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Technology Blended Learning Approaches and the Level of Student Engagement with Subject Content

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Abstract. This paper evaluates the implementation of technology blended teaching and learning in the Foundation Mathematics Program at a private college of higher education in Kuwait with a view to identifying improvements in student performance. The traditional classroom teaching was blended with a significant component of online learning with MML (MyMathLab), involving in-class tutorials and outside of class online activities. The aim of introducing this approach was largely to achieve a greater level of engagement with the course content and to increase the amount of practice time students devoted to doing problem solving exercises. The study used data generated by the MML tools as well as data on success rates from previous semesters when only the traditional approaches were used for teaching and learning in the Foundation Program. The study found that there was an increase of between 12% and 35% in the normal expected time required for problem-solving practice with the MML system. The greatest advantage was the student activity monitoring data available from the system could be used for identifying students at risk of failure and developing tailored and targeted support programs and strategies. In addition, comparison of results from previous traditional approach and the newly introduced blended approach revealed that grade inflation can be avoided and a greater degree of fairness can result in online grading.

Keywords: Education technology, Learning styles, Online learning.

Introduction

The traditional delivery of coursework which comprises lecture-based instructions where students take notes and do in-class practice at problem solving and undertake assessment of learned skills and techniques is rapidly been replaced by hybrid approaches. With the introduction of technology in the classroom, the approaches to teaching and learning is rapidly changing (Hayfa & Othaman, 2014; Ziphorah, 2014). Technology has transformed teaching and learning curriculum and a range of terminology has entered the field of education, and in some academic institutions, eLearning is now the only mode of teaching and learning, while in others it has been partially incorporated into curriculums. Terms such as "blended learning" or "hybrid learning" are frequently used to describe this development which partially incorporates technology in teaching and learning curriculums[1]. Scida & Saury, (2006) define hybrid learning as "classes in which instruction takes place in a traditional classroom setting augmented by computer-based or online activities which can replace classroom seat time" (p. 518). An often cited advantage of adopting technology in teaching and learning curriculum relates to accessibility. Lectures delivered online can be accessed anytime and replayed as frequent as the user wishes (Speckler, 2012). This is particularly important for Foundation Mathematics course, where frequent practice is considered critical for one to acquire the necessary skills to grasp key concepts and principles.

One web-based tool which is widely used in the teaching of mathematics is MyMathLab (MML) designed by Pearson Publisher Company (Hayfa & Othaman, 2014). When properly employed, the MML tool can enhance students' learning especially by providing them with an alternative platform for practicing mathematics (Hayfa & Othaman, 2014). As new ways of teaching are implemented, they need to be examined for effectiveness so that improvements can be made to the development and delivery of course material, as well as to understand the impact of blended approaches on teaches and students alike.

The successful implementation of technology blended approaches may require training and some modification of students and instructor perceptions (Lin, 2012). In evaluating technology based approaches, the dimensions to be investigated should be interaction, staff support, institutional quality assurance mechanisms, institutional credibility, learner support, information, as well as publicity and learning tasks (Jung, 2011). There is also the view that educational outcomes and learning approaches are not necessarily enhanced by using technology, concluding that evaluation of such programs is important for a better understanding impacts and experiences (Kirkwood, 2009). However, the

[1] The terms 'blended learning' and 'hybrid learning' are synonymous which means they can be used interchangeably

introduction of a well-integrated technology based learning platform has the potential for improving the quality of education (Basham, Smeltzer & Pianfetti, 2013), especially with regard to increased and more convenient access (Fisher & Sadera, 2011; Keengwe, Schnellert, & Mills, 2012).

This study reports on the first evaluation of the blended approach introduced in the teaching of Foundation Mathematics and identifies the impact of the new approaches on student engagement and outcomes. Technology facilitated learning was first introduced in the Spring semester of 2014, at a private college in Kuwait. Foundation Mathematics is a pre-University unit which students take as a pre-requisite, enabling more advanced mathematics courses for students continuing to diploma and degree programs in Business and Engineering. The technology blended learning was introduced to attain a greater level of student engagement in the mathematics learning process, as traditional methods have failed to achieve the practice level required for concept application and problem solving. The initial aim was to achieve deeper learning and greater engagement with the course content.

