

Students' Perceptions of MyMathLab as An Online Learning Tool

Check-Yee Law, Yong-Wee Sek, Lik-Neo Ng, Wei-Wei Goh, and Cheng-Lan Tay

Abstract—Assignment and assessment are important components in the teaching and learning process. With the evolution of web-based technologies, assignment and assessment which have been conducted with paper-pencil based can now be conducted online. This study analyzes students' perceptions of the use of MyMathLab (MML) as a supplementary tool in conducting assignment and assessment in a mathematics course. The main aim of this research is to better understand students' perceptions of the use of MML as a learning and assessment tool. This paper also investigated students' satisfaction and their expectation after the use of MML and how it has affected their attitude of study. Overall, students were satisfied with the use of MML in their studies. Although students only rated the system marginally positive, it had provided them with their first hand experience in using online learning and assessment tools.

Index Terms—Mathematics, mymathlab, online learning, perceptions, pre-university.

I. INTRODUCTION

Practice is one of the important components in learning. In teaching and learning of mathematics, it takes practice to enhance problem solving skills. Thus homework and assignments are essential components of Pre-Calculus instruction at the pre-university level. In a traditional delivery classroom, it has been a setting where an instructor gives lecture and students listen and copy down notes. As for assessments, it has always been conducted with the use of paper and pencil, and using questioning techniques, such as true false, multiple choices, fill in the blank, structured and essay items. With the evolution of web-based technologies and the wide availability of technology devices such as PDAs, computers, laptops and mobile phones, technology-based instructions have been partially or fully incorporated into the teaching and learning of various subjects for students' accessibility of learning materials anywhere and anytime. Such an approach, known by many writers as "web-based learning", "e-learning", "online learning", "internet-based learning", "networked learning", "virtual learning" and "technology-assisted learning".

According to Berge [1], teaching on the internet was the most extensive development during the 1990s. Today, online education has become an integral part of both distance and on-campus teaching. As technology inextricably penetrates into our daily lives, it entails different opportunities and challenges for teaching and learning to meet students' needs

[2]. This study analyzes students' perceptions of the use of an online learning and assessment tool called MyMathLab (MML) as a supplement in their mathematics course.

II. LITERATURE REVIEW

Long [3] stated that the four reasons for the acceptance, development and expansion of online learning are due to (i) international business, where the trend towards global business has opened the path for the delivery of learning and training through the electronic media, (ii) speed of development and delivery, where electronic-based materials can meet the just-in-time learning needs, (iii) flexibility, where online learners can learn according to their own schedules and at dispersed locations, and (iv) cost saving measures, where travel expenses, course fees and other inefficiencies of classroom instruction can be avoided. However, online learners may be confronted with irritating obstacles when using web-based technology, generally the ranging from an insufficiency of computer knowledge and skills to technical problems caused by the computers or the learning management system which might hinder them to be a successful online learner. In addition, learners may not have good time management skills to be successful in their online learning sessions [4]. Even though some of the disadvantages are naturally of great importance to the adoption and implementation of online learning, there may be ways to reduce the negative effects. Chickering and Ehrmann [5] attributed failures in using computers in teaching and learning to inappropriate strategies, not to the technology. Kazmer and Haythornthwaite [2] believed that it is important to face the challenges of online learning and learn as much as we can about how to utilise it properly since technology has increasingly interwoven into our daily lives and online education has become popular.

Research has shown students' favorable and unfavorable perceptions on online learning. O'Malley and McCraw [6] found that students' perception of online learning had significant advantages such as saving them more time, helping them to plan their schedules better and enabling them to take more courses. However, students were doubtful whether they were able to contribute to class discussions and whether they could learn more in this environment. Hong *et al.* [7] had a similar finding as some of the students felt isolated learning in the web environment and expressed a need for some face-to-face lectures, whereas some students felt that they were unable to contribute to or learn from the asynchronous web-based conferences. Therefore, Casey [8] who suggested the use of web as communication medium model emphasized that web-based learning need to include a significant element of human interaction, or otherwise these

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models will be less than satisfactory for a significant proportion of the learning population. As a result, on-going staffing costs will probably increase as staff will need to work around the limitations of the medium to establish and maintain viable teacher-student relationship.

