

A PRELIMINARY STUDY: USING LMS LOG DATA TO EVALUATE THE EFFECTIVENESS OF A PROFESSIONAL DEVELOPMENT COURSE IN BLENDED LEARNING

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Abstract - There is an increasing trend in the adoption of blended learning in higher education. The provision of continuous professional development is important and its effectiveness to success in teaching and learning is always dubious and difficult to be demonstrated. Typically, self-report method is used to measure the effectiveness of professional development training via surveys, interviews or human observation by asking participants' views such as usefulness and applicable to teaching. Other objective measures are always lacking. In this study, usage log data from Learning Management System, (LMS) is used to provide evidence of the effect of the training course on teachers. LMS usage is retrieved before and after teachers who have undergone a 16-week of professional development course on blended learning. Results suggests that there is a positive effect of training including a substantial increase in the adoption of blended learning in the curriculum, the use of a wider variety of online features in blackboard (Bb), and further implementation of other interactive tools in LMS (e.g. Discussion Board) after the training course in facilitating student learning.

Index Terms - Blended learning, data log, learning management system, staff development

I. INTRODUCTION

There is an increasing trend in the adoption of blended learning in higher education institutions worldwide and substantial investment has been put in by providing related professional development course to all relevant stakeholders including teaching staff. Evident of programme effectiveness is always demonstrated via self-report measures (e.g. interviews and surveys) by asking participants views about the training course. While these views offer meaningful results and implications for teaching and learning, they are subjective measures of programme effectiveness. With the advance of learning technology and the availability of certain analytic tools, analysis of LMS data has becoming a powerful way to directly measure actual behavior in teaching and learning. Over the past decade, there has been a number of studies extracted LMS data to examine student learning (e.g. Park and Jo, 2016; Black, Dawson, and Priem 2008; Griffiths and Graham 2009). The use of learning analytic, not only allows teachers to understand how much student learning take place, but also provides insights and helps institutions to inform policy decision making and resource allocation (e.g. Lam, Lo, Lee, McNaught, 2012). In this regards, this study aims to provide an alternative measure, data usage log from LMS, to examine the effect on teachers for a professional development programme on blended learning. In particular, how teacher's behaviors change as a result of the training programme they attended are to be examined. Preliminary analysis of the data log is investigated in terms of the activity levels, and types of the features used in LMS by teachers.

II. LITERATURE REVIEW

A. Blended Learning

The adoption of blended learning has been increasingly prevalent in higher education around the world. According to Bonk and Graham (2005), blended learning is a combination of face-to-face instruction and computer-mediated instruction. Allen and Seaman (2003) further emphasized the needs to deliver certain amount of the contents online and the importance of using discussion via both online and face-to-face. While it seems obvious that blended mode combines the advantages of traditional face-to-face interaction and provides the flexibility of online learning, the benefits of blended learning not only support more diversified learning that suit different learner's needs, but also foster deeper learning through interaction in class. Blended learning should be not just a mix of technology and face-to-face components, but requires redesign of teaching and learning relationship to transform learning experience for students (Garrison and Kanuka, 2004). Osguthorpe and Graham (2003) proposed six goals of blended learning as being pedagogical richness, access to knowledge, social interaction, personal agency, cost effectiveness and ease of revision. It is particularly true when teachers can facilitate deeper into the contents using both online and face-to-face interaction to improve teaching and learning outcomes and to enhance student learning.

B. Professional Development

Yet, there are many challenges for institutions in implementing blended learning. One key question would be whether teaching staff have the skills and