Foundation Mathematics course consisted of 4-credit hours, comprising three hours of lecture-based classes and one hour computer laboratory session per week. During the 3-hour of lectures, instructions were delivered using the traditional way of teaching, but resources from the interface website were used, like power point presentations, eBook, videos, animations, and worksheets. The one hour computer laboratory session was used to administer online quizzes and for students to carry out some assigned task on MML tool.

The evaluation of the program was to explore the effectiveness of the MML tool in the teaching of Foundation Mathematics and to introduce a strategy for continuous improvement in the blended approach. The objective of the study was to investigate if greater student engagement was being achieved. In particular the aims were as follows:

1. *Ascertain* whether or not there is relationship between the 'average time the students spent using the MML tool' and the 'Letter Grade' they obtain for the unit.
2. *Find out* whether or not there is a relationship between the 'average time the students spent using the MML tool and the 'grades students achieved in the various assessments', namely, Quiz test, Homework, mid and final examination and overall grade for the unit.
3. *Establish* the effect, if any, the MML tool had on the students' overall grades for Foundation Mathematics unit.

4. *Establish* whether or not there were any differences between female and male students' Foundation Mathematics grades that could be attributed to the MML tool.
5. *Establish* in which major, whether Engineering or Business, the use of the MML tool was more effective.

Literature review

The advancement of computer technologies and its classroom applications has brought a paradigm shift in the way instructors teach (Glass & Sue, 2008), especially in response to the generation of students who are "digital natives" (Windisch & Medman, 2008; Puyaraud & Hahn, 2012) and well accustomed to being in constant contact with the world around them. While their lifestyles are similar to previous generations, they interact differently with technology and are able to collaborate more effectively with one another wherever they are, at any time. These students do not respond well to traditional approaches used for past generations. However, the student learning outcomes resulting from the incorporation of technologies in teaching and learning relate to how the technology is used and if the student's approach to study is in any way modified because of the technology (Mkomange, 2012).

Implementing technology in the curriculum has proved to be beneficial to teaching and learning. It has been shown to be transformational, as it enhances communication, efficiency, problem solving, research, and decision-making (Niess, 2005, Veletsianos, 2011).Technology provides students with new forms of communication to enable them to take control of their own learning (Reba & Biggers, 2008). Moreover, students in eLearning develop technology skills and knowledge that they can incorporate in their daily and working lives (Hayfa & Othaman, 2014). Educational technologists argue that technology accommodates the diversity of learning styles of learners and offers flexibility for access (Peck & Jobe, 2008). It appears that increased access to online resources in a blended environment may enrich the learning experiences of students and more conveniently engage with the course material delivered and facilitated by new technologies.

Previous studies have shown that student engagement can be improved by incorporating interactive approaches to teaching. Borman & Sleigh, (2011) found that, when online teaching and assessment tools are used as an integral part of the course, an increased level of student engagement can be achieved. Once technologies are effectively incorporated into the classroom, it provides an opportunity for studying student engagement and positive learning outcomes.

Bulger *et al.*, (2008) found that technology aided learning in a classroom increases the level of student engagement with the content.

There have been a number of studies which report on the application of technology blended approaches. For example, Speckler (2012) analyzed 77 data-driven case studies in which MML was implemented and found that, in all cases, it has greatly supported student achievement. The case studies presented were collected from within the United States and abroad and included community colleges and two- and four-year colleges. Other studies (Kidder, 2015) support the view that student success rates improve with technology aided teaching. One of the key benefits of using the MML is that it helps in improving student retention and success, as well as increases the completion and pass rates (Speckler, 2012).

Hayfa & Othaman, (2014) identified seven principles for effectively leveraging technology for more productive educational outcomes, namely contact between students and staff, student collaboration and teamwork, active rather than passive approach to learning, prompt feedback to students, effective use of time, higher expectations, and greater respect for different learning styles and backgrounds.

