# Social Media and the Teaching of Mathematics in a Lifelong Learning Environment

Richard Ng
Open University Malaysia
richard_ng@oum.edu.my

Latifah Abdol Latif
Open University Malaysia
latifah@oum.edu.my

## Abstract

*Sharing information and connecting with others has proven to be a powerful tool in education. Learners collaborate with each other through social media to learn more on certain subjects, to test and share out ideas and theories, to understand facts, and to solve problems among peers and teachers. At Open University Malaysia, all courses including mathematics are delivered via a blend of face-to-face tutorials; self-managed learning using the print/html modules and e-learning via the institution's learning management system, MyVLE. Mathematics is one of the subjects most adult learners find challenging. Some learners develop a fear or phobia of mathematics either because of negative experiences in their past or lack of self-confidence. In an effort to improve the teaching of mathematics, Blog and Facebook are used. The main aim of using these social media is to establish social networks by fostering communication and knowledge exchange among learners, peers and tutors in a more informal manner. Such interaction among learners and tutors offer assistance, orientation and support and ultimately enhances the learning processes by creating a positive working atmosphere. This paper dwells on our experience in using social media to improve the teaching of mathematics in a lifelong learning environment.*

**Keywords:** *Social Media, Mathematics, Lifelong Learning, Facebook, Blog.*

## Introduction

The online discussion forum is one of the three key components of a blended learning pedagogy used at Open University Malaysia (OUM), Malaysia's first open and distance learning university with over 100,000 students to date. According to Ng (2010), 90 percent of these learners are working adults, who have families and jobs to take care. For a working adult who has left school for many years, coming back to school to take up mathematics course is a big challenge, what more if he/she has to do it via blended learning pedagogy with minimum face-to-face contact hours. The online discussion forum forms part of

the Learning Management System known as My Virtual Learning Environment (MyVLE) was developed to enable learning to be extended beyond classroom without barriers of space and time.

Management Mathematics and Statistics courses are core courses for learners who are taking the bachelor degree programmes in business, management and human resources at OUM. These learners often find difficulties in posting their problems via MyVLE as the system does not support mathematical symbols. Though there is software such as Microsoft Equation Editor which can be used to type mathematical symbols, learners however, are not familiar and probably have never used it before. Some of these learners are also hampered by technological problems due to their incompetency in using computer and Internet.

To overcome these problems, OUM has embarked on a pre-tutorial mathematics workshop aimed at equipping learners with skills on how to use the Microsoft Equation Editor software. Participants were also exposed on how to access the video clips and PowerPoint slides posted in the blog. They were also coached on how extended discussion is conducted in a specially created group in the Facebook. All these efforts are taken in order to increase their level of engagement so as to reduce their feelings of isolation which has been identified as one of the major factors that caused attrition among open distance learners.

## Research Objective

The objective of this research is to verify the impact of the use of social networking tools such as Weblog and Facebook, in the teaching of mathematics related subjects. The research will show how such approach influences the learners' sense of community, satisfaction, intrinsic motivation and their intention to stay. The following questions are used to guide the research:

(a) What is level of participation of learners in the social network?

(b) Is there a correlation between learners' level of participation in the social network and Pre-Tutorial workshop attendance and their level of Sense of Community, Satisfaction, Intrinsic Motivation and Commitment to stay?

(c) Is there a statistical significant difference in the learners' level of Sense of Community, Satisfaction, Intrinsic Motivation and Commitment to stay between learners who have high participation in the social network and those who have low participation in the social network?

## Problem Statement

Most learners at OUM are working adults who have left school for at least five years prior to taking up tertiary education. They are either weak in Mathematics or have forgotten what they have learned in school. All courses including mathematics are taught via blended learning which includes Face-to-face session, Self-managed learning and Online Discussion forum. Learners attend two hours of face-to-face session for four sessions per course in a semester where instructors will provide tutorial, which covers between two to three topics per session. As mathematics requires basic foundation and understanding of concept and formula, the two-hour session is insufficient for instructors to provide sufficient examples on how to apply the concepts and formula taught. Thus learning has to be extended beyond classroom via Online Discussion forum.

Unfortunately, the state-the-of-art Online Discussion forum has limitation where its editor cannot support mathematical symbols. Moreover, it does not provide the flexibility to instructors to post up video lectures to learners and respond to the learners' questions accordingly. There are also learners who are not IT savvy and are not exposed to using Microsoft Equation Editor. As a result, learners encountered problems with learning the mathematics related courses. This led to feeling of loneliness, lower sense of community, satisfaction, intrinsic motivation and commitment to stay in their programmes.

