

e-Content Development in Engineering Courses: Students Needs and Readiness

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Abstract

Information and Communication Technology (ICT) is an important aspect of the teaching and learning (T&L) process for the formation of knowledge workers in Malaysia. In order to achieve this aim, the nation's e-learning policy targeted that in the year 2015, 50% of the learning materials will be in the form of e-content. Accordingly, the engineering courses are also involved in achieving this goal. The objective of this research was to see the readiness and needs of students in the development of e-Content in engineering courses. Forty-six polytechnic students have participated in this study. Questionnaires were used as an instrument for collecting data. The findings showed that most of the students have the skills and internet facilities, uses either notes or printed module only, they also have a high level of willingness to learn through online, they need materials that are not boring. The instructors also suggested forms of online learning contents suitable for engineering courses such as the use of videos, simulations, interactive and attractive visuals to give a real picture of the process. Therefore, instructors should provide online learning resources to enhance the knowledge and skills of students in the teaching and learning process.

Keywords: Information and Communication Technology, e-learning, e-content; engineering courses; readiness and needs of students

1. Introduction

Information and Communication Technology have been implemented in this country for almost two decades and was followed by the implementation of e-learning. Therefore, the e-learning policy of higher learning institute was drafted in line with the needs of the critical fields of e-learning presented by the NITC (NITC, 2010). This requirement is more pronounced due to the process of globalization brought on by the recent communication technology and the internet. Technology has changed the way students learn and teachers teach through the use of online networking. The concept of student-centered learning through e-learning technology is expected to produce graduates who are more responsible, independent and self-reliant and can compete in the international arena. The use of e-learning technology is capable of linking teachers and students, students and students and students with global web materials within a short period of time. Many studies showed that e-learning has increased the effectiveness of the education system or training at public and private universities. According to Balwi and Koharuddin (2012), many students are interested in attending online courses as well as having a positive view of online courses. According to Allen and Seaman (2010), the enrollment of students taking online courses in 2008 has showed an increase of 17% which was a total of 4.6 million students compared to 2007. On the other hand, according to Allen and Seaman (2006), over 96 % of the largest colleges and universities in the U.S. provide online courses. For example; the University of Phoneix USA, Open University of Ramkhamhaeng Thailand and the Open University of UK practice online learning. Parallel to the development of the outside world, most higher education institutions in Malaysia have generally been moving towards e-learning.

The first university to use e-learning fully is Tun Abdul Razak University, followed by Multimedia University, University of Technology MARA, University of Putra Malaysia, Open University Malaysia, Wawasan Open University and the Asia e-University. The use of e-learning also got the attention of curriculum development in the education field to increase knowledge and skills. According to Forster et al. (2005) changes in teaching methods are influenced by the development of information technology and these modern methods are increasingly accepted by the world community. Jonnassen (2000) stated that the delivery of online teaching and learning is also rising. According to Norazah et al. (2010), the usage of ICT is an important aspect of the teaching and learning process for the formation of knowledge workers in Malaysia. In order to achieve this aim, the nation's e-learning policy targeted that in the year 2015, 50% of the learning materials will be in the form of e-content. Accordingly, the engineering courses are also involved in achieving this goal.

2. Research Objectives

This study will examine the students' readiness and needs towards the development of e-content for engineering courses and thus use the analyzed data to design and develop e-content materials.

3. Research Methodology

The analysis of the students' needs for the development of e-Content was conducted using a questionnaire developed by the researcher according to the research objectives to acquire the views of students about the process of teaching and learning in the polytechnics. This questionnaire consists of 5 parts. The needs analysis was conducted at the end of the December 2011 session involving 46 polytechnic students who have gone through the process of T & L for the Electrical Circuits course. According to Chua (2006), the minimum number of 30 samples is sufficient to implement a survey study.

4. The Research Findings

The need analysis was carried out to see the readiness and needs of students for e-content development for engineering courses. The study involved 46 polytechnic students. A survey instrument was used to collect data and the answers are "Yes or No", using the 5 point Likert scale and open-ended questions. Discussion of the research findings of the needs analysis are divided into five sections as follows:

4.1 Skills and facilities owned

No.	ITEM	YES	NO
1.	Are you skilled in using a computer?	41 (89.1%)	5 (10.9%)
2.	Do you like to surf internet anytime anywhere?	33 (71.7%)	13 (28.3%)
3.	Are there any internet or Wi-Fi facilities in your institution?	38 (82.6%)	8 (17.4%)
4.	Do you have your own internet network such as broadband, Wi-Fi or Streamyx?	32 (69.6%)	14 (30.4%)
5.	Are there computer labs in your institution?	39 (84.8%)	7 (15.2%)
6.	Where do you usually surf internet? a. House b. Hostel c. Cyber cafe d. Computer labs	35 (76.1%) 3 (6.5%) 22 (47.8%) 1 (2.2%)	
7.	What is the equipment you use to surf internet? a. Desktop b. Laptop/Notebook c. Smartphone	15(32.6%) 35(76.1%) 22(47.8%)	
		YES	NO
8.	Would you like to have online learning materials (e-Contents) developed for your course?	40 (87%)	6 (13%)
9.	Is there a need for online learning materials (e-Contents) development for future learning?	46 (100%)	0 (0%)

Table 1: Skills and facilities owned

The findings (Table 1) from in this section indicate 90% (41 students) of the students are skilled at using the internet, 85% of the students willing to surf the Internet anytime and anywhere, 70% of polytechnic students have their own networks such as broadband, internet, Wi-Fi and Streamyx. Most of the students surf the internet from home (76%) and cyber cafes (47.8%), in addition they also use laptops (76.1%) and smart phones (47.8%). 87% of the students agreed that online learning materials (e-content) should be created in their courses and 100% of the students agreed that online learning materials (e-content) should be developed for future learning.

