CAN INTERNET USAGE EASE THE PROCESS OF LEARNING ENGINEERING SUBJECTS? : A STUDY ON STUDENTS OF DIPLOMA IN MECHANICAL ENGINEERING

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Abstract: Engineering subjects are often being labelled as 'difficult' subjects. Many references either in hardcopy of softcopy form confused the diploma level students further as it might be written for higher levels. New educational possibilities provided by the Internet can transform the process of learning and teaching engineering subjects. A study on students of Diploma in Mechanical Engineering for Automation and Mathematical Engineering subjects reveals that they can use the Internet to enhance their educational experience in variety of ways. This paper at the same time sought to identify the limitations and related issues of using Internet for education. Recommendations are made about informing and training students on IT as the first step in promoting the Internet usage at the early stage of learning Engineering subjects.

Keywords: Engineering subjects, Internet teaching, Web-surfing, e-mails

INTRODUCTION

Teaching engineering subjects has long been a challenge to engineering lecturers teaching diploma level students. In the early stages, most students struggled to assimilate the concepts of the subject, making little progress and becoming more and more confused. The traditional teacher-centric way of teaching, which is commonly used in our institutions of learning do little to ease the process of learning engineering subjects. This is because the instructional medium is mainly textual and the learning mode tends to be passive. Most of the time, the learners play little part in their learning process. Overcoming this obstacle is crucial; sadly, some students never make it, either failing or withdrawing. There is a need to modify and enhance the traditional lecturer-centric method of lecturing, as used for decades in our higher educational system [1]. However, we need not overdoing it as study shows that most students preferred traditional face-to-face lectures to online ones as they saw traditional lectures as having better educational values [2].

The appropriate environment must be created first in order to engage diploma level student to a learning process whereby students work individually or in groups to explore, investigate and solve problems. They should be motivated to become actively engaged in seeking knowledge and information, rather than being passive recipients. Study being done on the constructivist learning mode shows that in this mode, the focus is in learning process rather than on the content, on learning 'how to learn' rather than 'how much is learned'. This environment encourages students to develop critical thinking, problem solving and team skills, with technology being integral to their learning [3].

In this paper, we investigate the possibility of using internet and existing websites as an aid for the lecturers to use to ease the learning process of learning engineering subjects for Diploma in Mechanical Engineering students at University Technology MARA, Penang Branch (UiTM Penang).

MATERIALS AND METHOD

Automation and Mathematic subjects are chosen for this study based on the authors' lectures for one particular semester. Automation subject is taught to final year students whereas Mathematical Engineering is taught to second year students. Final year student are considered to be independent and more adaptable to learning environment and most of them have their own study pattern already.

The second year student would be more dependent on the lecturer instructions since at this stage students always regarded lecturer as the source of expert knowledge. This perception could be caused by the syllabus constructed for Diploma in Mechanical Engineering (DME) in University of Technology MARA (UiTM). In UiTM the first year students would be taught with foundation subjects such as Physics, Chemistry, Technical Drawings, English Language and Islamic studies. It is during their second year when they begin to be introduced to engineering subjects.

At the beginning of the semester, the allocated students are required to register for the subjects. During the registration, they were invited to fill in a pre-lecture survey form. The survey was designed to investigate the availability of computer facilities nearby the student accommodation. It also included their preconceptions on the subject they are going to take, given that they have being informed on the level of difficulty of both subjects based on the average marks obtained in last semester examination. The statements given in the survey form are combination of positive and negative sentences to ensure that the students are aware of their answers.

When they attended the first lecture, the students were briefed on the scope of the topics and then they were given a notebook each to record their web-surfing activities outside classroom. Students are required to record the date and location of their access to Internet, the duration of their surfing, the address of the website access, and their comments on the knowledge they would gain based on the website access. In addition to this, they were given two website addresses to refer to; for Automation: http://www.bara.org.uk/encyclopedia/, and http:// www.thetech.org/robotics; and for Mathematics: http://www.numbertheory.org/book/mp103.pdf, and http://www.math.odu.edu/~bogacki/cgi-bin/lat.cgi. The students were then asked to surf the websites and then e-mail their comments and opinions of the websites to the lecturers. They were also given four short assignments based on the materials available in the websites given. The first assignment will be sent to them via e-mail after the lecturer received their comments. The second assignment will be sent to them after the lecturer received the solution to the first assignment and were satisfied with it. Students are asked to redo the assignment if the solution given is incorrect or incomplete. The same technique is applied for the third and fourth assignment.

