THE TEACHING AND LEARNING OF MATHEMATICS VIA ONLINE: SHARING A LIFELONG LEARNING EXPERIENCE AT OPEN UNIVERSITY MALAYSIA

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Abstract

Today many working adults opted to pursue their dreams of getting a degree through open and distance learning (ODL) mode of studies. This is because the ODL option allows them the flexibility to study without having to leave their jobs or families behind. However, the flexibility in such learning mode means that learners have to depend on online support or other assistance for their extended learning. Mathematics, a traditionally difficult course, forms part of the pre-requisite for learners to obtain a business degree at Open University Malaysia (OUM). The majority of learners at OUM are adult learners who have left school for at least five years and most of them have low grades in Mathematics prior to embarking on their journey. Thus it is a big challenge for these adult learners to undertake a compulsory Mathematics course via online with minimum Face-to-Face contact with their tutors. A system of coaching ODL learners to understand and learn mathematics was developed known as the Online Supplemental Instruction (OSI) model at OUM. It involves the use of math video clips developed and posted on YouTube and organized in a web blog to assist learners. Mentoring was carried out via OUM's online discussion forum available in OUM's learner management system known as myVLE. This paper shares the award winning Lifelong Learning experience of developing the OSI model of teaching math via online and feedback obtained from learners who have used it successfully.

Keywords: *Open and Distance Learning, Mathematics, Online Supplemental Instruction, Lifelong Learning, MOOC*

Introduction

The advent of mobile technology and the advancement in broadband internet connection in Malaysia couple with the increase in demand for better tertiary qualifications have resulted in more and more people engaged in open and distance learning. These new innovations in technology has made learning accessible and flexible. Open University Malaysia (OUM), the nation's first open and distance learning university in Malaysia has over 140,000 students to date where 97 percent are working adults. Most of these students have never been to a university prior to joining OUM and many have left schools for more than five years. Those taking up business courses such as the Bachelor of Business Administration, Accounting, Banking and Finance, and Marketing have to take the Mathematics and Statistic courses with only eight hours of face-to-face contact hours with the rest done via online or self-managed learning. Thus it is a big challenge for the tutors and students to teach and learn these math subjects.

The OSI model of teaching math with the aid of social media such as YouTube and Web Blog was introduced in 2008 to a group of selected students. A study was then conducted to gauge the effectiveness of such intervention and it was found that there was a significant improvement in the students participation in the collaborative learning and final exam grade (Ng, et al. 2008). The success of such intervention was presented at the Asia Association of Open Universities International Conference held in Beijing, China in 2008 and the paper won a Silver Medal for Best Paper award category. The video clips posted in the web blog (http://management-math.blogspot.com) were still available and was accessed by thousands of students in Malaysia and throughout the globe.

However, very little was known about the process of developing the video clips for the OSI system. Thus this paper will present the process involved which will provide a lifelong learning experience to both teachers and learners. It will also show how students have benefitted from it.

Literature Review

According to Puiu (2013), the education system which develops the career of a person is based on a lifelong learning concept from early childhood education, secondary education, higher education, continuous education and professional training of adults. The full complex development of an individual is achieved through lifelong learning. He noted that continuous education as part of the education development process involves all the learning activities undertaken by each person throughout life in formal, non-formal and informal contexts, leading to competence acquirement and development from personal, civic, social or employment perspective.

Puiu (2013) added that among the principles governing the lower and higher education and lifelong learning in Romania include; the principle of equity – under which access to learning is done without discrimination, the principle of relevance – under which education answers to personal development needs and to socio-economic needs, the principle of effectiveness – under which the aim is that of achieving maximum educational results by managing existing resources, and the principle of respecting the right to an opinion of the pupil / student as a direct beneficiary of the educational system.

Bruce (2006, as cited in Love, 2011) noted that lifelong learning has been equated with continuing education and training. Love (2011) pointed that education is a process that one continues throughout his or her career and lifetime. Lifelong learning according to Marks (2002) is a type learning that can range from a second chance access to higher education for adults wishing to learn to short-term skilling or re-skilling for those in unstable careers and temporary jobs. Its purpose can range from teaching of specific competencies of which the employers can make use to learning for its own sake be it for self satisfaction or contribution to the body of knowledge.

