

Students' perceptions towards Blended Learning in teaching and learning Mathematics: Application of integration

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Abstract: *Blended learning has gained considerable popularity in training and education in recent years. This form of learning which combines face-to-face teaching with some technological aids has been widely used in teaching and learning, making it suitable to be applied in teaching and learning mathematics. A courseware has been developed on the topic of application of integration. It is designed to supplement the lectures given in class and to assist students studying the topic at their own pace and time. This courseware was introduced to students in the January 2008 semester. The objective of this paper is to determine if blended learning approach which combines the traditional classroom learning, courseware and web-based learning will help the students in learning application of integration. It also examines the influence of blended learning approach on students' perceptions towards learning application of integration. A total of thirty engineering students were involved in the study. A set of questionnaire was given to evaluate the students' attitudes and learning perceptions. From the findings, conclusion has been drawn regarding the role of blended learning to support teaching and learning. The result shows that students demonstrate positive perceptions using the blended learning approach.*

1. Introduction

With the advancement of technology, it is possible to revolutionize the way people learn and to present the information to them. Most of the traditional instruction, students learn from the instructor-led approach. Usually in a traditional classroom setting, students have access to the experts, involved in questions and discussion, exposed to social interaction and have the opportunity to learn from others. Some students prefer an individualized or less structured environment. In other words, they need self-paced learning material. At the same time, educators are now facing with the challenges of integrating traditional and emerging technology as to balance various students learning styles.

Students experience difficulties in studying Mathematics since they have to understand the theories and memorize the formulae [1]. In certain cases, they need to visualize the picture when applying those theories and formulae. Studies have shown that attitude to be one of other reasons why learning mathematics is so difficult [2]. Most of these experimental methods of teaching mathematics have not shown that traditional methods can affect students' attitude towards learning mathematics. [2] also mentioned that technological aids such as calculators and computers have improvement effects on students' attitudes towards mathematics. With the help of the technology, will blended learning (BL) make it easy for students to study and be able to change their attitude towards learning mathematics?

The objective of this paper is to determine if BL approach which combines the traditional classroom learning, tutorial with the developed courseware and web-based learning will help the students in learning application of integration. The paper reports how this approach was adopted in

teaching application of integration in UTP. It also examines the influence of BL approach on students' perceptions towards learning this topic.

2. What is Blended Learning?

Blended learning (BL) or hybrid learning describes a learning environment that either combines teaching methods, delivery methods, media formats or a mixture of all these. It also refers to the integrated learning activities such as a mixture of online and face-to-face learning [3]. In other words, BL is a mixture of e-learning and traditional types of learning. It is mentioned as the integrated combination of traditional learning with web-based online approaches, the combination of media and tools deployed in an e-learning environment and the combination of a number of pedagogical approaches [4]. [5] elaborated BL as a set of learning strategies or dimensions that mixes various event-based activities, including traditional instructor-led training, synchronous online conferencing or training and asynchronous self-paced study.

Among the benefits of BL reported by recent research [6] were (i) provide students with more control over learning; (ii) help foster critical thinking; (iii) effectiveness of online assessment system and computer tutorials.

3. Related Work

There is a variety of teaching and learning methods. Each method depends on the learners preferences and needs. In designing the methods, few things have to be considered such as to provide easy access of content, to provide a good experience for learners and to provide guidance and feedback. The context of the learning environment has also shown to be very important to student learning experience [7]. Therefore, a blended learning approach using a series of Flash tutorials has been developed using Macromedia Captivate to teach the statistics. Their blended components comprised of face-to-face teaching, ordinary Web-based information and special Java-based tutorials.

[8] presents a case study of a BL strategy used in a course on introductory programming where historically students had problems dealing with the abstract nature of certain programming concepts. In this instance the instructors developed multimedia learning objects to enable students to engage visually with these concepts and hence overcome the problem of abstraction.

In another project [9], BL strategy was used in teaching mathematics undergraduate courses. The result showed that there was an improvement in the students' performance in mathematics. [10] also used BL in teaching first year mathematics subject, Operations Research Modeling. They found that the blend serves to introduce students to the diverse environment and experiences comprising professional practice. The majority of students responded favorably to the blend. There was also evidence to suggest that the students adopted deep approaches to learning indicated by the positive correlation between the average score on deep learning and average score for blending.