4.2. Contents of the existing learning materials

No.	Item	%	
1.	What is the content design of the learning materials received from your lecturer? - Printed modules/Notes /Reference books - PowerPoint Slides - e-Content (online learning materials) - Others	41(89.2%) 37(80.5%) 27(58.6%) 6 (13%)	
2.	Are you using the following ICT facilities to increase your knowledge about your course? - Interactive multimedia software in the internet - Discussion webs in the internet - e-mail to many places around the world to discuss about education - Access education websites - Others	25(54.3%) 11(23.9%) 4(8.7%) 35(76.1%) 4(8.7%)	
3.	What is the main aim of using LMS platforms (Learning Management System) above? - Download learning materials - Interact with lecturers and friends - e-Contents (online learning materials) - Others	44 (95.7%) 16 (34.8%) 30 (65.2%) 6 (13%)	
		YES	NO
4.	Have you ever used the LMS(Learning Management System) platform such as CIDOS?	46 (100%)	0 (0%)
5.	Are the learning materials found in the platform above interactive?	19 (41.3%)	27 (58.7%)
6.	Do lecturers use contents of online learning materials?	24 (52.17%)	22 (47.83%)
7.	Do the contents of online learning materials suitable with your course?	16 (34.78%)	30 (65.22%)
8.	Are you given the opportunity to look for contents of online learning materials?	25 (54.35%)	21 (45.65%)
9.	Do lecturers have collection of contents of online learning materials?	20 (43.48%)	26 (56.52%)
10.	Do the contents of online learning materials received from the lecturers could enhance your knowledge?	19 (41.30%)	27 (58.7%)
11.	Do the lecturers using multimedia software for teaching?	17 (36.95%)	29 (63.05%)
12.	Do the online learning materials fit the liking of users in Malaysia?	21 (45.65%)	25 (54.35%)
13.	Are you ready to use online learning materials (e-Contents) for your course?	39 (84.8%)	7 (15.2%)
14.	Are the online learning materials (e-Contents) able to increase your knowledge about your course?	35 (76.1%)	11 (23.9%)

Table 2: Contents of the existing learning materials

The findings (Table 2) in this section are related to the contents of the available learning materials which showed that most of the content of learning material is in the form of printed modules, notes and reference books (89%) and power point slides (80%). In addition, existing activities in the LMS platform (Learning Management System) focuses on downloading of learning materials (96%) and e-content (learning materials on the Internet) (65%).

4.3. Readiness for online learning

No	Item	%					Mean
		1	2	3	4	5	
1.	I am ready to use online learning at any time	4.3	4.3	34.8	41.3	15.2	3.59
2.	I always use the method of online learning	0	4.3	41.3	41.3	13.0	3.63
3.	I always learn on how to use online learning	0	2.2	30.4	52.2	15.2	3.80
4.	I have the skills to use the online learning method	0	4.3	30.4	41.3	23.9	3.85
5.	I am ready to use the online learning method in my learning process	0	0	17.4	50	32.6	4.15
6.	I am ready to face the challenges in using the online learning method	2.2	2.2	28.3	52.2	15.2	3.76
7.	I do not have any objections on using the online learning method	2.2	13	39.1	34.8	10.9	3.39
8.	I often try to get learning materials through the online learning	0	2.2	28.3	47.8	21.7	3.89
9.	I am very comfortable with the online learning method	2.2	6.5	37	32.6	21.7	3.65

1=Strongly Disagree, 2=Disagree, 3=Uncertain, 4=Agree, 5=Strongly Agree

Table 3: Readiness for online learning

The discussion of the research findings (Table 3) in this part are related to online learning readiness which shows that students are ready to try online learning methods in the process of learning (mean = 4.15) and they are always trying to get learning materials through the online learning (mean = 3.89). In addition, they stated that they have the skills to use online learning (mean = 3.85).

4.4. Opinion and Recommendations

The open-ended questions about the suitable facilities of the online learning materials (e-content) for learning were asked to students. Discussions of the findings in this section are concluded as follow:

- The attractive content of learning materials
- Develop a chat / discussion group about online education
- Create a platform to search for references and learning materials
- The problems are presented after the lecture so that the students can discuss
- In the learning materials, show steps that are easy to understand
- Similar characteristics as social sites, downloadable files, there are profiles, can chat
- The learning materials are easily available
- Materials those are not boring

Furthermore, the instructor gave their opinion on the forms of online learning contents suitable for engineering courses such as the use of videos, simulations, interactive and visually interesting to give a true picture of a process. Therefore, one of the learning approaches that came to the limelight in the development of e-content is problem-based learning.