Information and communications technology has broken down barriers to lifelong learning. Although not formally defining lifelong learning, Evans and Fan (2002) considered the use of Web-based technology for facilitating it noting that lifelong learning has come to involve a variety of learning experiences or modes especially with the availability of social media such as Facebook and YouTube. Love (2011) has listed eight characteristics, one of which include learner taking responsibility in planning his/her own profesional career path and thus requires associated skills such as ability to search for knowledge and learning resources.

As a result of this new phenomenon today where more people embrace lifelong learning as a way to improve their career, many adult learners have resorted to ODL mode of learning rather than opting for traditional environment. Research conducted by Russell (2001, 2005) on mode of learning confirmed that there is no significant difference between learning that takes place in a traditional environment versus open and distance learning. This research was supported by Neuhauser (2002) who found that course delivery media was not sufficiently significant to affect course outcomes.

However, many believe that technical subjects including mathematics cannot be delivered 100 percent 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. In the study by Dash (2004), he concluded that face-to-face workshop improved significantly the achievement of the distance teacher trainees. He reported that learning from other means get strengthened by supplementary interactive media like face-to-face development workshop.

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.

Lotze (2002), in his comparative study on the teaching of mathematics and statistics via face-to-face and online, found that students in the online learning mode not only struggle with the mathematics concept but also hampered by the use of mathematical symbols, which is necessary to understand and explain the concept. Thus, it is important to introduce both the basic concepts of mathematics and how to use software such as Microsoft Equation Editor to communicate these symbols as part of the orientation program or pre-tutorial session to enhance learning of mathematics via online.

The Alternative Model of Teaching Math via Online – The OSI Model

The author together with a group of faculty members from OUM have embarked on the Online Supplemental Instruction method in coaching the Management Mathematics subject for learners from the Faculty of Business and Management. The OSI model is as shown in Fig. 1 below. According to this model, learners must first be trained to use special software known as Ms-Equation Editor to assist them to type mathematical symbols required for online posting and discussion. This is conducted as a pre-tutorial workshop prior to the first session of the tutorial. A video on how to use this software will also be posted in the Youtube and organized in a Weblog.

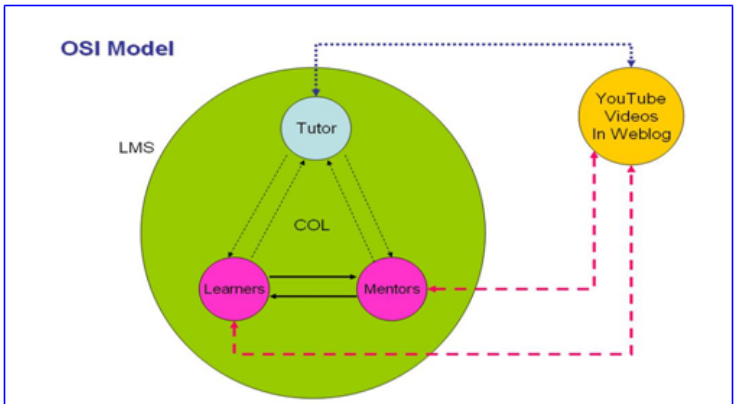


Fig.1 – The Online Supplemental Instruction (OSI) Model

According to Ng et. al. (2007) and Ng, Kaur and Latif (2008), the model was tested on 132 learners. It has resulted in higher online participation ratio and final exam score compared with other learners taking the same course.

Lifelong Learning Experience Sharing for the Teaching and Learning of Management Mathematics (BBMP1103) at OUM

To date, a total of 114 posting was made in the web blog with 74,351 page views received since its first posting in September 2008. The following sections will explain how teachers can create and post video clips onto YouTube, and then how to engage with learners.

