MyMathLab as a Dynamic E-assessment Tool: a Pilot Study

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Abstract. MyMathLab (MML) is used as a dynamic e-assessment tool to assess students' performance in mathematics. The main aim of this paper is to find out whether there is a relationship between students' performance in online e-assessment and paper-based assessment. Other relationships such as the number of attempts and amount of time spent interacting with MML system were also investigated. The results showed that there were medium to strong and positive correlations among the variables.

Keywords: online learning, dynamic e-assessment, MyMathLab, mathematics, pre-university, correlation

1. Introduction

The evolution of information technology has led to the digitization of virtually all aspects of our lives, and it changes the whole spectrum of society as it reshapes the way we learn, work, play, communicate and shop [1]. In the aspect of teaching and learning, the use of computer, the internet, and other technology devices has significantly transformed the education system. Computer and the internet are not only used to stimulate and enhance the teaching and learning process but also to carry out assessment process as well.

2. Literature Review

E-assessment is used by organizations ranging from small companies to big corporations and public authorities to assess job applicant's capability, ability, and suitability during the recruitment process. It is also used by schools, universities, and academic institutions to evaluate students' performance, achievement, and to enhance the teaching and learning process.

According to Martin Kröll [2], the use of e-assessment has enabled faster decision making in the matter of personnel selection, with greater validity, and a lower cost alternative to the traditional assessment procedure. It has also allowed documentation of the staff members' competences to be kept in the knowledge management system. In addition, Laumer Sven et al. [3] stated that besides assessing the biographical aspects of candidates, e-assessment has been used to evaluate the attribute aspects of a candidate such as the personality attitude or motivation and it is also used as simulation tool where candidates are evaluated in the aspects of a particular work situation to assess how a problem is solved.

On the other hand, Russell et al. [4] in their paper drew on the staff and student's experience of teaching and learning on a web-based Master programme to explore how specific features of the online environment can be harnessed to promote assessment as part of learning. Russell et al. [4] illustrated how to integrate assessment with online collaborative learning processes to gain high quality feedback between the tutors and students. It has also been stated that the development of e-learning has prompted new thinking and perceptions within universities and among students on how it can be fully utilized to perform, assist, and

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facilitate the assessment process. As a result, it led to innovation in the assessment processes in schools, universities and academic institutions.

Traditional paper and pencil based assessment is merely used to evaluate the performance of students, without any effort and attempt to change or improve the performance of students [5]. Thus, students merely know their performance and level of achievement from the results they obtained. Nevertheless, in dynamic assessment, teaching aid and assistance are provided through the assessment in order to improve and enhance students' performance [6, 7].

According to Lidz [8], dynamic assessment is an assessment which shares incorporation of a test-intervene-retest format where it focuses on learner modifiability and on underlying meta-cognitive processes to facilitate learners to learn while instructors play the role as assessors who act as active interventionists rather than as passive recorders. Therefore practitioners in dynamic assessment are interested and keen to know the way a learner learns, reasons of making errors, and how existing knowledge and skills can be improved and enhanced. It is believed that dynamic assessment is developed and designed to encourage the learning potential and provide students with opportunities to improve themselves. This strategy proposed by Wang [9] as "*assessment-centered e-learning environment that treats assessment as teaching and learning for improving students' e-learning effectiveness*".

The assessment by using MyMathLab (MML) has a similar approach and strategy. MML was developed by Pearson, a textbook publishing company. There are many features in MML to facilitate learning, practising and perform assessment. MML can be a useful and helpful tool to students if they are familiar with the features available and fully utilize it to learn at its full capability [10]. Among the useful and helpful features are Practice Exercises, Homework, Take a Test, Gradebook, Study Plan, Multimedia Library and Communication. This paper focuses on the assessment parts of the system which are the Take a Test and Gradebook features.

Since there are differences between dynamic e-assessment and conventional paper-based assessment, the challenge of this paper is in trying to find out is there any relationship between students' performance in dynamic e-assessment and paper based assessment, at the same time that students were interacting and using the system, is there any relationship between the time spent and total number of attempts compared to the e-assessment score obtained. The main aim of this research is to better understand the potential of MML as a dynamic e-assessment tool in facilitating learning.

3. Methodology

The participants for this research were pre-university students majoring in information technology who enrolled in Algebra and Trigonometry course during the first trimester of the 2010/2011 academic year at Multimedia University. Students could access MML system by using the code attached in the textbook. For practice purpose, unlimited attempts were given to students as to encourage them to work through the Study Plan. They could practice the questions with or without the online help (Help Me Solve This / View an Example). As for assessment, 2 quizzes were created by the instructor. Students were afforded 5 attempts for the first quiz since it was the first time they interacted and used the system for assessment, and 3 attempts were given for the second quiz. Each quiz consisted of 15 questions and was timed in 180 minutes. The duration given to complete each quiz was 2 weeks. MML quizzes contributed 10 percent to a student's final course grade. Immediate after the midterm test papers were marked and graded, students' score for each online quiz, number of attempts and total time spent interacting with the system were retrieved from the MML database. The midterm test score contributed 20 percent to a student's final course grade.

4. Results and Discussion

The linearity, homoscedasticity and relationship between variables were first inspected visually by generating scatter plots from Statistical Package for the Social Sciences (SPSS) software. From the inspection of the scatter plots, the information on both the dimension of the relationship whether positive or negative, and the strength of the relationship were inspected. All the scatter plots showed a straight line through the main cluster of points with fairly even cigar shape along its length. This confounded the

violation of linearity and homoscedasticity, and hence Pearson correlation was used to determine the relationship among the variables.