MML allows student to get instant feedback when completing homework through a series of links to resources, similar problems and their step-by-step problem solving approach, video lectures that reiterate the concept as well as links to the textbook (Westover & Westover, 2014). Students need to be assessed on their competence and knowledge, and receiving instant feedback can help them reflect on their learning, access additional information and examine procedures and examples of problem solving. Having the immediate feedback on correct and incorrect answers to problems increase the students' performance and motivation to get answers right (Speckler, 2012). In addition, this feature individualizes instruction, which is similar to an instructor providing feedback to a student during office hours (Reba & Biggers, 2008). The Pearson report (Speckler, 2012) shows that the immediate feedback feature in the tool reinforces the learning process and increase student success. According to Wells, (2014), computer based instruction which has the facility to provide instant feedback has the potential to reduce "math anxiety", which can have serious impact on learning.

The MML provides powerful facility for making studying more efficient because it provides access to a number of information sources and tools. An additional advantage is that learning material can be accessed from mobile devices, enabling students to utilize time more effectively. The effective use and management of time provides scope for more teacher-students and student-students interactions. Speckler, (2012) confirms that one of the benefits of the

MML interface is that it saves time in the classroom and increase time spent on the learning tasks. Further, the use of the MML tool provides benefits by diversifying ways of learning.

Hayfa & Hiba, (2014) confirm the fact that MML provides an opportunity for students to work at their own pace and in a learning environment that best suits their different learning styles and needs. Speckler, (2012) affirms that the use of MML provides a new form of communication that promotes active learning and encourages students to take control of their learning.

However, there are drawbacks to using web-based educational system (Niess, 2005). The MML interface requires more time initially for the instructor to design it and use it (Law *et al.*, 2012). In addition, Law *et al.*, (2012) stated that students as well as teachers may encounter technical difficulties in accessing some features of the interface. They may not be able to install the plug-ins and players required to use those features. In addition, students may lack the time management skills that make them successful in the eLearning environment (Law *et al.*, 2012). It is worth noting that ineffective use of technology is not necessarily associated with the technology but to inappropriate strategies in its use (Kidder, 2015).

Methodology

In this study, we are using the tool of MyMathLab. It is an online educational system developed by Pearson Education to assist in the teaching and learning of a number of subjects, including mathematics. It is tightly integrated with the published textbooks. It offers an eBook, a range of practice exercises that can be assigned as homework, quizzes, or tests, an adaptive Study Plan, a Gradebook, Discussion Forums, and Instructor Resources (worksheets, solution and resource manuals, test bank, etc.). In addition, for each section, a multimedia Library is available and offers learners a range of features such as animations, videos, and power points, among others.

Research over the years has shown that the MML tool has potential to enhance students' learning of mathematics. However, the outcomes may vary depending on a range of issues such as student academic levels, implementation strategies used, and the cultural settings within which they are implemented. Therefore, findings from various studies may not have universal application and each must be evaluated within its own surroundings.

In this section, we present the methodology used to explore the effectiveness of MyMathLab (MML) tool at private college in Kuwait. This was an exploratory study (Creswell, 2014) designed to investigate if greater student engagement was achieved and to evaluate the outcomes from the migration from traditional to blended approach to the teaching of mathematics. An exploratory design is adopted where little is known about the phenomena of interest to the researcher (Miles & Huberman, 2014). In this, an exploratory design can help a researcher gain useful insights about a phenomena of interest, particularly in the early phases of a research, as was the case. Exploratory designs can take either a qualitative or quantitative approach or a combination of approaches; however, in this case a quantitative approach was taken to achieve a broad overview of effectiveness and shortcomings of the implemented blended learning environment.

There were 200 students registered for Foundation Mathematics at the college. Data for this study were collected from two different sources. The first set of data was obtained from the 'Gradebook' housed within the MML tool. It comprised weekly online data from quizzes, homework results and the time each student spent using the MML tool. The 'Gradebook' function in MML tool contains information about the total time spent on MML for each of the assignments, grades of homework and quizzes, the number of attempts to get right results, the features used by each student (videos, help, and eBook), the progress of each student, the skills acquired, and descriptive statistics on each assignment. The second set of data was made up of results from paper based mid and final semester examinations, provided by the instructors of the different sections of the course.