LLL Experience for Teachers

The Preparation of Short Video Clips:

There are two types of video clips prepared; one using power point slides with the camera zooming on the computer screen, and the other one using a video camcorder to record live lecture being conducted. The following are the steps involved:

Step: 1 – Video Editing:

The video editing software can be downloaded free from the Internet. One such software is from DVDVideoSoft – Video Dub which can be obtained from the URL: http://www.dvdvideosoft.com/ as shown in Fig. 2. The video captured is then edited using this software and split into several video clips to reduce its size for uploading onto YouTube and Facebook.

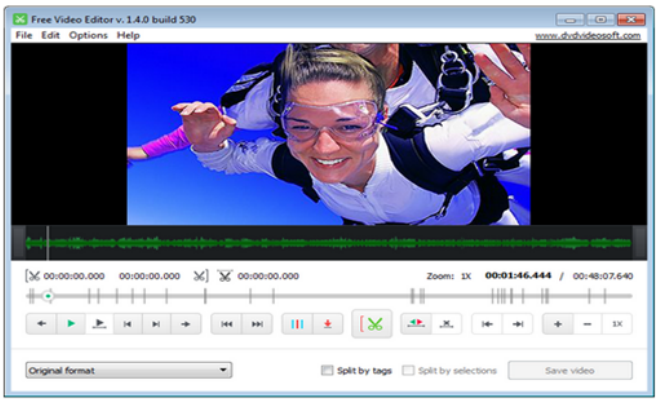


Fig.2 – The Video Editor

Step: 2 – Compressing the Video:

The edited video is usually greater than 25MB which makes it difficult to be uploaded to YouTube. Thus it is first converted using the video to flash converter which can also be obtained from http://www.dvdvideosoft.com/. See Fig. 3. The converted video normally has a size of one tenth of the original video.

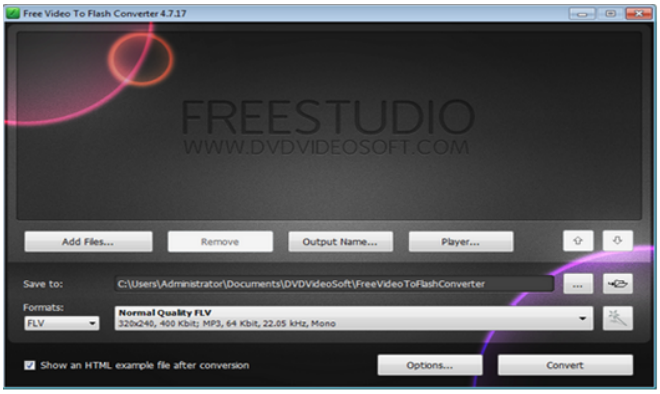


Fig.3 – Video to Flash Converter

Step: 3 – Upload onto YouTube:

The converted video is then uploaded to YouTube and Facebook. This can take between 30 minutes to 2 hours depending on the size and Internet speed. DVDSoft also provide free download for software used to upload video clips onto YouTube at a faster rate.

Step: 4 – Organize the Video Clips in Web Blog:

Video clips uploaded onto YouTube is then posted and organize in a web blog by embedding the code created in YouTube and post it in the blog together with Powerpoint notes and explanation on the video clips to guide the learners. Hyperlink was also created into the blog for easy search as shown in Fig. 4. The posting made was also labeled to organize the video clips and posting for easy access.

Fig.4 – Management Mathematics Blog

Step: 5 – Trigger the Learners:

The posting and video clips made must be triggered to alert users. At OUM this was done through Online Discussion Forum available in the OUM's portal – MyVLE (My Virtual Learning Environment). Also posting from the blog can also be posted into Facebook to alert users by providing the hyperlink. With today's mobile technology, video clips can also be posted in Whatsapp and discussion is held with students who are members of the group. Learners can also be triggered through posting in other related blogs as well or using tags and strategic keywords for search in Google and other search engines. See Fig. 5.