At the end of one month, the students are requested to hand in their record on the web-surfing activities outside classroom. The records are collected to investigate the frequencies of the student access to Internet and whether they have used other websites as their references.

RESULTS AND DISCUSSION

Descriptive Analysis

A total of 72 students have registered for both subjects. Out of that number, 28 students are taking Automation subject and 44 students are taking Mathematical Engineering (ME). All students have completed the survey forms after they were done with their subject registration. The gender split on each subject was 21% female and 79% male for Automation and 19% female and 81% male for ME. All students from Automation group and 79% from ME group stayed in the University accommodation outside campus area, whereas 21% of ME students stayed in the University hostel within the campus area. There are cyber-cafés available in Bandar Perda, Bandar Sunway and Bukit Mertajam. All places are within 10 kilometres radius of the out-campus University accommodation. Data was collected on student perception of computer facilities available and their Internet usage in general. The statements as in *Table 1* below are given and students are requested to indicate their preference.

Table 1: Statements for Computer Facilities/Internet Usage As In The Survey Form Given Out To The Participating Students

No.	Statements
1	Easy access to computer with internet line
2	Frequent visit to Cyber-café
3	Prefer to surf internet individually
4	Familiar with the use of Internet (e-mail, web search)
5	Surfing internet will increase motivation in learning
6	Have experience in surfing website related to this course

The Likert scale section of the statements used is reproduced in graphical form in *Figure 1*. An average of total response from both groups indicated that they basically agreed on the availability of computer with Internet line nearby their accommodation. They might have used cyber-café or the facilities available in the campus. However, the ME students' responses indicated that they might not have frequent visits to the cyber-cafés. Some of them living within the campus area may be the reason because hostel residents are prohibited to bring motor vehicle. Average response to the next statement suggested that many prefer to surf Internet individually and most indicated that they are familiar with the usage of Internet before. They also agree that surfing Internet activity could motivate their learning desire but the ME students might have less experiences in surfing websites related to the subject taken compared to the Automation students.
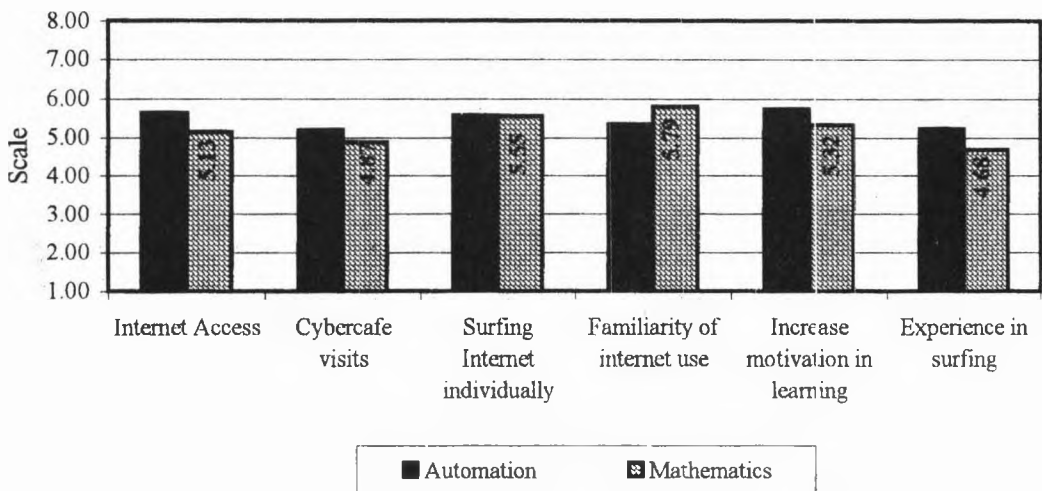
Computer Facilities

Figure 1 : Likert scale by average of total responses
(Scale: 1-2 = strongly disagree, 3-4 = disagree, 5-6 = agree, 7-8 = strongly agree)

Data was also collected on the participating students' preconception of the subject they are going to take. They are requested to indicate their preference to the statements as in *Table 2*.