support in the use of the technology and pedagogy in the pursuit of blended learning. To fully embed and ensure the effective way of incorporating technology and pedagogy into the curriculum, continuous professional development opportunities are in need. Research showed that the most effective professional development has positive influence on instructional practices, teaching skills, and student achievement (Garet, Porter, Desimone, Birman, Yoon, 2001; Wenglinisky, 2000; Owston, Wideman, Murphy, Lupshenyuk, 2008), and it should be long-term, collaborative, school-based, focused on the learning and linked to the curricula that teachers have to teach (Hiebert, Gallimore, and Stigler 2002). Other researchers suggested that requirement for professional development shall focus on the needs of all students and the curriculum that teachers are required to teach, yet, the ultimate goal is to improve in student achievement (e.g. Garet et al. 2001; Cohen and Hill 2008). The professional development programme offered in the current study has similar nature in the hope to maximize the potential for teachers to fully implement blended learning in the subjects that they teach. The blended learning mode has added advantage, which allows teachers to test or try out their ideas in the classrooms rather than waiting, thus, providing just-in-time training opportunities.

C. LMS Data Log

The use of Learning Management System (LMS) is becoming a trend in many higher education institutions, that serve an aim to provide another learning environment for teachers and students to extend the time and places for teaching and learning opportunities. Many studies are now using LMS data to inform decisions such as curriculum design, policy-making in teaching and learning initiatives, and this method has been found to be effective because the LMS data could capture exact behavior of which it occurs (Chatti, Dyckhoff, Schroeder, This, 2012). Often, studies used surveys, interviews and human observation to evaluate programme effectiveness by asking participants' views about satisfaction, usefulness, and applicability to teaching (Owston et al. 2008; Owston, Sinclair, and Wideman 2008). Although this types of investigations provide meaningful findings and implications, the self-report type of data collection methods had its own limitations in terms of participants' response rate and truthfulness of their responses. The extraction of LMS data thus overcomes these limitations and provides another effective approach to investigate teachers' and students' learning behavior. Mostow et al. (2005) described the use of data log from LMS were more extensive and comprehensive in capturing level of details for online education implementation. In the light of the learning analytics techniques, this study

aims to utilize the information of data log from LMS in terms of usage patterns and features used in this online environment.

III. RESEARCH CONTEXT

A. This case: A University in Hong Kong

The University is a campus-based, multi-disciplinary institution, constitutes of six faculties (with 27 academic departments) and two schools. It has the largest number of student population among other universities in Hong Kong, with over 30,000 full time equivalent students each year, and approximately 2500 teaching staff. The University offers its programmes mainly via a traditional face-to-face classroom setting, but with the increasing trends of adopting e-Learning approach, the University has started to incorporate more of the e-Learning components (e.g. blended learning, online modules etc.) to the existing curriculum. In 2012, a new institutional Learning Management System (LMS), Blackboard is implemented, and a series of training workshops and seminars were provided to all teaching staff as part of the institutional supporting strategy. Initially the workshops focused on generating awareness of the change of LMS and the technical aspects such as "know how" to use the new LMS system. Later on, another series of staff professional programme were offered to teaching staff, focusing on the integration of technology and pedagogical aspects in blended learning, in the hope to provide teachers with experience not only how to be an online learner, but also how to design and implement a blended approach in the existing curriculum that they teach to better enhance student learning.

B. Professional Development Course for Blended Learning

The introduction of a new professional development course was funded by an institutional teaching development grant, supported by The University Grand Committee (UCG). The purpose of this training course was to improve the quality of blended learning at this university in addition to increase the usage of LMS and foster student interaction across different subjects. The training course was delivered in a blended learning mode, consisted of a range of moderated online activities and five compulsory face-to-face sessions over 16 weeks. The participation of the course was voluntary and the course was run into three modules: The first one was to provide an online environment for teachers to become an online learner themselves; the second one required participants to design a small-scale blended learning activity plan; and the third module was to implement that plan with their students in the subject they will be teaching at that time. Teaching staff were guided step by step

throughout the process of designing and implementing the blended approach to their students.

III. METHODOLOGY

A. Research Question

The key research question in this study is to investigate the extent to which teachers behave differently in the online environment after they attended a professional training course on blended learning. Specifically, the emphasis will be placed on the usage activities data log, the number of clicks, and types of features used in the learning management system.