The Facebook and Weblog offer an opportunity for instructors and learners to support learning because not only they are available for free but also they provide flexibility and are user-friendly. The Weblog allows the instructor to post and organise video clips as well as PowerPoint slides. The Facebook allows the creation of group discussion as well as posting of sample questions and answers to assist learners to understand the course better.

## Literature Review

According to Fisher (2011), the use of social network has big influence on teachers and learners compared to traditional educational system due to the opportunities provided to connect and collaborate in a much easier manner. Stephens (2011) noted that more and more students are glued to social network especially Facebook to socialise, to catch up one another, share events and popular causes, news, pictures and hold discussion.

Stollak et al. (2011) concurred that social networking such as Facebook, MySpace, Blogs, Twitter, LinkedIn and YouTube is getting more and more popular among college students since its introduction between 2004 to 2006. They estimated that 85 percent of students today are involved in social networking. Students used them to communicate among friends within or outside the college environment and make them feel they belong to a community. One common question that pops up among parents is whether the amount of time spent on social network has impact on their studies.

In an online debate conducted by the Economist (2008) to find out if significant time spent by students on social networking platforms helps in their studies, 64 percent of the respondents supported the notion that social networking can bring large positive change to education. According to Hoffman (2009), social networking tool has both its advantage and problems for usage in teaching and learning. With the emergence of freely available Web 2.0 and open access tools, instructors and designers have been given greater ability to customise e-learning.

Social networking tools are products of improved World Wide Web or commonly known as Web 2.0. (Alexander, 2006). It allows collaboration, sharing of knowledge and content among users. (O' Reilly, 2005). According to Lee and McLoughlin (2010), there is a tremendous potential in using social networking tools in enhancing distance learning through increased connectivity, customization, personalization and opportunities for networking and collaboration. With appropriate learning designs and pedagogical strategies, the social networking tool can enhance, enrich, and extend traditional distance education paradigms.

However, according to Martin (2009), in a research conducted by University of New Hampshire, students who are heavily engage in social networking do just as well academically as students who are less interested in keeping in touch with the medium. The same study indicates that social media is being integrated with rather than interfering with students' academic lives. Thus it is the pedagogical aspect

which needs innovative idea to create interest among learners as pointed by Lee and McLoughlin (2009). Munoz and Towner (2009) concur that social network tool such as Facebook provides instructors opportunities and structures by which students can help and support one another which can increase both teacher-student and student-student interaction.

Stollak et al. (2011) noted that with the emergence of smart phones, netbooks and tablets today the involvement of students in the social network will increase greatly not only for communication and entertainment but also for education. In a preliminary research on social network tools usage by Shaughnessy (2011), it was found that Facebook and Tweeter are good social network tools for opinion forming due to its ease of use. However, he noted that blogs are the most important place to express opinion on significant issues.

Mathematics has been regarded by learners historically as one of the many difficult courses or "high-risk" courses due to its low success rate in completion. Many believe that technical subjects including mathematics cannot be delivered 100% via online. According to Engelbrecht and Harding (2004), this could be due to the inability of the Internet Hypertext Markup Language (HTML) to represent mathematical symbols and also the general belief that mathematics can only be taught successfully via face-to-face approach.

Weems (2002) conducted a comparative study on the Introductory Algebra subjects offered to two groups of students; one taught via online and the other via traditional approach. He found that there is no significant difference between the achievements of both groups of students. A similar research conducted by Ryan (2001) on the Introductory Mathematics subject also yielded the same result

Ng et al. (2008) in their research found that learners who have been exposed to pre-tutorial workshop where they were taught on how to use Equation Editor, access video clips from a blog and post questions through online discussion forum, recorded higher rate of participation in the online discussion forum and higher final exam grade.

## Pre-Tutorial Workshop and Pedagogical Model Used at OUM

(a) **Social Network Tools used:**
The pedagogy used in teaching mathematics involved the use of the following Social Network Tools:

(i) Blog – to organize video clips according to each topic and to post up related notes

(ii) YouTube – to upload video lectures for sharing in the blog

(iii) SlideShare – to convert slides for sharing in the blog

(iv) Facebook – to create online group discussion and to alert learners on new posting in the blog

(b) **The Pre-Tutorial Workshop:**
OUM learners who have signed up for the Management Mathematics and the Introduction to Statistics courses were invited to attend the pre-tutorial workshop. The learners were taught on how to use the Microsoft Equation Editor software to type mathematical symbols and transfer them onto Microsoft Words document. They were then shown hands-on on how to access the blog and

Facebook and hold group discussion. Those who have no Facebook account were taught on how to create it.