Table 2: Statements for Students Preconception On The Subject Taken As In The Survey Form Given Out To The Participating Students.

No.	Statements
1	I will not do very well in automation class
2	Automation/ME class are boring
3	Automation/ME has no practical application
4	Automation/ME instructors are intimidating
5	Automation/ME is a very difficult subject to understand
6	I plan on learning only enough material in this class to get me the grade I need
7	Using computer will not help me learn anything useful in Automation/ME class

The reproduction of the Likert scale section of the statements in *Figure 2* reveals that average response disagree with the indication that they will not perform in the subject that they are going to learn. They also disagree that they are going to get bored in the classroom for the subject and there would be some

practical application of the subject. Both groups also might have known their instructors well and have some information on the subject taken. Surprisingly, responses from Automation group for statement 6 have an inclination to agree that they planned to study on the subject just to get the grade they needed. Coming from final year students, this should alarm the educators that they might adopt the same attitude with other subjects. Average response for the last statement indicated that the students agree that computer is an important tool in their learning process.

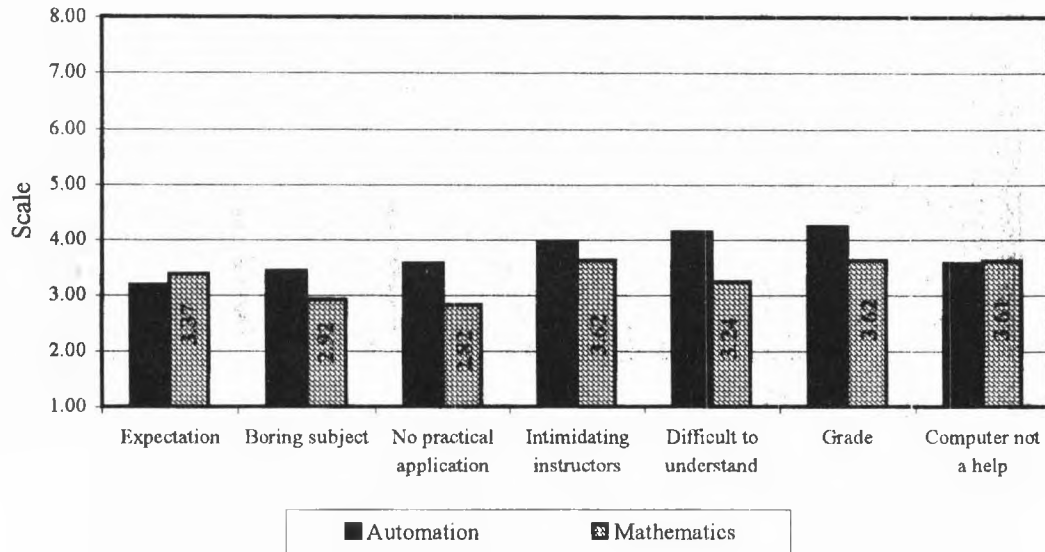**Students Preconception on Subject Taken**

Figure 2 : Likert scale by average of total responses
(Scale: 1-2 = strongly disagree, 3-4 = disagree, 5-6 = agree, 7-8 = strongly agree)

Analysis of Written Statements

Within one month of the time given for students to communicate with their respective lecturer via e-mail, 86% from Automation group and 73% from ME group have responded. A total of 100 emails were received, every student sending an average of 2.5 e-mails. The most active students sent in 6 e-mails. 17% used UiTM Penang facilities whilst 83% used cyber-cafe. This could be an additional cost to the students because the charge rate for one-hour usage of Internet at the cyber-cafe varies from RM 2.50 to RM3.00. Computers with Internet access are also available in campus but on limited quantities. Only 10% of UiTM Penang students can use the in-campus facilities at one time.