5. The use of PBL approach in the development of e-Content

The widespread use of computers and the internet, gave a positive impact on the implementation of the PBL approach. This development got the attention of online learning materials development (Donnelly & Fitzmaurice 2005; McAlpine & Allen 2007). This was demonstrated in previous studies that supported the use of ICT in implementing PBL to facilitate access to data and information resources by developing collaborative learning laboratory for medical courses (Koschmann et al. 1996). The internet networking technology and websites are used to support the PBL collaboratively in bio-technology and physiotherapy courses (Donnelly & Fitzmaurice 2005; Poikela et al. 2007).

Meanwhile, Albion (2000) developed interactive multimedia software titled Integrating Information Technology into Teaching of Information Technology subjects using PBL approach. Lowther and Morrison (2003), developed the Integrating Technology for Inquiry (Nteq) software for Computer Science subjects using PBL. Hmelo-Silver et al. (2006) have developed the eSTEP system for trainee teachers to learn the concepts of science using videos in PBL. Savin-Baden and Gibbon (2006) developed the SONIC (Students Online in Nursing Integrated Curriculum) for nursing students using the PBL interactively to promote independent learning and investigation.

In the Malaysian context, Jamaluddin (2004) has developed a web-based learning system that uses PBL approach to the topic of Multimedia Technology for 44 students in third year of undergraduate studies, which managed to improve their performances in the test, increased their confidence and cognitive level. Meanwhile Faaizah (2008) examined the use of multimedia packages using PBL approach in the science subject of form two, in the topic of nutrition, to enhance students' achievement. On the other hand, Faridah (2009) examined the use of interactive multimedia software using a PBL approach for the mathematics topics set for form four students to raise their achievement and problem-solving skills.

The study by Fauziah (2011) examined the use of Learning Management System by PBL approach to enhance critical and creative thinking of students in physics courses at university level. In the context of polytechnics of Malaysia, Krishnan and Ruhizan (2009) have developed a website using PBL approach for project courses for electrical engineering students to improve the quality of their products. In addition, Rahman et al. (2011) developed an e-Library and Learning Object System for project development courses for Mechanical courses in polytechnics. ICT development has also attracted the interest of many researchers to apply the PBL approach in web-based learning, particularly to support collaborative learning (Atan et al. 2005; Poikela et al. 2007). Donnelly and Fitzmaurice (2005) outlined a number of branches of the use of ICT to support learning in PBL such as problem presentation, discussion, reflection, collaboration, sharing of ideas, evaluation and administration of the whole learning. However, studies on the development of online learning materials and contents using a PBL approach in general and specifically for engineering students of polytechnic students still not well explored in Malaysia to enhance their knowledge and skills. Finally, it cannot be denied that the use of ICT in implementing PBL is important in acting as a catalyst for teaching and learning.

6. Discussion and conclusions

The use of e-learning also got the attention of curriculum development in education to increase the knowledge and skills. According to Norazah et al. (2010) the use of ICT is an important aspect in teaching and learning process for the formation of Knowledge Workers in Malaysia.

To achieve this, the national e-learning policy targeted that in the year of 2015, 50% of the learning materials will be in the form of e-content. The research findings showed that most of the students possess the skills to use the internet and communication equipment facilities such as broadband or Wi-Fi. They also indicated the need for online learning materials (e-content) to be created in their courses and for future learning. Second, the type of learning material contents available for use in polytechnics are mainly modules and printed notes, books and power point slides. Furthermore, the readiness for online learning showed that students are ready to try online learning methods in the learning process, they are always trying to get the learning materials via online and they stated that they possess the skills to use online learning. The recommended form of contents by students are; (i) the attractive content of learning materials, (ii) develop a chat / discussion group about online education, (iii) create a platform to search for references and learning materials, (iv) the problems are presented after the lecture so that the students can discuss, (v) in the learning materials, show steps that are easy to understand,

(vi) Similar characteristics as social sites, downloadable files, there are profiles, can chat, (vii) the learning materials are easily available, and (viii) materials that are not boring. Instructors also gave their opinion on the forms of online learning contents suitable for engineering courses such as the use of videos, simulations, interactive and interesting visuals to give a true picture of a process.

To create an active learning environment in e-content, PBL approach is gaining attention. Ferreira and Trudel (2012) argue that technological developments are more easily integrated with PBL approach. The PBL approach has great potentials to foster learning of procedural knowledge to a higher level or students involved deeply in the learning process (Murray & Savin-Baden 2000). According to Savin-Baden (2000), PBL can improve efficiency in the application of knowledge and problem solving. PBL approach is also able to solve the problems encountered in the conventional system of learning which gives less emphasis on the construction of knowledge (Cunningham & Duffy 1996). In conclusion, the needs analysis of students' will be taken into account in the designing the e-content for engineering courses as well as problem-based learning approach will be the basis for the development of e-content.

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