Lin [9] found that students preferred online resources not only because they could save money from the pricey textbooks, but the online resources such as the multimedia materials in YouTube could enrich their learning experience and were effective in helping them finish their projects. Kazmer [10] indicated that technology skills and knowledge developed during online learning are useful to departing students who are graduating as they can bring the internet and related communications technologies into their everyday lives, and incorporate technological expertise into their home and working lives. On the other hand, Smart and Cappel [11] in their attempt to integrate online modules in a traditional class for two groups of students who enrolled in required course and elective course found that only fair or somewhat disappointing results were achieved as the participants in the elective course rated online learning slightly positive whereas students in the required course rated it slightly negative. They further explained that the three most intriguing findings might involve the differences in respondents' attitudes toward the use of simulations in the online modules, differences in perceptions between those enrolled in elective and required course, and the time the participants required to complete the online modules.

Baker and Dias [12] found that there was an improvement of student's performance in Elementary Algebra through the use of a web-based course management system which was used as a supplement to direct traditional instruction, and it appeared that students' web-based homework was an important and significant part of their success in passing the exit examination from remediation. Similarly, Glass and Sue [13] in their study to analyze student preference, satisfaction and perceived learning in an online college mathematics course for business majors noted that online environment offered students with an extensive, flexible and rich learning experience with homework emerged as the factor students preferred and used the most and had the greatest impact on their learning. Hong *et al.* [7] conducted a study to explore students' responses and reactions to a web-based tertiary statistics course supporting problem-based learning found that majority of the students were satisfied with web-based learning, and they could achieve comparable learning outcomes compared to students in face-to-face mode. Students appreciated the flexibility of anytime and anywhere learning.

MML was developed by Pearson, a textbook publishing company. Since MML was designed and developed, more than 30 universities, colleges and community colleges in United States of America (USA) had piloted MML from 2004 to 2009. The report published by Pearson showed that the use of MML had resulted in an impressive success in teaching and learning mathematics [14]. Among all case studies, Ivy Tech Community College, Quinsigamond Community College, Central Texas College and Florida State College at Jacksonville had reported the improvements in students' success and retention. The data from Augusta State

University indicated a significant increase of ABC rates and decrease in Drop/Fail/Withdraw rates. In addition, Cleveland State Community College and Florence-Darlington Technical College found that the completion rates in mathematics increased whereas Southern Illinois University Carbondale found that the withdrawal rates were lower.

Among the useful and helpful features in MML are Practice Exercises, Homework, Take a Test, Gradebook, Study Plan, Multimedia Library and Communication. This paper focuses on Study Plan, Take a Test, and Gradebook. The Study Plan feature is a helpful learning resource to students. It is categorised by section and chapter. Students will receive a list of exercises covered the important part of the section and chapter. In Study Plan, learning aids are available as students answering the questions. They can click the online help button such as "Help Me Solve This" or "View an Example". "Help Me Solve This" button will be a good guide to students as it work out problem step by step with students. Students have to answer questions along the way they are guided by this button to work out for the final answer. Once students have worked out the problem, students will have to answer a similar problem in order to receive credit. The "View an Example" has the similar function where it will show the step by step working too but students will not be asked to answer any questions as they go along the way solving a problem.

The quizzes or test feature can bring students to any quizzes or test that their instructor has assigned for the course. Instructor can set controls to a particular quiz or test to suit the need of the students and according to the instructor's requirement. The options that an instructor can set for a particular quiz or test are such as the available date and time, the due date and time. For scoring option, instructor can choose to give partial credit for questions with multiple parts. In access controls, a lecturer can set the number of times a student can attempt the quiz or test. Besides that, instructor also has the control towards displaying of result whether to display the score only or to display score and question and the suitable time when can students review the test. In addition, instructor can also set control to allow or to prohibit students to print out the correct answers and their answers while reviewing.

Gradebook is like the performance record book. It keeps records of students' quiz, assignment and test scores. There are options for students to view scores such as scores of recent work, scores to date or scores categorized by assignment types. The "Overall Score" lets students to view their current average score and a breakdown of their scores.