4. The Implementation of BL

Three approaches for BL were suggested by [12]. The three approaches were Skill Driven, Behavior Driven and Attitude Driven. Among the three approaches, Behavior Driven (BD) approach has been chosen to be applied in this study. The approach can be defined as a learning approach that blends collaborative learning events through instructor-led classroom sessions and learning labs (tutorial) and interactions and discussions facilitated through technology to develop

specific attitudes and behaviors among learners [12]. The objective of BD approach is to choose a mixture that will highly motivate the students and assist them in understanding the topic.

The BL was implemented at UTP for the January 2008 semester by blending several learning deliveries. Application of integration has been identified as the toughest topic in Engineering Mathematics II [11]. Therefore, a courseware for teaching application of integration has been developed. Figure 1 shows how the BL approach was adopted in teaching application of integration. The lecture will be involved with face to face approach, instructor-led, coaching the students and with some feedback activities. The lectures are in groups of about 100 to 150 students and are normally carried out three times per week. Each lecture lasts an hour. The tutorial session is for two hours per week and each group consists of about 30 students. The tutorial is made up of face to face interaction, simulation using the developed courseware [11], interaction with material or the exercises discussed in class, and also feedback activities. While for the web-based, the developed courseware is made available on the e-learning. The web-based involves in self-paced and student centered approaches and also interaction with the exercises given in the developed material. With the web-based, students are able to access the material on e-learning at their own time and place.

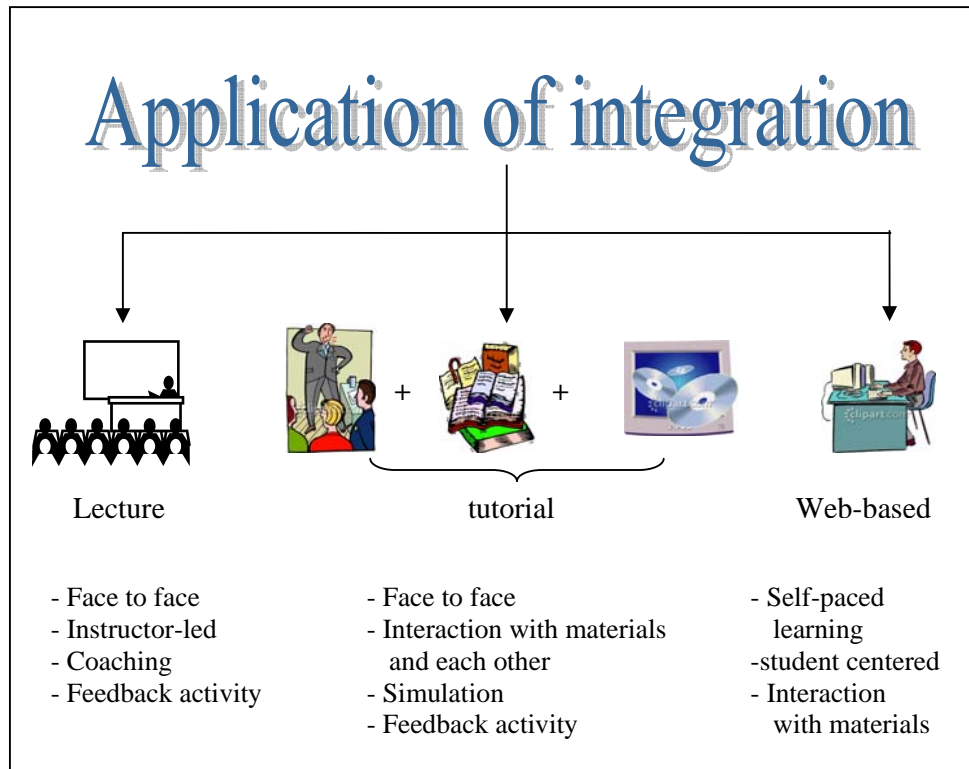


Figure 1 BL approach in Application of integration

Figure 2 and 3 show the interfaces of two different examples of the introduction for module 3 of the application of integration topic: Volume by method of disk for irregular shaped solids. Figure 4 shows the interface of one of the exercise questions in Module 3.