We exported the quizzes, homework results, and the time each student spent using the MML tool data sets from Gradebook into Microsoft Excel program using a procedure in the MML tool. We then manually entered data from the paper based mid and final semester examinations. After screening and checking the data for errors, we used various statistical techniques (e.g. mean, standard deviation, correlation) in Excel program to analyze the data.

Results and discussion

The data provided by the online Gradebook revealed important information about the students' activities and progress on MML throughout the semester which can be used to answer the research objective mentioned earlier. In this section, we present our findings for each of the research objective.

Data for the study was collected over one academic semester, comprising 14 weeks, at a private college in Kuwait. We sampled all 200 undergraduate students who registered for Foundation Mathematics in the Spring semester of 2014.

Attrition: The tracking of weekly usage data indicated that the initial attrition was 9.5%, which comprised students who had not used MML at all, and consequently had not completed the course work nor taken the final examination for the unit. These were excluded from any further analysis of the effectiveness of the program approaches. In addition, 6.5% of students who were to some degree engaged in the MML tutorials did not attend the final paper based examination. Consequently, only data from 168 (84%) of the 200 students who enrolled for the unit was used (*Table* 1).

Student Profile: In terms of sample composition, the gender distribution of the respondents was quite even; 57% male and 43% female (*Table* 1). However, the majority of respondents were from Engineering (77%) and the remainder (23%) from Business School (*Table* 1).

Table 1: Respondents' Profile (N =168)

Respondent Profile		Number	Percentage
Gender	Male	96	57%
	Female	43	43%
	Total	168	100%
Major	Engineering	130	77%
	Business	38	23%
	Total	168	100%

Engagement measured by time spent on MML: Firstly the relationship between the average time the students spent using the MML tool and the 'Letter Grade' they obtain for the unit were investigated. The 'Letter Grade' is derived from combining students' grades for the various assessments which make up the unit. For example, 'Letter Grade' *H* for Honor represents a grade of 90% above, *P* for Pass denotes a grade of 65% and above and lastly *F* means Fail which denotes a grade of 64% and below. This is presented in *Table* 2 below.

As *Table* 2 indicates, 19 (11%) students achieved the overall Letter grade Honor (H) for the unit. Students who achieved the H grade on average spent a minimum of 18 hours using the MML tool. This represents on average the most time students spent using the MML tool (*Table* 2). Based on the various tasks that were assigned throughout the semester, the planned expectation was that students would spend on average 14 hours using the MML tool.

Table 2: Average time spent on MML and resulting grade

Letter Grade	Average Total Time Spent onMML tool (hours)	Number (%)
H*	18.96	19 (11%)
P**	15.69	133 (79%)
F#	9.93	16 (10%)

H*= Honor (90% and above), P**= Pass (65%), F# = Fail (65% and below)

In the case of those who achieved a Pass (P) grade for the unit (79%) the average time spent using the MML tool was 15.69 hour. Those who achieved a Fail (F) grade for the unit (10%) spent on average 9.93 hours using the MML. There was a positive correlation between the time students spent using the MML tool and the overall 'Letter Grade' they achieved for the unit. This implies that the more time a student spent using the MML tool, the more likely they are to receive a higher grade for the unit.

The data from the MML enabled the monitoring of time devoted to doing exercises and problem solving, which was not possible when teaching using traditional means. This information enabled effort to provide additional encouragement and support to students who were likely to be at risk of failure and was clear advantage of technology blended learning.

Assessment: The second objective was to ascertain whether or not there was a relationship between the average time the students spent using the MML tool and the grades the students achieved in the various assessments, namely, quizzes, homework, mid and final examination and overall grade for the unit. The results of the correlation analysis we conducted to achieve the second objective are presented in *Table* 3 below.