Instructional developer and designer are inextricably tied to the cultural differences when an internet-based learning method is developed and designed. Bentley *et al.* [15] provided eight educational value differentials for understanding cultural issues in internet-based learning which include language, educational culture, technical infrastructure, local versus global differentials, learning style, reasoning pattern, high and low-context, and social context differentials. Therefore, although a lot of researches on the use of MML have been conducted in USA, research has to be carried out outside USA as well. The main aim of this research is to better understand students' perceptions of the

use of MML as a supplementary learning and assessment tool. This paper also investigates students' satisfaction and their expectation after the use of MML and how it has affected their attitude of study.

III. METHODOLOGY

The participants for this research were pre-university students who enrolled in Pre-Calculus course during the first trimester of the 2010/2011 academic year at Multimedia University. MML was adopted for use as supplement in this course as a learning tool and assessment tool. Students could access MML system by using the code attached in the textbook. For the learning unit, students were encouraged to work through the Study Plan which was designed to reinforce practice. Students would select questions from the question bank according to sub-topics. They solved the questions with or without the online help (Help Me Solve This / View an Example). For this purpose, students were afforded unlimited attempts until they mastered and fully understood how a problem was being solved. As for the assessment unit, 3 quizzes and 3 assignments were created by the instructor. Students were given 3 attempts to solve each quiz and assignment which consisted of 15 questions within two weeks. MML contributed 30 percent to a student's final course grade.

A 23-item survey related to the perception of the online learning was administered to the 450 students at the end of the trimester. 76% of the respondents were male and 24% were female. 17.33% were Malay, 62.89% were Chinese, 18.67% were Indian and other races constituted 1.11%. All of them had never used MML system before. Participation for this survey was voluntary. A five-point Likert scale questionnaire with (5) strongly agree, (4) agree, (3) neutral, (2) disagree and (1) strongly disagree as anchoring points which was adapted from "Making The Grade, Version 3" [16] was used. The data collected were then categorized into 4 aspects: students' perceptions of learning unit, students' perceptions of assessment unit, change of attitude of study and expectation, and overall satisfaction. Means (μ) and percentage of descriptive statistics were used for data analysis to determine the level of students' perceptions on each item.

IV. RESULTS AND DISCUSSION

This study provides data on an initial attempt to incorporate online learning in a traditional face-to-face class, shifting to the mode of blended learning. In this research, encouraging results were obtained as participants rated the use of MML quite positively. They felt that MML system had changed their attitude towards their studies. Overall, participants were quite satisfied with the system.

TABLE I shows some important measures of students' perceptions of the online learning unit. As shown in the summarized means presented at the right column of the table, students rated the online learning unit relatively positive from a high score of 4.02 to a low score of 3.42. The score, 3.69 shown in the bottom of Table I is the composite means which

is the mean of means.

The user friendly interface and easy to access features in MML had enabled students at all levels of experience to grasp the program quickly and advance through the pedagogical content confidently [14]. In this study, we found that 62.7% of the students agreed that the online system was easy to use and 68.2% said that it increased their understanding of the material in the mathematics course. As high as 81.1% of them found that the system had helped them learn mathematics whereas 74.1% said that with the online system, they had become better problem solvers. In addition, with wide array of questions in Study Plan, 50.0% of the students said that this feature had helped them learn the course materials.

TABLE I: STUDENTS' PERCEPTIONS OF ONLINE LEARNING UNIT

Items	5	4	3	2	1	μ
Easy to use	30.	31.	5.3	12.	19.	3.42
Did not increase my understanding.(R)	9	8	4	4	6	3.71
Helped me learn mathematics	20.	47.	16.	12.	2.7	4.02
Became a better problem solver.	7	5	4	7	2.7	4.02
Helped me learn the material.	46.	35.	4.0	5.1	9.8	3.72
	0	1	2.4	6.2	17.	3.72
	38.	35.	2.4	6.2	17.	3.60
	5	6	2.4	6.2	3	3.60
	13.	36.	45.	2.4	1.8	3.60
	1	9	8			3.69

(R) Indicates a reverse coded question and was asked in a negative way. It is presented in a positive way in this table to ease the comparison across all items.