(c) **The Pedagogical Model:**

Learners taking the Management Mathematics and Statistic courses have completed one semester of study at OUM where they were taught on the various learning skills in a blended learning environment. Thus these learners are supposed to have read at least two topics before coming to their face-to-face tutorial session.

The tutor will then use the PowerPoint slides to guide the learners. These slides are then uploaded into www.slideshare.net before they are posted into the mathematics blog http://bbmp-1103.blogspot.com or statistic blog http://sbst-1103.blogspot.com. Video clips of tutorial sessions and sample questions and answers were uploaded into YouTube before they are organised in the respective blog.

The discussion group is created in the Facebook and learners' names were added into the group. Any new posting made in the blog will be alerted through a link posted in the group discussion. Exercises were posted as pictures in the Facebook and learners are to provide the answers via file attachment either through private message in the Facebook or via email. The tutor will provide solution via video clips posted in the blog.

Figure 1 below shows the model of teaching pedagogy using social network tools mentioned above.

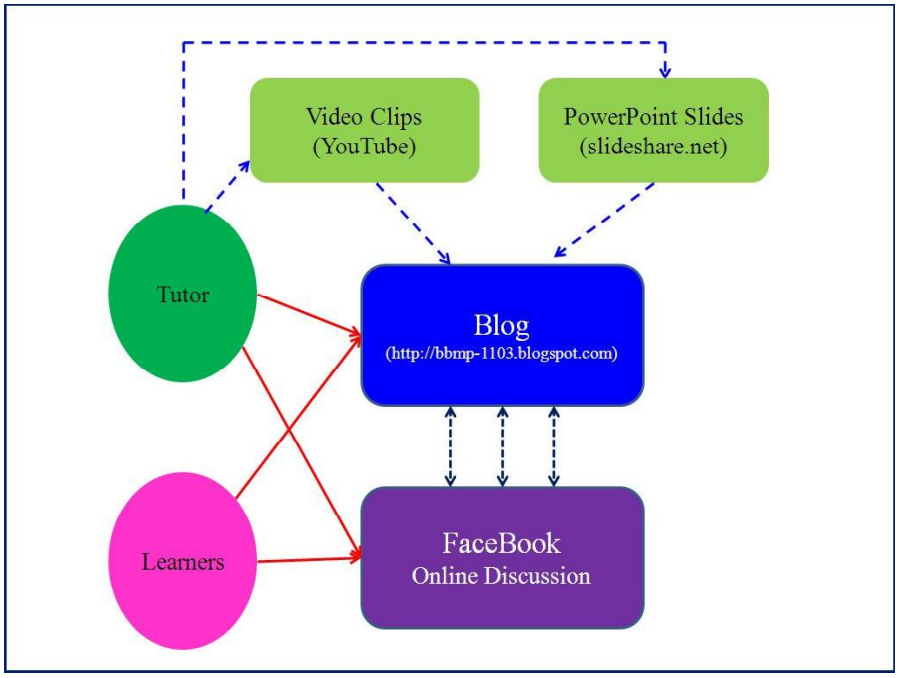


**Figure 1 :** Pedagogical Model of Teaching Math using Social Network Tools

## Research Methodology

A 63-item instrument was used to find out if their participation in the social network has impact on their level of Sense of Community, Satisfaction, Intrinsic Motivation and Commitment to stay in their studies. The conceptual model of the research is as shown in Figure 2 below.

