

Moodle quizzes in the learning environment

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Abstract

One of the more dynamic functions that Moodle has to offer is the quiz module which allows the creation of quizzes with different types of questions. These questions can be adapted to specific learning outcomes / objectives which can contribute to the teaching – learning process. Currently in Wawasan Open University (WOU), the use of the quiz module as a teaching or learning tool is kept at a minimum since there are no university policies encouraging the use of Moodle quizzes for teaching purposes. Academics are, however, encouraged to use whatever means necessary to enhance the learning experiences of the learners. Moodle quizzes are used primarily as a non-graded self-assessment tool in the learning environment of WOU. The quiz module has been diligently used in the elementary Microeconomics course since 2007 for the purposes as stated earlier. As there is a constraint in time, this paper will compare the performances of two cohorts of learners in two different semesters all of whom are first year learners. This paper focussed on analysing the learners' answers and performing a psychometric analysis of the appropriateness and quality of the questions used in the quizzes in achieving the learning outcomes. The questions are generally appropriate with the ability to discriminate between good and bad students. However, further fine-tuning is necessary for improving the tool. It is possible to use them as assessment tools within the context of open and distance learning environment. However, there are a lot of preliminary work that needs to be done on the design of the quizzes so that the tool is more effective.

Keywords: moodle quiz, self-assessment, learning outcomes, learning pace

Introduction

Distance learning institutions face a difficult task when they have to provide the most conducive environment for their learners to perform. It goes without saying that the introduction of e-learning and information and communication technologies provides a new, but rather complex, framework for learning. It is essential to know how to put new activities into practice, as well as how to improve them through the assessment of their implementation. Wawasan Open University (WOU) has always promoted a student-centred system based on the student workload required to achieve the objectives of a study programme. These objectives should preferably be specified in terms of the learning outcome to be acquired. Learning outcomes are sets of competences, a dynamic combination of attributes, abilities and attitudes, expressing what the student will know, understand or be able to do after completion of a process of learning. Hence, in this context, e-learning tools provide an outstanding opportunity to enhance learning activities in the classroom in this era. With that in mind, this paper attempted to look into online assessment such as Moodle quiz to enhance the learning experience.

Background of study

This study was conducted on the learners of Microeconomics, an elementary level course that is offered by the School of Business and Administration at Wawasan Open University (WOU). The basis of the study is to look at the effectiveness of using the quiz module of the Modular Object-Oriented Dynamic Learning Environment (Moodle), an open source learning platform as a learning tool as well as assess the possibility of using them as formative or summative assessment.

There are a range of tools provided by Moodle to assist the teacher in teaching learners. The researcher focused his attention only on the quiz module. This module allows the creation of quizzes with different question types, adapted to the specific objectives to be achieved at any step in the teaching-learning process (Blanco et al, 2006). A powerful tool for monitoring and diagnosing a student's understanding, Moodle quizzes can contribute to the development of new strategies not feasible with the traditional paper-and-pencil exams.

The quiz module is one of the least used functions of Moodle in WOU. At the moment of this study, Microeconomics is the only course that uses Moodle quizzes as a learning tool. No marks are allocated for this activity. Quizzes have been used in this course since 2007 but due to time constraint only data from two semesters are analysed in this paper. There a total of 7 quizzes designed to be used for teaching Microeconomics to learners who are predominantly in their first year. The self-contained course material used for learning Microeconomics in WOU contains 5 units of study. The 7 quizzes were designed to coincide with the 5 units keeping the learning outcomes of each unit in line.

Each quiz contains 10 multiple choice questions with 4 options offering in this case strong feedback, that is, learners were given not only the knowledge of their own score, often described as "knowledge of results," they are also provided additional explanation.

Therefore, the feedback consists of the correct answer and an explanation on why the distracters are wrong. Gibbs and Simpson (2004) noted that it is acknowledged for many students, the only contact they have with their tutor is through feedback. And in this case, there is no tutor, only learner and quiz. This is necessary if we want to ensure the learners really learn from the quizzes. Knowing the correct answer alone is not enough to enhance the comprehension level of the learners. The quizzes allow for multiple attempts for learners to improve their understanding and there is no time limit imposed.

