Blended Learning and Application of Web Tools for Materials Engineering: A Case Study

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ABSTRACT

The present study aims to examine students' perception of online learning through the university's Learning Management System (LMS) as opposed to free online LMS and free web tool environment which allow blended learning. Subjects involved are the students of the Materials Engineering course in semester 1, 2014/2015 session. 28 students enrolled for the course but only 21 students responded to the survey. Apart from an online short survey, data were collected from the available learning tracks, where blended learning was carried out using both the university's and free online LMSs. It was found from the learning track evidence that the majority of the students used resources from Blendspace many times more (more than 80%) than the LMS, when the same resources were made available at both platforms. The result from the self-reported survey also supported this trend where the majority of respondents agreed that they preferred the free web tools compared to the university's LMS. On the other hand, the academic staff when asked about the issues of teaching and learning with technologies claimed that their preference for the free web tools is mainly because the platforms are more interactive and attractive compared to the university's LMS. The study shows that the efficacy of e-learning depends on the students' buy-in as the majority of them claimed that although they feel more engaged through e-learning, they still prefer face-to-face learning.

Keywords: blended learning, e-learning, higher education, technology

INTRODUCTION

One of the program outcomes highlighted by the Engineering Accreditation Council (EAC) is to be able to display lifelong learning skills (EAC, 2012). Since the previous announcement of PSPTN (2007), e-learning has grown in importance. Consequently, the Malaysian Education Blueprint (Higher Education) (MOE, 2015) also posited initiatives that echo program outcomes in terms of the requirement to teach and learn through the online environment. E-learning in the Malaysian educational scenario started as early as in 2000 at *Universiti Teknologi Tun Abdul Razak* (UNITAR) and Open University of Malaysia (OUM) (Azizan, 2010; Asia-e University, 2011). After 15 years, academics are still debating on one single term, the meaning of e-learning. It is accepted that e-learning means, learning that is done through information accessed or shared from or through the internet or simply technology-enhanced learning. Blended Learning on the other hand, is a new enforcement in institutions of higher education in Malaysia where a part of the course is done or delivered through digital or online media.

Few researchers have looked into the challenges of implementing technology-enhanced learning and role attributes of the senior leadership and instructors (Juhdi et al., 2010; Puteh, 2007). Whilst many Malaysian Institutes of Higher Learning (IHL) are still not quite past acculturating technology-enhanced learning or blended learning amongst the instructors, according to Saad (2014), students who are more comfortable with technology in their everyday lives, may be more ready to accept active learning with technologies. Oye et al. (2012) statistically showed how 215 students of the Faculty of Computer Science and Information Systems in Universiti Teknologi Malaysia (UTM) benefited from e-learning which affected their Grade Point Average (GPA) performance.

In the case of Universiti Pertahanan Nasional Malaysia (UPNM), the practice of blended learning covers just about 40% of the whole course offered in a year. Being a boutique university, there are only about 350 courses offered in a year. Blended learning in UPNM is defined by the operational definition set by the Ministry of Education where currently at minimum, 7 resources files should be uploaded, 3 synchronous and asynchronous activities and 2 assessments activities must be conducted. However, the current LMS is limited in the aspect of allowing optimum

interactions between instructors and students. Therefore, this case study aims to examine students' perception of online learning through the university's LMS as opposed to free online LMS and free web tools which allow blended learning. It is interesting to see whether the students really care about the limitations of the current LMS and their perception of the free web tools. It will also be interesting to see if the perceptions about technology enhanced learning and blended learning by the students are mutually felt by the instructors.

METHODOLOGY

Since the cohort of the students was from the previous semester, it was felt that an online survey would be the best method to get immediate and fast response from the students. Albeit that, only 21 from a total of 28 (75%) students enrolled for Materials Engineering of Semester 1 2014/2015 responded to the survey. 14 of the respondents were male students and the rest were female. However, the survey did not have any sections on demographic background because the students were all from the same batch and it was not the aim of the study to compare gender. The screenshot of the online survey is shown in Figure 1.

Figure 1: Screenshot of the Questionnaire using Google Doc

The course outcomes for Materials Engineering are as shown in Table 1. The Materials Engineering course is considered a reading subject course as compared to other mechanical engineering courses. The main technical skill required in this course is for the students to be able to interpret and analyze various graphs related to changes in material properties as a result of various processes.