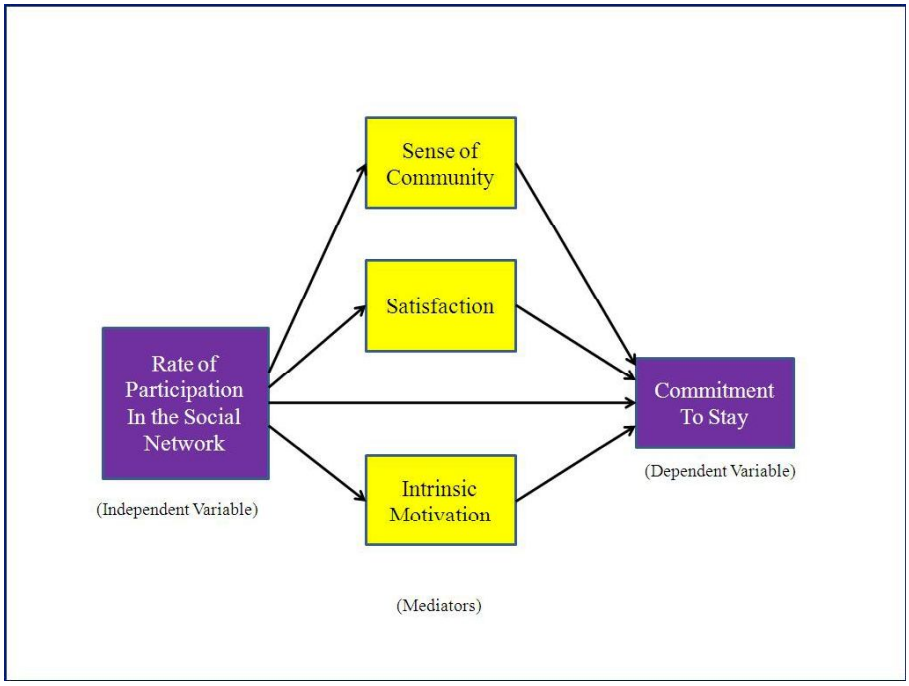


**Figure 2:** Conceptual Model of the Research

The research targeted 100 OUM learners from four different cohorts who have taken the Management Mathematics and Statistic courses and have gone through the new pedagogical teaching using social network tools. Research questionnaire was sent via email and respondents were given two weeks to response. Response received were then entered into Microsoft Excel before they are analysed using Statistical Package for Social Science (SPSS) software.

## Findings

(a) **Samples and Demography:**

A total of 68 responses were received giving a response rate of 68 percent. Of this total, 28 are Male respondents compared to 40 Female. Malay made up the biggest ethnic group with 34 respondents followed by 24 Chinese and 10 Indian. In terms of age group, majority of the respondents were found to be in the 31 to 40 age group with 37 respondents, followed by 21 respondents in the 21 to 30 age group, 3 in the 41 to 50 age group and 1 in the Above 50 age group. Of the total respondents, 47 have attended the Pre-Tutorial workshop and 21 did not attend. The number of hours per week spent on accessing the Facebook and Blog in the Less than 1 hour

category is 12, 1 to 2 hours category is 16, 2 to 3 hours category is 31 and more than 3 hours category is 9.

The mean scores and standard deviations for Sense of Community, Satisfaction, Intrinsic Motivation and Commitment to stay are shown in Table 1 below:

**Table: 1 –** Mean Scores and Standard Deviation of Sense of Community, Satisfaction, Intrinsic Motivation and Commitment to stay

| | N | Mean | Std. Deviation |
|---|---|---|---|
| Sense of Community | 68 | 3.7941 | .36849 |
| Satisfaction | 68 | 3.5897 | .33015 |
| Intrinsic Motivation | 68 | 3.6441 | .23269 |
| Commitment To Stay | 68 | 3.7691 | .43888 |

(b) **Answers to Research Questions:**

(i) *What is level of participation of learners in the social network?*
In this research, the level of participation is defined as the number of hours spent per week in the social network instead of the number hits due to the difficulty in measuring the hit rate. The number of hours spent per week has been mentioned above where majority was found to be spending between 2 to 3 hours per week. The median point was found to be between 2 to 3 hours per week. Thus, learners' participation in the social media is high.

(ii) *Is there a correlation between learners' level of participation in the social network and Pre-Tutorial workshop attendance and their level of Sense of Community, Satisfaction, Intrinsic Motivation and Commitment to stay?*
The Spearman Correlation Coefficients for these variables are as shown in Table 2 below.

**Table: 2 -** Spearman Correlation Coefficients

| | | SCI | SAT | IM | CTS | AW | HR |
|---|---|---|---|---|---|---|---|
| Attend Workshop | Correlation Coefficient | .686(**) | .481(**) | .356(**) | .440(**) | 1.000 | .797(**) |
| | Sig. (2-tailed) | .000 | .000 | .003 | .000 | . | .000 |
| Hours spent per week | Correlation Coefficient | .746(**) | .554(**) | .418(**) | .527(**) | .797(**) | 1.000 |
| | Sig. (2-tailed) | .000 | .000 | .000 | .000 | .000 | . |

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

Thus from the table it was noted that participation of learners in the workshop and number of hours they spent in the social media has impact on their level of Sense of Community, Satisfaction, Intrinsic Motivation and Commitment to stay in their programmes as all the coefficient correlations are significant ($p < 0.01$) at 2-tailed test as suggested by Garson (2008).