Review of literature

There are not many researches done in the area of Moodle quizzes and its effectiveness as an assessment tool. One of the early studies published on this topic found that frequently-quizzed students perform better in class, and they do so because they become more motivated and hence put in greater effort to learn (Fitch, Drucker and Norton 1951). Unfortunately, the quiz here is in reference to a face to face quiz and not one conducted in an online environment.

Blanco and Gianvort (2006) did a study on the use of Moodle quizzes for Mathematics and Statistics for first year engineering students. They concluded that Moodle quizzes are certainly useful to promote student involvement in these subjects. They also added that in order to help boost effectiveness in the learning process, the design of the quizzes for future use must taking into account the total results given by the psychometric analysis.

Quizzes as an assessment tool would entail provision of marks to ensure students would work at the quizzes diligently. When students have the ‘carrot’ of summative assessment (even if lightly weighted) they usually attempt all the questions (Jordan & Butcher, 2010). This makes sense as human beings do respond positively to incentives and marks tied to an activity would certainly draw interests among learners.

One of the issues with using quizzes in this study is that the researcher has used multiple choice questions in the quizzes. One is aware that multiple-choice exams are not the most suitable to provide information about the learning process (Gerfield, 2003). Nonetheless, it served its purpose for the sake of this study.

There were researches done to look into the possibility of learning from the quizzes themselves. Students can learn from the quiz instrument since they are able to attempt the quizzes multiple times as with the availability of instant feedback (Sagarra & Zapatta, 2008).

Methodology

The quiz module was activated for learners of the Microeconomics course in July 2013 and January 2014 semesters. There are a total of 7 quizzes used to enhance the learning experience of learners in this course. Of the 7, only Quiz 1 is used for this study as it is at the elementary level with a lower order thinking skills (LOTS) needed to attempt the quiz. The questions in this quiz test the learners on the knowledge level in the Bloom's Taxonomy. Table 1 shows a summary of the alignment between Bloom's Taxonomy and the questions in Quiz 1.

Table 1: Alignment of Bloom's taxonomy for each question

Bloom's Taxonomy	Questions
Knowledge	1, 2, 3, 4
Comprehension	7, 8, 9, 10
Application	5, 6,

Interestingly, only Quiz 1 has the highest number of learners taking part. The novelty of the quizzes seems to diminish as the semester progresses. This paper will not attempt to unravel the mystery of the diminishing interest in quizzes, at least not now.

A psychometric analysis of the questions in the quizzes would be done to evaluate the appropriateness of the questions. Psychometric analysis is a mathematical procedure which applies statistical principles for determining the suitability of the proposed questions based on the responses and their individual relationship with the rest of the answers, thereby detecting whether the proposed questions are appropriate to assess the level of knowledge, degree of difficulty and degree of discrimination between high and low conceptual skills (Heck, 2006).

A survey was conducted on the first year first semester learners of WOU in the two semesters; July 2013 (76 respondents) and January 2014 (86 respondents). Only those are enrolled in the Microeconomics course were included in this survey. At the moment, this is the only course that uses quizzes extensively for learning purposes. A series of statements were given in the survey with a 5 point Likert scale (1= strongly disagree, 5 = strongly agree). The survey evaluated the motivations for the learners in attempting the quizzes and the quality of the quizzes. This survey is important to investigate the learners' feedback on the quiz as a learning tool. Moreover, what is more important is whether the learners think that this is an effective tool for learning purposes. It is pointless to do something for the sake of doing it

Results and Discussion

Given the novelty of the technological tools and the pedagogical approach involved, a psychometric analysis and an analysis of learners' results are essential in this kind of assessment, all the more so because, the quizzes covered an important part of the syllabus of a Microeconomics course for undergraduate business students. For activities such as quizzes, Moodle not only provides the score and elapsed time, but also a

detailed analysis of each learner's responses and item analysis of the items themselves. Analysing each learner's response would not be feasible given the time constraint of the researcher.

Psychometric analysis of the questions

Moodle offers a range of resources to carry out a psychometric analysis of a particular quiz. One can conduct an assessment on the test (test statistics) whereby the whole quiz is evaluated or on the questions (question statistics) where individual questions are evaluated. In this section the researcher will attempt to analyse the psychometric quality of the questions in the quiz, which can help us to answer whether the questions are appropriate, well chosen to demonstrate concepts and of an appropriate level of difficulty and whether the questions discriminate between higher and lower student abilities.