		Search Query
159 Hits	91.38%	(Keywords Unavailable)
2 Hits	1.15%	how to do 3x3 applications
1 Hit	0.57%	BBMP1103
1 Hit	0.57%	3 x 3 inverse matrix easy way
1 Hit	0.57%	bbmp1103 oum pdf
1 Hit	0.57%	consumer surplus integration
1 Hit	0.57%	http://bbmp-1103.blogspot.com/2009/01/solving-simultaneous-equations-using_27.html
1 Hit	0.57%	logarithm video clips
1 Hit	0.57%	mathematical software evaluation rubric template
1 Hit	0.57%	mathematics for management dr richard ng
1 Hit	0.57%	mathematics for management oum
1 Hit	0.57%	mathematics for management oum pdf
1 Hit	0.57%	modul mathematis for management oum
1 Hit	0.57%	sample assignment oum 1103
1 Hit	0.57%	solve 3x3 matrix by inverse method

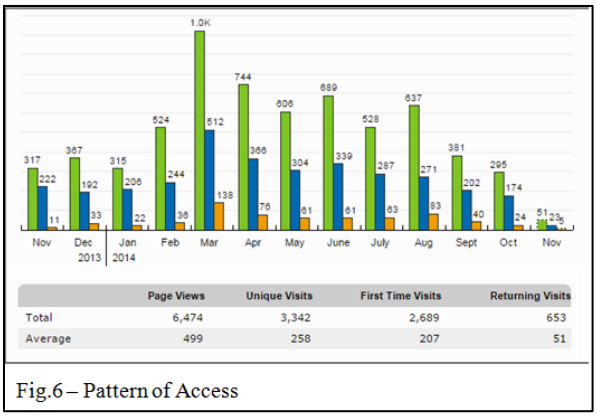
Fig.5 – Keyword Search Query

Step: 6 – Encourage Feedback and Discussion:

The OSI model requires the identification and 'appointment' of mentors who are normally good at math and technology to guide slower learners. The tutors or lecturers can provide sample questions and answers via video clips and then followed by exercises for learners to answer. Learners are given a certain time frame to answer through file attachment in MyVLE or Facebook. Solutions can be posted into the blog via video clips explaining the steps involved.

LLL Experience for Learners

Learners are normally alerted about the existence of the Mathematics Blog and Video Clips during face-to-face lecture, Online Discussion Forum in MyVLE or Facebook. Today we can alert them via Whatsapp or another mobile communication technology.



	Page Views	Unique Visits	First Time Visits	Returning Visits
Total	6,474	3,342	2,689	653
Average	499	258	207	51

Fig.6 – Pattern of Access

However, there are other techno savvy learners who will google for help. Thus, having good keyword tags can help in positioning the materials required to assist in the search. Learners access pattern can be traced using StatCounter tracking system available free from www.statcounter.com. Fig. 6 shows the histogram provided by StatCounter.

Learners' other pattern of behavior in accessing the materials and video clips can also be traced from the statistics provided by StatCounter such as keywords, search engines, browser, direct or indirect access to the blogs, and the city, state or country of their origin. StatCounter also provided statistics on unique visitors, what page was downloaded and number of times a page was viewed and downloaded. The learners' satisfaction can be traced from the comments and feedback usually through messages posted in the YouTube, Facebook or Emails.

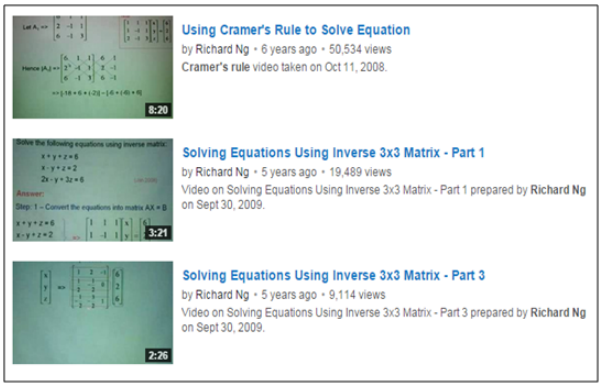


Fig.7 – Video Clips poster on Youtube

One of the most popular video clips downloaded and was viewed 50,561 times is the video clip on Using Cramer's Rule to solve equation problems (See Fig. 7). It has received 69 glowing remarks from people around the globe. Some comments received are as shown in Fig. 8.