B. Participants

Data for this study were collected for the first cohort of teachers who completed all the modules of the staff development course offered by the central unit of the University. All teachers were required to teach a subject at the time during the period when they attended the training course as they have to design, develop and implement their teaching plan in their own classroom as part of the training activities and course assessment. Teachers who have the same subject(s) taught before and after the training are examined so that pattern of online teaching practices can be compared. Initially about 50 participants enrolled the training course but this left a total of 11 individual teachers who have fulfilled the criteria as specified in this study.

C. Data Collection and Analysis

The Learning Management System (LMS) used at this university is Blackboard (Bb), and data log of subjects taught of all teachers who have completed the staff development course were retrieved. Only the same subject taught by the teachers a semester immediately before and after the staff development programme are included in this study (i.e. teachers without the same subject taught a semester immediately before and after the training course were excluded). Activities of teachers from the Blackboard database were extracted for all clicks and the available features in Bb including Content, Announcements and Discussion Board. Activity level in Bb subjects are compared for each teacher in terms of number of clicks and types of features used before and after training. Pre-post measures is used to compare the effect of training.

V. RESULTS

A. Number of Clicks

Actual number of clicks in each Bb course are recorded for each teacher. Table 1 shows the actual number of clicks for all teachers included in this study. Results show that among 11 teachers included, 2 had never used Bb, 6 made less than 10 clicks in their Bb course while 3 made between 40-50 clicks prior to the training. This result indicates a very low level of online

activity performed by each teacher. However, these numbers increased significantly after teachers attended the training course. All teachers performed certain level of activities in their Bb course. Despite the 2 teachers made less than 100 clicks, 4 made 100-800 clicks, and all other made at least a thousand clicks in their Bb course in the next semester after the training. This phenomenon clearly shows that the training has encouraged teachers to perform more online activities, and teachers become much more active in Bb in a way that was not happening before.

No. of clicks made			
Teacher	Pre-training	Post-training	Difference
A	7	31	24
B	17	1721	1704
C	45	787	742
D	1	529	528
E	43	2165	2122
F	2	334	332
G	3	174	171
H	43	1500	1457
I	0	56	56
J	6	2167	2161
K	0	1282	1282

Table 1: Number of clicks made by teachers

B. Number of Bb features used

The number of Bb features used by each teacher is recorded before and after they attended the training as displays in Table 2. Results show that, despite 4 teachers only used 1 Bb feature, 1 used 2 features and 4 used 4-5 features prior to the training. After the training, all teachers has increased in their use of Bb features. They used at least 2 Bb features in their courses, and 9 out of 11 used at least 5 features after the training. These results are consistent with their activity level as indicated by the actual number of clicks previously, indicating that they are not only more active in terms of delivering online activities, but also they used more variety in Bb features for their online teaching.

No. of Blackboard features used		
Teacher	Pre-training	Post-training
A	2	3
B	4	6
C	4	7
D	1	2
E	5	8

F	1	5
G	1	5
H	5	7
I	0	2
J	1	9
K	0	8

Table 2: Number of Blackboard features used by teachers

C. Features in Bb used: Content, Announcement, Discussion Board

The number of clicks made in Content, Announcement and Discussion Board are examined before and after the training course. Table 3 displays the number of clicks made by each teachers in these features. Results show that prior to the training, majority of teachers used Content only, and 4 teachers have used Announcement additionally. There was only 1 click made by a teacher in Discussion Board. However, after the training, there is an increases in the use of all features examined including Content, Announcement and Discussion Board, indicating that teachers are exploring and using more features in Bb other than just using Content to upload their teaching materials and powerpoint in the Bb.