TABLE II indicates the level of students' perceptions on the online assessment units which ranged from a high score of 4.40 for the item "It is helpful that I can rework on the problems that I did wrongly to improve my score" to a low score of 2.66 (marginally disagree) for the item "I sometimes get help from the Help Me Solve This or View an Example buttons to work on the quizzes and assignments". The score, 3.84 shown in the bottom of Table II is the composite means which is the mean of means.

Similar findings have been reported in other case study by using MyStatLab [14], another online management system developed by Pearson, 76.9% of students appreciated the online feedback feature and viewed their results in online assessment, this feature enabled students to have immediate access to their progress in the context of learning. As high as 91.3% of the students liked the feature which they could rework on the problems they did wrongly to improve their scores whereas 85.8% of the students liked the feature which they could know their mistake upon submission. This is indubitable the two important features in online assessment [17]. With these two features, students were able to discover in an early stage on whether they needed help to avoid them repeating the same mistakes during test or examination and prepare them for future assessment [14]. Fast, timely feedback, and ease of operation are some main advantages of online assessment [18].

60.2% of the students felt that the online assessment units had increased their performance in mathematics. Unlimited practice offered by online assessments motivated students to do more mathematics exercises, thereby increasing not just students' success but mastery [14]. The learning aids such as

Help Me Solve This was useful as it guided students through a problem step-by-step that provided students the basic concept for solving a problem itself and helped students to obtain a detailed understanding of the problem whereas the View an Example learning aid showed example of similar exercise from which students might get help to solve a problem [14]. Nevertheless, this study is in contrary shows that only 38.9% (mean=2.66) of the students got help from the help features available (Help Me Solve This, View an Example) in assessment unit. Most students did not seem to get help from the help feature available in assessment unit. This can be due to they had got sufficient help in Practice Problem in online learning unit or it can be due to the word “sometimes” that made students to be ambiguous about the statement. Students might have used the help feature in a more frequent manner that led most of them to disagree with this statement.

TABLE II: STUDENTS’ PERCEPTIONS OF ONLINE ASSESSMENT UNIT

Items	5	4	3	2	1	μ
Online feedback and results is helpful.	29.8	47.1	21.8	1.1	0.2	4.10
Helpful to rework the wrong problems.	54.0	37.3	4.7	2.2	1.8	4.40
Helpful to know mistake upon submission.	52.9	32.9	11.1	2.9	0.2	4.35
Did not increase my performance.(R)	12.7	47.5	35.8	2.7	1.3	3.68
Sometimes get help from Help buttons.	19.1	19.8	6.0	18.7	36.4	2.66
						3.84

As can be seen from TABLE III, the system managed to provoke positive study attitudes among the students to be responsible, independent, confidence and motivated towards their studies. Overall, students rated the change in their study attitude in a rather positive light with the scores ranging from 3.53 to 4.10. The score, 3.80 shown in the bottom of TABLE III is the composite means which is the mean of means.

TABLE III: CHANGE OF THE ATTITUDE OF STUDY AND EXPECTATION

Items	5	4	3	2	1	μ
Devoted more time and effort.	16.9	38.2	36.9	5.1	2.9	3.60
Choose own time to study.	35.8	39.3	22.0	1.3	1.6	4.10
Encouraged to search for answers myself.	18.4	47.3	30.7	2.7	0.9	3.80
Try hard to solve math problems.	43.6	26.9	9.3	8.0	12.2	3.82
Complete quizzes and assignment in a timely manner.	46.4	28.2	10.4	5.6	9.3	3.97
Helped keep up with work.	25.1	41.3	27.6	3.8	2.2	3.80
Encouraged to be responsible for own learning.	18.2	48.9	30.9	1.8	0.2	3.80
More confident.	37.8	24.7	8.4	11.1	18.0	3.53
						3.80

55.1% of them had devoted more time and effort to the mathematics course and 75.1% of them said that MML had enabled them to choose their own time for their studies.