Table 1 shows the descriptive statistics of midterm test score and MML scores with the mean of 11.6 out of a total of 20 marks and 6.6 out of 10 marks respectively. Table 2 shows the result of Pearson correlation between online e-assessment score and paper-based assessment score.

Table 1: Descriptive Statistics of Midterm Test and MML Scores

	Mean	Std. Deviation	N
Midterm Test Score	11.648	3.6735	156
MML Score	6.638	2.2520	156

Table 2: Correlations between Midterm Test and MML Scores

	Midterm Test Score	MML Score
Pearson Correlation	1	.622**
Sig. (2-tailed)		.000
N	156	156

**. Correlation is significant at the 0.01 level (2-tailed).

The relationship between midterm test score and MML score appeared to have a strong, positive correlation between the variables with r=0.622, n=156, p<0.01 with high MML scores associated with high midterm test scores. This means that the high online e-assessment scores are associated with the high score in the paper-based assessment. This indicates that online e-assessment has the potential to be used as a supplementary assessment tool or as a replacement for paper-based assessment.

We further investigated the descriptive statistics and determined the correlation between the number of attempts and the online assessment scores. The results are as shown in Table 3 and Table 4.

Table 3: Descriptive Statistics of MML Scores and Number of Attempts

	Mean	Std. Deviation	N
MML Score	6.638	2.2520	156
Number of Attempts	3.94	2.050	156

Table 4: Correlations between MML Scores and Number of Attempts

	MML score	Number of Attempts
Pearson Correlation	1	.477**
Sig. (2-tailed)		.000
N	156	156

**. Correlation is significant at the 0.01 level (2-tailed).

It was found that there was a medium, positive correlation between number of attempts and online assessment score with r=0.477, n=156, p<0.01 with a high number of attempts in quizzes associated with medium to high online assessment scores. This indicates that the online e-assessment has the potential to be used as a practice tool where more practice has helped the students. As the dynamic e-assessment in MML enables students to repeat the exercise in multiple attempts to earn a perfect score, it allows students to try

their very best to improve their score and motivates students to persevere and get their expected grades. This can be seen from the descriptive statistics where on average the students used up 3.94 attempts to solve the online quiz. Dynamic e-assessment is different from paper-based assessment in the sense of it allows multiple attempts to encourage the learning potential and provide students with opportunities to improve themselves. As MML has the capability to regenerate exercises algorithmically and the flexibility of allowing unlimited practice to students, it motivates students to solve more mathematics problems and it helps increase not just student success but mastery [11]. Therefore dynamic e-assessment is offering learners chances to reinforce a willingness to keep trying, attempting and thus increasing time on task rather than just to put learners in a punitive scoring system.

Table 5 and Table 6 show the result of descriptive statistics and correlation between MML score and total hours spent interacting with MML assessment system.

Table 5: Descriptive Statistics of MML Scores and Total Hours Spent

	Mean	Std. Deviation	N
MML Score	6.638	2.2520	156
Total Hours Spent	6.762	3.5482	156

Table 6: Correlations between MML Scores and Total Hours Spent

	MML score	Total Hours Spent
Pearson Correlation	1	.370**
Sig. (2-tailed)		.000
N	156	156

**. Correlation is significant at the 0.01 level (2-tailed).

When the correlation between time spent interacting with MML and score obtained was investigated, there was a medium, positive correlation between total time spent and online assessment score with r=0.370, n=156, p<0.01 with high amount of time spent in MML associated with average (medium) online assessment score. From the descriptive statistics, students on average spent 6.762 hours for solving 2 quizzes or an average of 3.381 hours for 1 quiz. This means students with poor or good online assessment scores had spent lengthy time interacting with the system to complete the quizzes assigned to them. It could also due to this was students' first experience using e-assessment and they were not familiar with the online e-assessment yet and therefore in general, students spent time to explore and interacted with the system. A case study conducted by using MyEconLab (the same system like MML but used in the teaching and learning of Economics subjects) reported that there was a clear correlation between time spent on MyEconLab and students' examination scores, as majority of the students whose scores increased one letter grade or more spent more time interacting with MyEconLab [11]. Similarly, another case study conducted by using MySpanishLab reported that the correlation was very clear, students who spent time to complete their work in MySpanishLab finally succeed in the course [11].

5. Limitation

This study is not without the limitations since it is solely based on data collected from MML database and students' midterm test score where all the respondents were from one university taking the same major. Thus, the results cannot be generalized to students in other majors and in other universities. Moreover, due to MML was first time piloted in the teaching and learning of mathematics subjects in this university, therefore this study was carried out in a small scale where the researcher just considered the data of 2 quizzes. Extensive research should be done to include the data of more quizzes to determine the strength of the correlations.

6. Conclusion

MML as a dynamic assessment tool has provided the students with their first experience using online e-assessment tool. As e-learning becomes an integral part of teaching and learning for various subjects and for institutions everywhere all over the world, the experience gained from this dynamic e-assessment system would be useful to help the students in their future studies. Finally extensive research should be conducted to further evaluate the various aspects of the system and issues related to e-assessment if it is to be fully adopted to replace paper-based assessment.

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