(iii) *Is there a statistical significant difference in the learners' level of Sense of Community, Satisfaction, Intrinsic Motivation and Commitment to stay between learners who have high participation in the social network and those who have low participation in the social network?*

The Independent Samples *T*-test was carried out to find if there a statistical significant difference in the learners' level of Sense of Community (SCI), Satisfaction (SAT), Intrinsic Motivation (IM) and Commitment to stay (CTS) between learners who have high participation in the social network and those who have low participation in the social network. Using the cut-off point of Number of Hours spent per week between 2 to 3 hours, which is the median point as suggested by Garson (2008), the results are as shown in Table 3 below:

**Table: 3 –** Independent Samples *T*-Test for SCI, SAT, IM and CTS between learners who have high and low participation rate

| | | Levene's Test for Equality of Variances | | t-test for Equality of Means | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | F | Sig. | t | df | Sig. (2-tailed) | Mean Diff. | Std. Error Diff. | 95% Confidence Interval of the Difference | |
| | | | | | | | | | Lower | Upper |
| **SCI** | Equal variances assumed | 5.444 | .023 | 6.768 | 66 | .000 | .4757 | .07029 | .33538 | .61605 |
| | Equal variances not assumed | | | 7.436 | 63.343 | .000 | .4757 | .06398 | .34788 | .60355 |
| **SAT** | Equal variances assumed | .115 | .735 | 5.076 | 66 | .000 | .3529 | .06951 | .21408 | .49164 |
| | Equal variances not assumed | | | 5.277 | 64.673 | .000 | .3529 | .06687 | .21929 | .48642 |
| **IM** | Equal variances assumed | 3.900 | .052 | 3.886 | 66 | .000 | .2025 | .05211 | .09845 | .30655 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Equal variances not assumed | | | 3.661 | 45.400 | .001 | .2025 | .05532 | .09111 | .31389 |
| **CTS** | Equal variances assumed | 1.383 | .244 | 3.769 | 66 | .000 | .3725 | .09884 | .17516 | .56984 |
| | Equal variances not assumed | | | 3.988 | 65.921 | .000 | .3725 | .09340 | .18602 | .55898 |

The results above show that there is a statistical significant difference in the learners' level of Sense of Community ($t(63) = 7.436$, $p = 0.000$), Satisfaction ($t(66) = 5.076$, $p = 0.000$), Intrinsic Motivation ($t(66) = 3.886$, $p = 0.000$) and Commitment to stay ($t(66) = 3.769$, $p = 0.000$) between learners who have high participation in the social network and those who have low participation in the social network.

Multiple regression analysis carried out with Commitment to stay as the dependent variable and Sense of Community, Satisfaction and Intrinsic Motivation as predictors, found that the adjusted r2 value is 0.62 indicating that the predictors explained 62 percent of the variance of Commitment to stay.

## Discussion and Conclusion

Social media is now a vital part of life. Academicians need to learn how to effectively take advantage of social media to integrate academics. The results of this research concurred with Lee and McLoughlin (2010) that with appropriate learning designs and pedagogical strategies, the social networking tool can enhance, enrich, and extend traditional distance education paradigms and increase connectivity and engagement of learners.

This research also concurred with the findings by Ng (2010) that increased in the level of Engagement of learners will increase their level of Sense of Community, Satisfaction and Intrinsic Motivation and this has impact on their Commitment to stay in their programmes. More importantly is that social network tool can be use to teach mathematics related courses via online and help reduce the learners' feeling of isolation and increase their retention.

As suggested by Hoffman (2009), social networking tool has both its advantage and problems for usage in teaching and learning. Thus learners need to be exposed first on how to use social network for collaboration in the learning of mathematics related courses through the Pre-Tutorial workshop. Instructors and tutors should capitalised on the emergence of freely available Web 2.0 and open access tools which provide greater ability to customise online learning. As pointed by Stollak et al. (2011) the emergence of smart phones, netbooks and tablets today will help increase involvement of learners in the social network.

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