Table 3: Correlations Between 'Total Time Students Spent on MML tool' and Assessment Grades

	Quiz Scores	Homework Grades	Mid	Final	Overall Grades
Pearson Correlation	0.25*	0.33*	0.04*	0.27	0.23*
N	168	168	168		168

**r is significant at p<0.01*

Table 3 indicates a positive correlation between the total hours students spent using the MML tool and Quiz scores $r = 0.25$, $n = 168$, $p<0.01$. Based on Cohen's (1988) interpretation r = 0.25 indicates a modest positive correlation between the total time students spent using the MML tool and their Quiz Scores. Similarly the correlation between the two variables can be considered as modest for mid-term tests scores $r = 0.04$, $n = 168$, $p<0.01$, final exam scores $r = 0.27$, $n = 168$, $p<0.01$ and overall unit grade scores $r = 0.23$, $n = 168$, $p<0.01$.

The correlation between the total hours students spent using the MML tool and Homework grades $r = 0.33$, $n = 168$, $p<0.01$., is within the moderate range, albeit, very low end (See Cohen, 1988). As indicated in the above section, we expected higher correlations between the variables than was obtained. Similar results were reported by Law, *et al*., (2012) in their study on the use of MML tool by students in Malaysia. They argue that the modest correlation could be a result of the fact that students spent lengthy time on the interface getting familiar with it since it was their first experience using the system. Another reason might be that students would leave their account open while doing the homework outside the campus, hence this would add time spent on the interface without actual work on it (Law, *et al*., 2012). Further research is necessary to explain the modest correlations between the variables we obtained in our study.

Effect on final grades: The third objective was to establish the effect, if any, the MML tool had on students' overall grades of the Foundation Mathematics unit. Students' 'Letter Grades' were compared with those from the previous semester in which the MML tool was not used. *Table* 4 presents the results of analysis of means conducted to achieve objective three.

Table 4: Comparison of 'Letter Grades" before and after MML implementation

Letter Grade	% of 'Without MML'	% 'With MML'
H*	30	11
P**	52	79
F#	18	10

H*= Honor (90% and above), P**= Pass (65%), F# = Fail (65% and below)

The sample size for the '*Without* MML' tool results was 254 students while in our '*With* MML' tool was 168 students. We observed mixed results for this objective. First, the percentage of students who achieved an *H* grade for the '*Without* MML' tool (30%) was almost treble the number of those who achieved the same grade in the '*With* MML' tool. However, the percentage of students who achieved *P* grade was higher for '*With* MML' tool group (79%) than for '*Without* MML' tool (52%). More importantly the percentage of students who passed the unit is higher for the '*With* MML' tool (90%) group than for '*Without* MML' tool (82%) group. In addition, fewer students from the '*With* MML' tool (9%) group failed the unit than compared to the for '*Without* MML' tool (18%) group.

Consequently, the results appear to suggest that the MML tool had a positive effect in increasing the number of students passing the unit and to some extent reducing the number of students achieving the highest grade *H*. This indicates that there may be considerable grade inflation in the traditional approach and teaching and assessment may be inconsistent across different teacher and classes. Grade inflation is a serious issue and difficult to monitor under traditional approaches, especially with large number of students and multiple classes. There are a number of important choices and decisions made on the basis of grades. For example, students make choices about courses, majors, and careers on the basis of their grades in various courses, and, graduate schools make choices about whom to admit and employers make choices about whom to hire (Butcher *et al*., 2014). A serious problem of grade inflation is that it tends to diminish motivation. If high grades become relatively easy to obtain, students will not be motivated to realize their full potential. Therefore, the clear advantage of technology blended approach is that it provides greater uniformity in assessment, a greater degree of fairness in awarding grades and more consistency across various classes and instructors.

Gender Difference: The fourth objective was to establish whether or not there were any differences between female and male students' grades that could be attributed to the MML tool. Male and female scores in a number of assessments and also the times each gender group spent using the MML tool, are presented in *Table* 5 below.