Besides that, 65.7% felt that the online system encouraged them to search for answers themselves rather than to ask help from others whereas 70.5% agreed that the online system had helped them trying hard to solve mathematics problems. The results also showed that 74.6% of students usually completed their quizzes and assignment in a timely manner and 66.4% of them said that having deadlines for online assessment had helped them keeping up work for their mathematics course. Finally, 67.1% of students found that the online system had encouraged them to be responsible for their learning and 62.5% said that they were more confident in learning mathematics. The use of online learning system had instilled positive attitude among students. With the delivery of College Algebra course both on ground and online, students were more prepared for class, and the online program had eased mathematics anxiety among students and enabled them to take full control over their learning [14]. Online learning increased students’ confidence and enabled them to persevere through difficult problems as help was just a click away [14].

Students’ overall satisfaction on the use of MML is shown in TABLE IV. Generally, students rated the online learning unit marginally positive with the scores ranging from 3.60 to 3.79. The score, 3.69 shown in the bottom of Table IV is the composite means which is the mean of means.

TABLE IV: STUDENTS’ OVERALL SATISFACTION

Items	5	4	3	2	1	μ
Achieve a higher grade.	13.1	36.5	45.3	3.1	2.0	3.60
Understand the subject better.	12.7	50.6	32.4	2.4	1.8	3.70
Satisfied.	8.0	55.3	30.0	4.7	2.0	3.60
Will use MML in next course.	41.5	28.7	8.7	6.9	14.2	3.76
Will recommend to other students.	42.5	28.5	8.4	7.3	13.3	3.79
						3.69

Half of the total students (49.6%) agreed that the online learning had helped them to achieve a higher grade and 63.3% of them said that regardless of their grade obtained, they felt that the online system had helped them to understand the subject matter better. Moreover, the same percentage (63.3%) of the students was satisfied with the use of MML in their mathematics course. More than two thirds (70.2%) of them hoped that they could proceed with the next mathematics course by using this system and 71.0% of them said they will recommend this online system to other future students.

The use of online learning is not only benefited the students but the instructors and the management too. The use of technology made teaching more interesting and the use of online learning system reduced the time spent for grading homework papers. Besides that, the flexibility of online learning tool which support customization of Study Plan enabled instructor to retain control of course content and instructors can indeed enhance teaching style with technology. Moreover, it had benefited the management in the sense that it saved the cost to conduct a course [14].

Due to the user friendliness, ease of use and flexibility of the system, students are not only able to persevere and

reinforce their belief in their abilities, but they have become more confident in their mathematics abilities, and obtained tremendous improvement in their studies [14]. This may be the reasons, that in general, students in this research were quite satisfied with the use of the online system in their learning and had rated it rather positively, despite the fact that it was their first hand experience using an online tool as a supplement to learn mathematics.

Finally, to implement online learning smoothly and in great success, it involved all parties especially the online system development and design team, the students, the instructors, the management team and the technical support team. It has to always ensure that the content is accurate, adequate, up-to-date, and meets the needs of users whereas the system has to be designed in the way that it is user friendly, easy to use and fast. The system should be well-maintained, features are enhanced from time to time, and the technical problem should be kept to the lowest possible level. The management and computer technical support team have to ensure that the network coverage is good and internet connectivity is easy and fast especially in campus and hostel.

V. LIMITATION

This study was solely based on a self-reported survey where all the respondents were from one university. Thus, the results cannot be generalized to students in other universities. Moreover, it focused mainly on the learning and assessment units of the online management system. Other features such as the e-book, the multimedia library, and the communication tools which consist of discussion board, announcement, message, email, etc. were not within the scope of this study.

VI. CONCLUSION

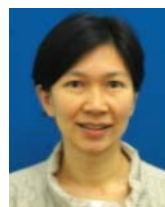
In overall, students were satisfied with the use of MML in their studies. Although students only rated the system marginally positive, they admitted that it had provided them with their first experience using online learning and assessment tools. The experience gained from this learning environment may be of great help to them in their future studies. Future research should include students from other universities so that the results can be generalized at a wider scale. It would also useful to evaluate the communication tools available to see how interaction among all parties can be advocated: students, peers, tutors and instructors. Finally extensive research should be conducted to further evaluate various aspects of the system such as the technical quality, the content quality, the pedagogical quality and so on if it is to be fully adopted in mathematics courses.

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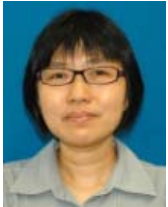
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