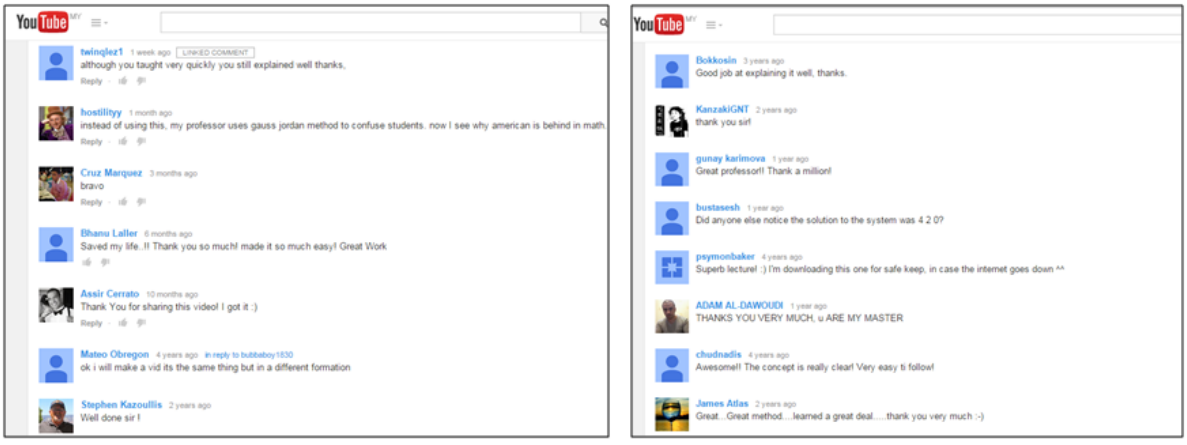


Fig.8 – Comments from users

Conclusion and Discussion

The research on the effectiveness of using OSI model as an alternative approach in teaching mathematics via online has shown positive results as reported by Ng. et. al (2007) and Ng, Kaur and Latif (2008). It shows that mathematics can be taught via online through open and distance learning mode. For busy working adults especially generation Y learners who are techno savvy, the video clips posted on YouTube, organized in Web Blog and Facebook can give them the knowledge and information they seek to enhance their understanding in difficult subjects such as mathematics.

According to Ng, Kaur and Latif (2008), the model developed could help reduce barriers of technology necessary to enhance learning over a distance. The online supplemental instruction can help improve learners' participation in online discussion forum where most of the learning takes place beyond classroom. Engaged learners will not feel isolated thus reduce attrition rate. Learners' confidence and satisfaction will also increase and this will have impact on their final exam score.

The findings in this paper concur with Love (2011) and Marks (2002) that education is a process where people continue to learn be it for short-term skilling or re-skilling, or teaching of specific competencies. It also concur with Evans and Fan (2002) that lifelong learning has come to involve a variety of learning experiences or modes especially with the availability of social media such as Facebook and YouTube. It is also about learners taking responsibility in planning his/her own profesional career path and thus requires associated skills such as ability to search for knowledge and learning resources (Love, 2011).

Another interesting point to note is that the video clips and Powerpoint slides have also been downloaded by people and become a sort 'MOOC' to them searching for free materials that are useful for them to enhance their knowledge. As it contains the whole set of notes for the Management Mathematics subject for OUM's students, it is not surprise to note that such model is turning into a MOOC model for the teaching of Mathematics with the users getting certification from their respective university. According to Macmillan Dictionary (2014), Massive Open Online Courses or MOOC is a course of study offered over the Internet which is free and has a very 'large' number of participants. It is the hottest new trend in digital pedagogy and is completely free, and truly 'massive' in that they are open to all, potentially enrolling many thousands of students.

It is hope that with the sharing of such lifelong experience in teaching mathematics via online, more teachers can help contribute to the progress of mankind.

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