Table 5: Mean Differences Between Gender Assessments and Time using MML tool

Assessment Type	Female (n=72)Mean	Male (n=96) Mean
MML Homework % score	62	79
MML Quiz % score	79	78
Total Time Spent (in hours)	18.28	13.44
Midterm % score	79	77
Final % score	73	72
Overall Average Grade (%)	78	76

The result in *Table* 5 indicates that female and male scores were mostly similar in the various assessments. Thus, suggesting that MML tool had a similar effect on both female and male students. However, there appears to be some gender difference in the means for the 'Homework' grades. Male students with an average grade (79%) for 'Homework' appears to have significantly done better than their female (62%) counterparts. On the other hand, the results appear to suggest that female students (18.28 hours) spent significantly more time using the MML tool than their male (13.44 hours) counterparts (*Table* 5). However, in the absence of results from appropriate statistical tests, it is not possible at this stage to conclude whether or not these gender differences in 'Homework' and 'Time spent using MML tool' are statistically significant.

Differences in student majors: The aim was to establish in which major, whether Engineering or Business, was the use of the MML tool more effective. To achieve this, various assessment scores and the time student spent using the MML tool were compared for the two majors. This is presented in *Table* 6.

Table 6: Mean Differences Between Students from Different Majors

Assessment Type	Engineering (n=130) Mean	Business (n=38)Mean

MML Homework (%)	73	67
MML Quiz (%)	75	72
Total Time (in hours)	12.87	14.89
Midterm (%)	80	70
Final (%)	74	67
Average Grade (%)	78	72

Engineering students' scores for all assessments were marginally higher than those for Business students (*Table* 6). To some extent we expected this result given that at the college where we conducted our study, proven prior mathematics background is an entry requirement for Engineering students and not for students in the Business programs. However, the study found that Business students' grades were similar to those of engineering students. The Business students on average spent (14.89 hour) more time using the MML tool than did the Engineering students (12.87hours), which may account for their improved grades.

Conclusion

When changes in normal practice are implemented, the evaluation stage is critical for accessing impacts and implications for the future as a part of the continuous improvement process. This evaluation identified a number of issues for improvement and further investigation. The main aim of the study was centered around the issue of student engagement; however a number of pertinent issues were identified. For example, previous studies report that a greater level of student engagement is achieved with technology blended approaches (Borman & Sleigh, 2011; Bulger, *et al*, 2008). This study found that blended approach introduced in the teaching of Foundation Mathematics led to greater level of student engagement with the course, revealing that the course expected minimum hours of online activities were exceeded by between 12% and 35% in the case of those students who achieved a pass grade in the unit. An important element of the technology blended approach is that it enables continuous monitoring of student online activities. With a follow-up policy, staff are able to identify those students likely to be under performing in scheduled activities and likely to be at risk of failure because they are less engaged with the course. This opportunity did not exist in the traditional approach. The system provided data on the areas in which students appeared to be having difficulty. With this new information, appropriate efforts were made to provide targeted additional support for specific students. In the next phase of the program efforts will be required to develop a strategy for implementing an integrated student support program to run parallel to the online and classroom activities.

Comparison of the results from traditional and blended approaches revealed that grade inflation could be overcome by greater reliance on online assessments. While the failure rate from one semester to the next relate to different groups of students, the study found that the overall failure rate was reduced from 18% to 10% under the blended approach. However, the proportion of students achieving Honor grade decreased from 30% to 11% while the Pass grade increased from 52% to 79% (*Table* 4). One would have expected that with the blended approach and greater student engagement, there will be grade improvement, which was not achieved. It should be noted that a comparison between two different cohorts can show differences for various reasons which may be independent of the teaching approach.

This may be explained by issues relating to grade inflation. The compression of grades near the top can be a means of misinformation both for students and the institution. Grade inflation in the Foundation Programs disadvantage STEM fields (science, technology, engineering, mathematics) were completion rates tend to be lower because students tend to select courses that are more leniently graded. The reasons for grade inflation where 30% of students are scoring 90% or more, may be caused by the pressure to pass students, staff worry about their job security and the fear of poor student evaluation of staff. When grade are largely based on online assessments a greater degree of fairness can be achieved.

References

Basham, J., Smeltzer, A. & Pianfetti, E. (2013). An integrated framework used to increase preservice teacher NETS-T ability. *Journal of Technology and Teacher Education*, 257-276.

Borman, D. & Sleigh, A. (2011). An evaluation of the use of interactive approaches and integrated on-line resources. *Teaching Mathematics Applications, 30*, 166-177.