Table 1: Materials Engineering Course Outcomes

CO1	Identify and describe the internal structure of various engineering materials and explain the relationship between structure and properties of engineering materials in terms of properties and behaviour (C1)
CO2	Explain the mechanism and factors affecting the changes in internal structures, the resulting effect on material properties and their practical applications and determine the changes to material properties due to specified changes in internal structure / processing (C2)
CO3	Apply properties of engineering materials to select and specify suitable materials specific design requirements (C3)

The online survey was prepared with simplicity and accessibility (Carbonaro & Bainbridge, 2000) in mind where it was hoped that subjects could answer the survey through their smartphones or tablets. The survey was created using Google Docs and the responses were collected automatically through Google Sheet (as shown in Figure 2). The students were invited to the survey using a link posted on the class's message group on Whatsapp. The survey was found to be reliable where the Spearman-Brown split half analysis value was 0.85.

Figure 2: Survey Responses Collected through Google Sheet

A very brief interview was also carried out amongst a few instructors or academic staff, just to uncover their perception of using technology in their teaching. The questions were as follows:

1. How do you feel about using technology in your teaching and learning (T&L)?

2. How do you feel about using the university's LMS in your T&L?

3. What is the reaction of your students towards using technology in their learning?

RESULTS AND DISCUSSION

Students' Survey

The result from the survey is shown in Table 2. It can be seen that the medians and modes of the responses are inclined to agree and strongly agree on items that support technology-enhanced learning. On the items that do not support the aim of the survey, the medians and modes are found to be neutral. The majority (85%) of the students agreed and strongly agreed to the notion that they like to use technology in learning. Surprisingly too, the majority of them (42% agree) like to use the university's LMS despite its limitations. However, it cannot be said that they like or did not like to use tools other than the university's LMS because the majority chose to be neutral about it. Similar responses were observed on the question of the application of Web 2.0 tools during class time. Although one of the authors as the instructor of the course had used various Web 2.0 tools during class, it was never mentioned that those were Web 2.0 tools. A good example of that was experienced by one of the authors whose videos were always shared through Blendspace and embedded in the university's LMS (e.g. of how to read stress-strain curve and TTT diagram). However, from the learning tracks of both platforms, videos at Blendspace were accessed sometimes four times more than the number of the students enrolled in this course. Meanwhile, the same videos at Blendspace which were embedded in the university's LMS were not watched by students at all. It can be assumed that many of the students did not understand the meaning of Web 2.0 tools.

This is also supported with answers to questions 7 and 12 (42% and 47%, respectively) where the students agreed that the free web tools had helped them.

It is also interesting to point out that the majority of the students prefer face-to-face learning (42%) although they feel neutral about having hardcopy materials or textbooks. The students understand that technology is important and strongly agree that ICT would help them in their lifelong learning. They also claimed that they felt more engaged in learning and that the university's LMS did facilitate their learning of the course.

Table 2: Responses from the Students to E-Learning Aspects for Materials Engineering Subject

No	Survey Item	Percentage (%)					Response	
		1 Strongly disagree	2	3	4	5 Strongly agree	Median	Mode
1	I like to use technology in my learning	0.00	4.76	9.52	57.14	28.57	4	4
2	I like to use the University's Learning Management System	0.00	4.76	38.10	42.86	14.29	4	4
3	I like to use other tools than the University's Learning Management System	4.76	23.81	42.86	23.81	4.76	3	3
4	The facility in the Campus allows the application of web 2.0 tools during class time	0.00	23.81	33.33	23.81	19.05	3	3
5	I prefer text book and printed materials than softcopy/online notes	4.76	0.00	42.86	23.81	28.57	4	3
6	I am forced to use University's Learning Management System by my lecturer	9.52	28.57	33.33	23.81	4.76	3	3
7	I prefer to use Schoology and Blendspace directly than the University's LMS because they are easier to assess from my smartphone/ tablet	4.76	9.52	38.10	42.86	4.76	3	4

8	Using the technology, I feel more engaged in learning and actually learned more	0.00	9.52	14.29	57.14	19.05	4	4
9	I learn more from a face to face class than from online learning	4.76	4.76	19.05	42.86	28.57	4	4
10	Technology is important in today's higher education learning	0.00	4.76	14.29	23.81	57.14	5	5
11	The ICT skills I have gained at the University will improve my job prospects	4.76	4.76	23.81	42.86	23.81	4	4
12	The use of resources from Blendspace has facilitated my study in Materials Engineering Course	4.76	4.76	23.81	47.62	19.05	4	4
13	The use of resources from the University's LMS has facilitated my study in Materials Engineering Course	4.76	0.00	23.81	61.90	9.52	4	4

It seems that the finding from Brook and Beauchamp (2015) is similar to the responses obtained in this study. Although students claimed that they feel more engaged (57% agree) and very positive on the aspects of e-learning and ICT in learning (57% strongly agree), they still value face-to-face interactions (42% agree). This can lead to the conclusion that blended learning has its potential in engaging students in learning and will be beneficial to them.