Only 19 out of 32 (59.4%) ME students handed in their first assignment. The number has decreased to 25% for the second assignment and 6.25% for the third assignment. The ME lecturer uses a free e-mail facility available on the Internet whereas the Automation lecturer uses the e-mail address provided by the University. There are 83% failures sending e-mail to the Automation lecturer e-mail address recorded by the students. Therefore, only 42% of the total students in Automation group are able to respond to the first and second assignments. It was then found out that during that month UiTM has its server upgraded resulting in interruption of e-mailing activities.

At the end of one-month duration, the students are invited to comment on their experience learning the topic with Internet usage. From the answers it was possible to identify 5 areas of favourable comment and 3 areas of unfavourable comment. The percentage of students who commented in each area is given in *Table 3*.

Table 3 : Percentage of Selected Students Comments

% who in favour with using Internet		% who does not like to use Internet	
Learn more things	5	Difficult to reach website needed	18
Helpful to understand subject matter	18	Prefer conventional method because easy to understand	7
Clear and easy to understand	9	Not attractive enough (animation, sound)	7
Easy referencing	18		
Enjoyable & gain more experience	18		

It is seen that the aspects of using Internet for learning that most students identified as favourable are: they can understand the subject better (18%), easy referenced (18%) and they found it an enjoyable experience (18%). The only aspect of using Internet for learning that students found unfavourable is it is difficult to get the website needed (18). This could be time consuming and if they are using cyber-café, it is cost consuming too. However, the difficulty might be caused by the student's level of computer skill. Although most students may have experience using Web browsers and email, they may not be able to use Web addresses or send (or receive) attachments [4]. In their recorded notebook, (which was asked to be handed back to the lecturer) it was found out that 83% of their total visits to computer outlets was done at cyber-café with an average of 1 hour per visit. Only 17% of the visits were done at UiTM computer laboratories. The students have also recorded the websites that they have used other than the two websites addresses given to them by the lecturer. It is noted that at an average of at least one other website is used by a student to learn on the related topic.

The lecturers are also invited to comment, of which they have identified a list of possible areas that must be looked into when using Internet for teaching engineering subjects:

- Students did not take it seriously They also did not bother to check up their spelling when handed in their assignment.
- Students are not familiar with using attachment file.
- It is difficult for students to write mathematics notation or engineering equations on computer.
- Students need to be motivated to use Internet for learning.
- Students are de-motivated as not enough facilities are being provided in campus to make it convenient for students to surf the Internet without additional cost to them.

However, there are some areas that that the lecturer found useful after using the Internet for

- Students are more comfortable to voice their opinion via e-mail compared to when they are in the classroom.
- Lecturers can response immediately to the student's problems via e-mail.
- Wider scope of the topic can be covered in short time because students understand better when they have used the websites.

RECOMMENDATIONS AND CONCLUSION

The following is a non-exhaustive list of practices to improve learning using Internet.

- Students should be taught how to use search engine for engineering subjects in their first year.
- All lecturers should encourage students to interact with them via e-mail.
- Some class time should be spent on introducing students how to insert mathematical notations and engineering symbols on computers.
- In-campus computer facilities must be upgraded to ensure that student can get a free access to Internet thus motivate them to use Internet further.

This paper looked at the possibilities of integrating information technology to enhance the traditional method of lecturing, as used for Diploma in Mechanical Engineering students in University Technology MARA Penang branch. The Internet and related developments in on-line communications will continue to drive and transform teaching and learning [6]. Current revision of syllabus for DME student has included computer skill as one of the subject. It is recommended that in their foundation year, the computer skill taught inclusive of web searching and learning, mail attachments and inserting mathematics notation and engineering symbols on computer.

The paper reports action research in progress. The intention is to expand the method for teaching other engineering subjects. It is important to envision using Internet in teaching and learning as a way to enhance, not substitute traditional classroom teaching. Its technical advantage, it can offer ways to continue teaching and learning outside the classroom [5]. Further research is required to ascertain more clearly the extent of Internet usage to ease the process of learning engineering subjects.

ACKNOWLEDGEMENTS

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