Bulger, M. E., Mayer, R. E., Almeroth, K. C., & Blau, S. D. (2008). Measuring Learner Engagement in Computer-Equipped College Classrooms. *Journal of Educational Multimedia and Hypermedia, 17*(2),129-143. Available at SSRN: http://ssrn.com/abstract=1859239

Butcher, K. F., McEwan, P. J. & Weerapana, A. (2014). The effects of an anti-grade-inflation policy at Wellesley College. *Journal of Economic Perspectives, 28*(3), 189-204.

Chickering, A. & Ehrmann, S. C. (1996). Implementing the seven principles: technology as lever. AAHE Bulletin. 1996. Retrieved 1 Aug 2014, from http://www.iupui.edu/~cletcrse/ncaa/seven.htm

Cohen, J. (1988). *Statistical Power Analysis for the Behavioural Sciences*. Hillsdale, NJ: Erlbaum

Creswell, J. W. (2014). *Research Design - Qualitative and Quantitative Approaches*. 4th Edition California: Saga.

Davidson-Shivers, G.V. & Rasmussen, K. L. (2006). *Web-based learning: design, implementation and evaluation.* New Jersey: Pearson.

Dennis, Emmett C. (2003). Enhancement Effect of MyMathLab and WebCT in a Math Class. *Electronic Proceedings of the Sixteenth Annual International Conference on Technology in Collegiate Mathematics*. Chicago, Illinois, October 30-November 2, 2003. Paper S056. Retrieved July 14, 2013 from http://archives.math.utk.edu/ICTCM/VOL16/S056/paper.pdf

Eadie, G. M. (2001). *The Impact of ICT on Schools: Classroom Design and Curriculum Delivery*. Wellington: Samuel Mardson Collegiate School.

Fisher, C. & Sadera, W. A. (2011). Comparing student learning and satisfaction between learning environments in continuing medical education. *International Journal of Instructional Technology and Distance Learning*, *8*(5), 29-38.

Glass, J. & Sue, V. (2008). Student preferences, satisfaction, and perceived learning in an online mathematics class. *Journal of Online Learning and Teaching, 4*(3), 325-340.

Goldin, C. (2013). Can 'Yellen Effect'Attract Young Women to Economics? *Bloomberg View*, October 14. http://www.bloombergview.com/articles/2013-10-14/can-yellen-effect-attract -young-women-to-economics-.

Hayfa, N. & Othaman, H. (2014). The Use of an Interactive Website as an Assistive Technology in University Calculus Course: A Synergist for Teaching and Learning?, *Athens: ATINER'S Conference Paper Series*, No: EMS2014-1294. Retrieved from http://www.atiner.gr/papers/EMS2014-1294.pdf

Miles, M. B. & Huberman, A.M. (2014). *Qualitative Data Analysis*. 3rd Edition, London, Sage.

Jung, I. (2011). The dimensions of e-learning quality: From the learner's perspective. *Educational Technology Research and Development*, *59*(4), 445-464.

Kazmer, M. M. (2005). How technology affects students' departures from online learning communities. *Newsletter ACM SIGGROUP Bulletin-Special issue on online learning communities,25*(1), 25-31.

Keengwe, J., Onchwari, G. & Wachira, P. (2008). The use of computer tools to support meaningful learning. *AACE Journal*, *16*(1), 77-92.

Kidder, L. C. (2015). The Multifaceted Endeavor of Online Teaching: The Need for a New Lens. In B. Hokanson, G. Clinton, & M. W. Tracey (Eds.), *The Design of the Learning Experience: Creating the Future of Educational Technology*, pp. 77-91. Switzerland: Springer International.

Kirkwood, A. (2009). E-Learning: You don't always get what you hope for. *Technology, Pedagogy and Education, 18*(2), 107-121.