Stake (1995) as cited in Puteh (2007) was quoted defining a case study as an analysis of the complexity of a single case and disagreed if a case study is used to penetrate into the particular details of a situation and how things actually worked. Obviously, the results of this survey alone does not represent the perception of the rest of the students in UPNM, what more other IHL in Malaysia. However, it gives hope that more can be done to help students to benefit from technology enhanced and blended learning.

Instructors' Interview

In order to understand whether the perceptions about technology enhanced learning and blended learning by the students are mutually felt by the instructors, five instructors were interviewed. The instructors are

involved in teaching these students although not Materials Engineering but other courses. Comments from two instructors that are glaringly contradictory are shared here.

Instructor 1

The exact comments from Instructor 1 who is a young lecturer who teaches Engineering Mathematics and Control System subjects regarding the three questions are:

"I love using technology in teaching and learning for face-to-face or non-face-to-face hours. It engages the students more and students are encouraged to use technology more instead of just gaming and Facebooking. But, wifi (in UPNM) is very slow. (Further) our LMS lacks interaction between students and lecturer. Also, students can't submit their works online so we need to find alternatives like Edmodo or Schoology. They (the students) love it (using technology in their learning). Especially gamification tools like Kahoot. They put extra efforts out of competitiveness. But, many commented on limited capability of our Wi-Fi. Also, giving them lecture on YouTube is not working since UPNM blocked YouTube. "

Interpretation for Instructor 1

The instructor being young and technology savvy from generation Y shows interest in using technology actively in teaching. It was suggested that other than uploading materials or resources, instructor 1's class students prefer blended learning that includes gamification and active participation on their part. However, the facility issue is a hindrance to fully utilize technology for student learning.

From the authors' point of view, although facility support is the basic requirement to implement active e-learning or blended learning during class time, it is not necessarily a total deterrent. Some applications are simple enough to be used through smartphones, for example, the Padlet or assessment games such as Hot Potatoes (Half-baked software) or Kahoot. it. Instructors could prepare the materials prior coming to the class, and use them as attention drivers or closure activities. Most IHL students nowadays have a basic smartphone. Activities from the mentioned applications can

be conducted using smartphones or as a flipped class activity where the students use technology to enhance self-directed learning.

Instructor 2

Instructor 2, instead of commenting on each question just summarized it in despair as:

(I do) Not using it to the maximum as the course involves a lot of calculations. It is easier to use the white board. A lot of videos from Khan Academy were shared through the LMS, but the students were not bothered to watch them. Their excuses such as "no time" or "internet is slow", are just too common."

Interpretation for Instructor 2

The instructor who is from generation X, when responding sounded a little bit frustrated when reported that the students did not watch all the videos that have been shared through the University's LMS. The instructor truly believed that the videos could help the students when doing their revisions. However, results from the available learning track from the university's LMS seem to demotivate her to do further active learning using technology during her class. The same complaint about students criticizing the incompetency of facility support was also reported.

Both instructors' views were shared by other instructors interviewed especially the idea of using videos and Web 2.0 applications for their courses. However, most of them expressed their frustration about the slow internet speed and how their shared resources on the university's LMS were not accessed by their students. Some of them also complained about the lack of interactions or the limitation of the university's LMS. They said that they had to depend on other free web tools to receive assignments or materials submission or sharing from the students. It is not just troublesome for everyone having to login into different websites, but also a waste as it is difficult to monitor and do analytics survey on the real usage of e-learning of each student from a random sampling of the students.

CONCLUSION

The study shows that the students used resources from *Blendspace* many times more than the LMS, although the same resources are available at both platforms. Although, when asked about using Web 2.0 activities in the class, they do not agree nor disagree with that notion. It shows that the students might not understand the term Web 2.0 tools. It is also reported that the majority agree that they prefer the free web tools compared to the university's LMS. On the other hand, the instructors or academic staff when interviewed claimed that the major problem in applying technology enhanced learning during class is the speed of the internet. However, their preference for the free web tools over the university's LMS is mainly because the platforms are more interactive and attractive. The study shows that the efficacy of e-learning depends on the students' buy-in as the majority said that although they feel more engaged through e-learning, they still prefer face-to-face learning. Nevertheless, they believe technology enhanced learning does not only help deliver the information about the course but also prepare them with ICT skills for better job prospects.

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