This paper only looks at the individual questions in the test therefore the researcher has chosen three significant indices namely the Facility Index (FI), the Discrimination Index (DI) and the Discrimination Efficiency (DE). Item FI describes the overall difficulty of the questions. This index represents the ratio of users who have answered the question correctly. In principle, a very high or low FI suggests that the question is not useful as an instrument of measurement.

Table 2: Interpretation of Facility Index

Facility Index	Interpretation
5 or less	Extremely difficult or something wrong with the question.
6-10	Very difficult.
11-20	Difficult.
20-34	Moderately difficult.
35-64	About right for the average student.
66-80	Fairly easy.
81-89	Easy.
90-94	Very easy.
95-100	Extremely easy.

The discrimination index (DI) is the correlation between the weighted scores on the question and those on the rest of the test. It indicates how effective the question is at sorting out able students from those who are less able. Discrimination efficiency (DE) on the other hand attempts to estimate how good the discrimination index is relative to the difficulty of the question. The discrimination efficiency will very rarely approach 100%, but values in excess of 50% should be achievable. Lower values indicate that the question is not nearly as effective at discriminating between students of different ability as it might be and therefore is not a particularly good question. The results should be interpreted as in Table 3.

Table 3: Interpretation of Discrimination Index

Discrimination Index	Interpretation
50 and above	Very good discrimination
30 – 50	Adequate discrimination
20 - 29	Weak discrimination
0 - 19	Very weak discrimination
-ve	Question probably invalid

(i) July 2013 semester

Table 4 depicts the question statistics for the learners in the July 2013 semester. A total of 33 learners attempted this quiz. As can be seen, the FI for the 10 questions is in the third column. It indicates a low of 42.42 and a high of 84.85. According to Table 2, questions with an FI of above 80 are considered easy. This can be seen in MCQ3 and MCQ4. As for MCQ6, the FI is the lowest at 42.42 which indicates that the question level is about right for the average student. Table 1 shows that MCQ6 is a question on application. The average tertiary student in the Malaysian context would have to have a minimum of Higher School Certificate (A-level equivalent) with a minimum age of 20. The youngest learner in this batch is 25 years old. In a distance learning institution, average takes a whole new meaning.

Table 4: Question Statistics July 2013

Question name	Attempts	Facility index	Discrimination index	Discriminative efficiency	Mean Score
MCQ1	33	75.76%	20.09%	27.42%	0.91
MCQ2	33	78.79%	47.32%	70.80%	0.85
MCQ3	33	84.85%	39.83%	56.82%	0.85
MCQ4	33	84.85%	39.83%	60.56%	0.91
MCQ5	33	66.67%	28.73%	36.62%	0.76
MCQ6	33	42.42%	1.99%	2.41%	0.61
MCQ7	33	45.45%	51.60%	65.89%	0.88
MCQ8	33	75.76%	31.45%	41.94%	0.58
MCQ9	33	63.64%	53.28%	65.89%	0.82
MCQ10	33	90.91%	18.22%	30.71%	0.79

As for the DI, a value of above 30 is expected to be adequate enough to provide the necessary discrimination between good and bad performers. As can be seen, questions 2, 3, 4, 7, 8 and 9 provides the right level of difficulty to be able to distinguish between the abilities of the students in this cohort. Again MCQ6 stands out as the question with the lowest DI score of 1.99. A DE score of above 50% is sufficient to indicate that the DI is good enough to effectively discriminate between learners with different abilities. Again the infamous MCQ6 stands out at 2.41. A possible explanation for this might be the fact

that these questions are in the first Unit of the course and the learners are still trying to grasp the fundamentals of Microeconomics let alone understand the application.

(ii) January 2014 semester

Table 5 depicts the question statistics for the learners in the January 2014 semester. A total of 41 learners attempted this quiz. As can be seen, the FI indicates a low of 36.59 and a high of 95.12. As mentioned earlier, questions with an FI of above 80 are considered easy and there is one question (MCQ10) that is “extremely easy”. A similar question was asked in this cohorts’ first assignment which could be the reason for this value. MCQ6 again has the lowest FI at 36.59 even lower than the previous cohort. The mean score is also only 0.45 indicating the below average performance of the learners for that question. The main reason for this to happen is because the course material used in the January 2014 semester has been revised. The topic that was tested in MCQ6 has been transferred to Unit 2. Since the students were told that Quiz 1 is related to Unit 1, only a handful would have read Unit 2 at the point of answering these questions.