No. of Clicks by teachers						
Teacher	Content		Announcement		Discussion Board	
	Pre	Post	Pre	Post	Pre	Post
A	6	23	1	2		
B	3	819	1	261		2
C	18	274	6	128		4
D	1	52		9		
E	27	437	3	88		15
F		219		15		
G	3	48		36		
H	14	317		52	1	73
I		39		17		
J	6	353		242		
K		144		59		8
No. of teachers	8	11	4	11	1	5

Table 3: Bb features used in Content, Announcement and Discussion Board

DISCUSSION

Actual number of clicks in the same subject taught by the same teachers before and after the training course are compared in order to see the effectiveness of the training course. Prior to the training, the number of clicks in Bb by teachers were in fact quite low, indicates that there weren't many online teaching and learning activities taken place (unless teachers were

using online platform other than Bb), or teachers were not incorporating much of the online teaching components in conjunction to their face-to-face teaching at the time before training. If they do, Bb was mainly used for Contents (i.e. uploading class notes or teaching materials) or perhaps Announcement. However, the number of clicks have gone up dramatically after teachers attended the training course. It is clearly showing that teachers who have attended the training are much more active for their online teaching and learning activities in Bb. The course's objective in the adoption of blended-mode of teaching seems to be effective and teachers' technical skills and knowledge were enhanced by the training course. As Zemsky and Massy (2004) mentioned, teachers' competency in online teaching often are the problem in the adoption of e-learning and he claimed that "e-learning" took off before people really knew how to use it" (p.57). This is also supported by the number of features used in Bb courses and results show that prior to the training, teachers mainly used one single tool in their Bb course despite those who have never used Bb in their teaching. After the training, all teachers make use of the Bb course and use more than 1 features in Bb in their subjects. It shows that the training course helps teachers to increase the use of features in Bb, and the training materials of the "deep dive" contents in the course have certainly helped teachers to enhance their technical competency in exploring the use of different features. In terms of the features used in Content, Announcement, and Discussion Board in Bb, there is a significant increase in the use of these three types of Blackboard features by teachers after training, i.e. teachers are using different tools other than just Contents. In fact, all teachers are engaging, to certain extent, with students via the LMS. This can be explained by the design of the training programme which includes showcases of how different tools can be used pedagogically and technically to enhance student learning. When examining more closely in the features used, it is not difficult to see that teachers tend to start using more interactive feature (i.e. Discussion Board) in their subjects to facilitate learning, which was also part of the purpose of the training course. For example, only 1 teacher used Discussion Board (with only 1 click) prior the training and 5 teacher used the same feature after the training. Also, the number of clicks has significantly increased after the training. It provides useful insight in pedagogy that teachers are aware of the important of including interactive elements into the curriculum. In particular, much literatures emphasized the importance of incorporating interactive features in student learning in online environment. For example, the study conducted by Wilson and Stacey (2004) examined the importance of and addressed the need for interaction in the online teaching environment. Swan

(2003, p.4) stated that “Central to the concepts of both learning and computer mediation is the notion of interaction”, any forms of interactive components should be incorporated into the notions of learning and interaction between students, and instructors in the learning process is the crux of deep learning (Rosie, 2000). The use of interactive feature in Discussion Board by teachers in this study after training at least demonstrates the first step of the awareness of the need in facilitating interaction between people although there are other factors that determine the success in online learning. This study preliminarily focuses on the online activities performed by each teacher, and has examined only a few features used by teachers in Bb course (i.e. Content, Announcement, and Discussion Board). In future data extractions process, further investigation should be made on how other interactive features are used by teachers, and also whether there is any relationship between using these interactive tools and student learning. The actual activities performed by both teachers and students on these features can be examined in more details.

CONCLUSION AND RECOMMENDATION

The analysis of LMS usage logs presented in this paper suggests that staff professional development programme benefits teachers and students in engaging more online activities. The programme demonstrates its effectiveness in changing teachers’ behavior, helping teachers to adopt a blended approach in their teaching and utilize the functionality of the online features in the LMS by improving teachers’ technological skills. The use of interactive feature was encouraged to allow more interactions between teachers, students and their peers. Although the use of LMS logs provides more objective evidence than self-report measure, there are many questions remains to be answered. For example, how and why teachers engaged students in certain ways, and what would make it differently for particular disciplines. Thus, other means of investigation shall be required (e.g. focus group) in addition to the LMS data so that the rationales and reasons to understand the pedagogical purposes by teachers can be further analyzed.

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