Kvavik, R. B. & Casuro, J. B. (2005). ECAR study of students and information technology 2005: Convenience, connection, control, and learning. EDUCAUSE Centre for Applied Research. Retrieved from https://net.educause.edu/ir/library/pdf/ERS0506/ekf0506.pdf

Law, C. Y., Ng, L. N., Goh, W. W., Tay, C. L., & Sek, Y. W. (2012). Students' Perceptions of MyMathLab: An Online Learning Management System. *International Journal of e-Education, e-Business, e-Management and e-Learning,2*(1), 23-27.

Lin, M. L. (2012). *Students' motivation and attitudes in an online distance English course for placement year undergraduates in Taiwan* (Doctoral dissertation, Queen's University Belfast). http://ethos.bl.uk/OrderDetails.do?uin=uk.bl.ethos.579768

Miles, M. B., and Huberman, A.M. (1984). *Qualitative Data Analysis*. London, Sage.

Mkomange,C.W. (2012). Prospective Secondary Teachers' Beliefs About Mathematical Problem Solving. A Masters' Degree Thesis Submitted (unpublished) to the Faculty of Science for the award of MSc in Mathematics.Universiti Teknologi Malaysia

Niess, M. L. (2005). Preparing teachers to teach science and mathematics with technology: Developing a technology pedagogical content knowledge. *Teacher and Teacher Education*, *21*(5), 505-524.

Owens, E. W., & Waxman, H. C. (1994). Comparing the effectiveness of computer assisted instruction and conventional instruction in mathematics for African American postsecondary students. *International Journal of Instructional Media, 21*(4), 327-336.

Peck, K. L. & Jobe, H. (2008). Classrooms for the Future: Preliminary Results, *Pennsylvania Educational Technology Expo & Conference (PETE&C)*. Hershey, PA.

Prosser, M. & Trigwell, K. (1999). *Understanding Learning and Teaching: the experience in higher education*. Buckingham: Open University Press.

Puybaraud, M & Hahn, H (2012). Digital natives: a tech-savvy generation enters the workplace. Expert Insights. Retrieved from: http://workdesign.com/2012/02/digital-natives-a-tech-savvy-generation-enters-the-workplace/ .

Reba M. & Biggers S. (2008). Active Learning in Mathematics via Tablet PCs, Web-Based Software, Podcasts, and Interactive Homework Systems. *Electronic Proceedings of the Twentieth Annual International Conference on Technology in Collegiate Mathematics*. San Antonio, Texas, March 6-9, 2008. Paper S057. Retrieved August, 10, 2014 from http://archives.math.utk.edu/ICTCM/VOL20/S057/paper.pdf

Scida, E. E. & Saury, R. E. (2006). Hybrid courses and their impact on student and classroom performance: A case study at the University of Virginia. *CALICO Journal, 23*(3), 517-531.

Speckler, M. D. (2012). Making the Grade, V.5: 77 Data-driven Case Studies Illustrating How the MyMathLab Family of Products Supports Student Achievement, Boston, USA: Pearson. Retrieved on June 2014 from http://www.pearsonmylabandmastering.com/global/northamerica/results/files/MTGv5.pdf

Testone, S. (2005). Using publisher resources to assist developmental mathematics students. *Research and Teaching in Developmental Education, 21*(2), 1-4.

Veletsianos, G. (2011). Designing Opportunities for Transformation with Emerging Technologies. Educational Technology, 51(2), 41-46.

Wells, T. J. (2014). A mixed method of developmental math students' perspectives on successes and challenges in math and with MyMathLab, University of Florida dissertation. Retrieved on 15 June 2015 from http://gradworks.umi.com/36/47/3647877.html

Westover, J. H. & Westover, J. P. (2014). Teaching hybrid courses across disciplines: Effectively combining traditional learning and e-learning pedagogy. *International Journal of Information and Education Technologies, 4*(1), 93-96.

Windisch, E & Medman, N (2008). Understanding the digital natives. *Ericsson Business Review, 1*, 36-39.

Woodbridge, J. (2004). Technology integration as a transforming teaching strategy. Retrieved from http://www.techlearning.com/story/showArticle.jhtml?articleID=17701367

Ziphorah, R. M. (2014). Information and Communication Technology Integration: Where to Start, Infrastructure or Capacity Building? Procedia - Social and Behavioral Sciences. Elsevier. 116, 3649–3658