Table 5: Question Statistics January 2014

Question name	Attempts	Facility index	Discrimination index	Discriminative efficiency	Mean Score
MCQ1	41	80.49%	39.62%	55.81%	0.77
MCQ2	41	63.41%	35.41%	44.69%	0.65
MCQ3	41	70.73%	18.30%	22.85%	0.71
MCQ4	41	82.93%	32.46%	45.07%	0.84
MCQ5	41	75.61%	12.85%	16.01%	0.84
MCQ6	41	36.59%	-3.04%	-3.97%	0.45
MCQ7	41	43.90%	25.96%	34.17%	0.97
MCQ8	41	75.61%	39.66%	52.58%	0.48
MCQ9	41	73.17%	47.33%	62.00%	0.74
MCQ10	41	95.12%	24.21%	50.30%	0.71

As for the DI, questions 1, 2, 4, 8 and 9 provides the right level of difficulty to be able to distinguish between the abilities of the students in this cohort, 2 questions lesser than the previous batch. Again MCQ6 stands out as the question with the lowest DI score of -3.04. This indicates that the question might be invalid. Technically it is since the topic tested is covered in a different unit and learners may not have read them. A DE score of -3.97 again pushes MCQ6 into the limelight confirming the earlier suspicion.

The DI provides a rough indicator of the performance of each item to separate high scorers vs. low scorers. The DE is a correlation coefficient between scores at the item and at the whole quiz. In both cases, higher values indicate items that discriminate proficient learners, whereas lower indices mark items that are answered best by those with lowest grades, hence not helping to discern between the good and the bad performers. In short, these coefficients can be used as a powerful method of evaluating the effectiveness of the quiz when assessing differentiation of learners. The advantage

of using DE over DI is that the former uses information from the whole population of learners, and not just the extreme upper and lower thirds. Thus, this parameter may be more sensitive to detect item performance.

Learners' motivation

According to 66% of the learners surveyed in the July 2013 semester, the pace at which the quizzes were presented was about right. One or two quizzes placed after each Unit in the study guide made it possible for the learners to pace their learning and test themselves out at the same time. The January 2014 cohort echoes the same sentiment with 72% of them agreeing to the pacing of the quizzes.

Of the students who performed the quizzes, around 90% of them regarded the activity positively in the January 2014 cohort. According to 78% of them, the quizzes helped them to understand some of the topics covered in tutorials and course material. Similar results were obtained with the July 2013 batch.

All of the learners in both cohorts agree that feedback on the correct answers should be given after each quiz as a learning enhancer. And also, all learners requested that marks be given for their attempt so that it acts as a motivational tool for them to improve further. They also want some form of reward for spending time and energy in trying out these quizzes. This is something that WOU should look into as at the moment assessments are done in a traditional manner. Unfortunately only 32 % (July 2013) and 28% (January 2014) of the learners agreed that the quizzes boosted their interest in the subject matter. In short, the researcher's overall impression is that learners of Microeconomics regarded the quizzes positively.

On a lesser scale, there were learners who commented that they did not understand the some of the questions in the quizzes. This came to 12% (July 2013) and 18% (January 2014). To address this issue, the questions in the quizzes have been re-worded in the current (July 2014) semester to simplify the language used. The effects of that revision could not be covered in this paper. It is to be noted that the English proficiency of distance learning students may not be at a higher level. Interestingly, in a study conducted by Prakash (2010), those with above average English proficiency have a tendency to drop-out from their course of study due to loss of motivation.

Conclusion

From this first experience regarding the use of the Moodle quiz module in the subject of Microeconomics, the researcher intends to generate improved quizzes suitable enough for assessing the teaching and learning of the subject. To help boost more effective, dynamic and autonomous learning, the purpose is to redesign some of the quizzes in the future to include the possibility of turning this into a tool for formative or summative assessment.

It is proven that Moodle quizzes can serve to boost effectiveness and promote learner performance, as well as change teachers' and learners' attitude towards assessment design. As an incentive to teachers, the automatic assessment of the quizzes frees up time for the teacher to concentrate on other aspects of the learning process. However, it is essential to bear in mind that the whole process should be permanently revised and updated.

It is hoped based on this study that the university can see the potential of using Moodle quizzes as an assessment tool for both formative and summative assessments.

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