents considered that it is very important / important to allow users to give feedback to instructors. 100% (78.8% + 21.2%) of the respondents considered that the security of the system is very important / important. 94% (57.6% + 36.4%) of the respondents considered that it is very important / important for the system to be accessed at anytime and anywhere. 100% (66.7% + 33.3%) of the respondents considered that the speed of the system is very important / important.

TABLE III. LEVEL OF IMPORTANCE ON FUNCTIONS IN AN ONLINE ASSESSMENT SYSTEM

Topic	Completely unimportant	Not important	Neither	Important	Very important
T1	0.0	0.0	0.0	36.4	63.6
T2	0.0	0.0	9.1	21.2	69.7
T3	0.0	0.0	0.0	27.3	72.7
T4	0.0	0.0	21.2	33.3	45.5
T5	0.0	0.0	27.3	36.4	36.4
T6	0.0	0.0	0.0	21.2	78.8
T7	0.0	0.0	6.1	36.4	57.6
T8	0.0	0.0	0.0	33.3	66.7

Overall findings suggest that for the largest percentage of respondents (more than half), instant and detailed feedback can improve their learning and formative assessment can better enhance their learning than summative assessment. Most of the respondents considered that an online assessment system which can improve their study should be a secure system which has an easy-to-use interface, can be accessed anytime and anywhere at a high speed, be able to provide feedback after assessment, allow them to review past assessments and give feedback to instructor. They also considered that it is very important that the system provides a communication tool to enhance their participation.

VI. CONCLUSION

The research results will help people to understand that the effectiveness of an e-learning system is not judged by how many functions it can carry out. A good e-learning system should be designed as a learner-centered system which is easy to use and support learners to learn effectively during their study process. The research results can be used to help the e-learning system developers to consider how to design an e-learning system which can meet learners' learning requirements, enhance their learning experiences and improve their learning outcomes. In addition, the results can also be used to help learners to choose the e-learning system which best suits their needs.

A learner-centered formative assessment system will bring learners an innovative way of study, It will not only be able to support student learning in education industry, it can also be used by companies for training purpose.

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