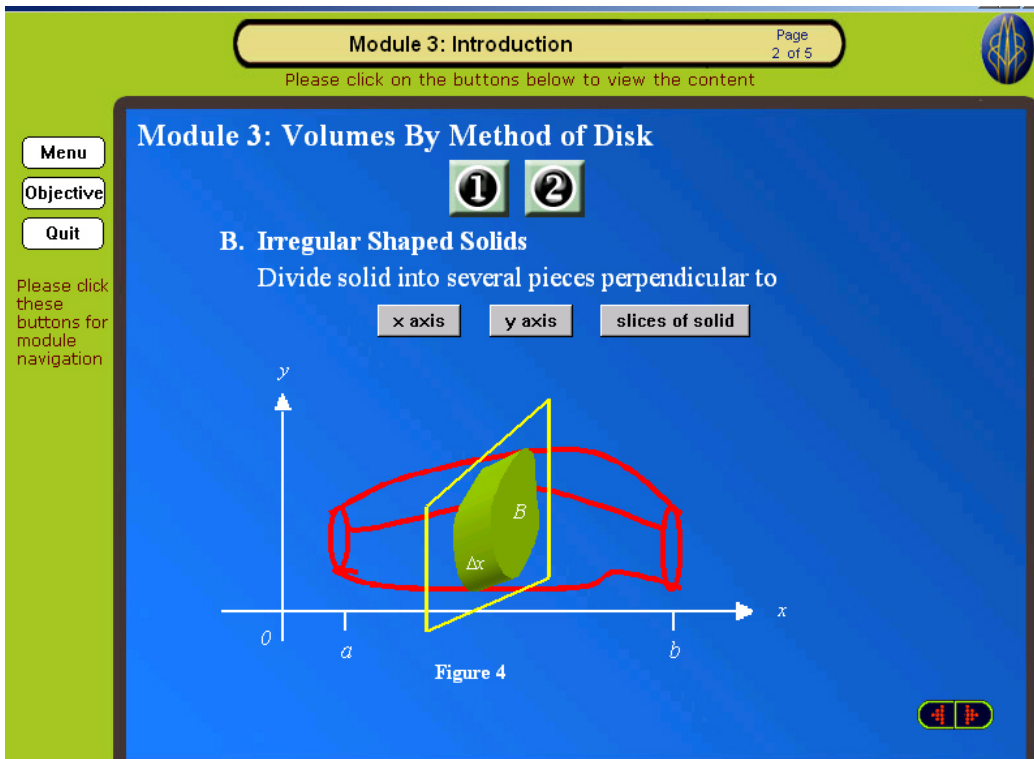


Figure 2 Interface of Module 3 – Introduction

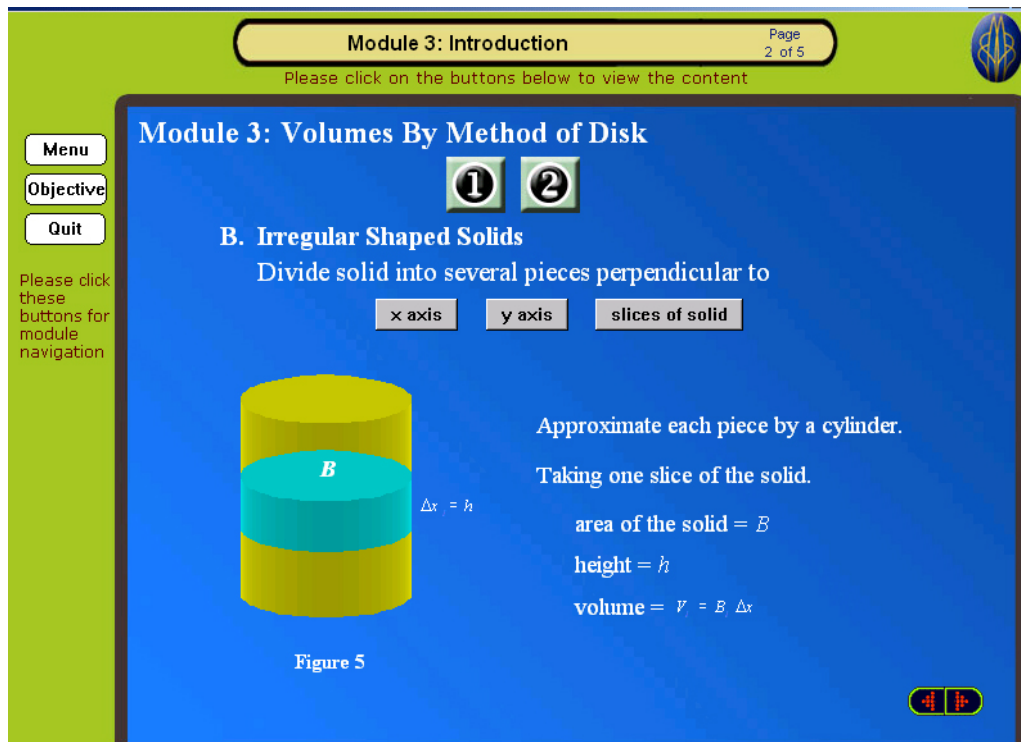


Figure 3 Interface of Module 3- Introduction

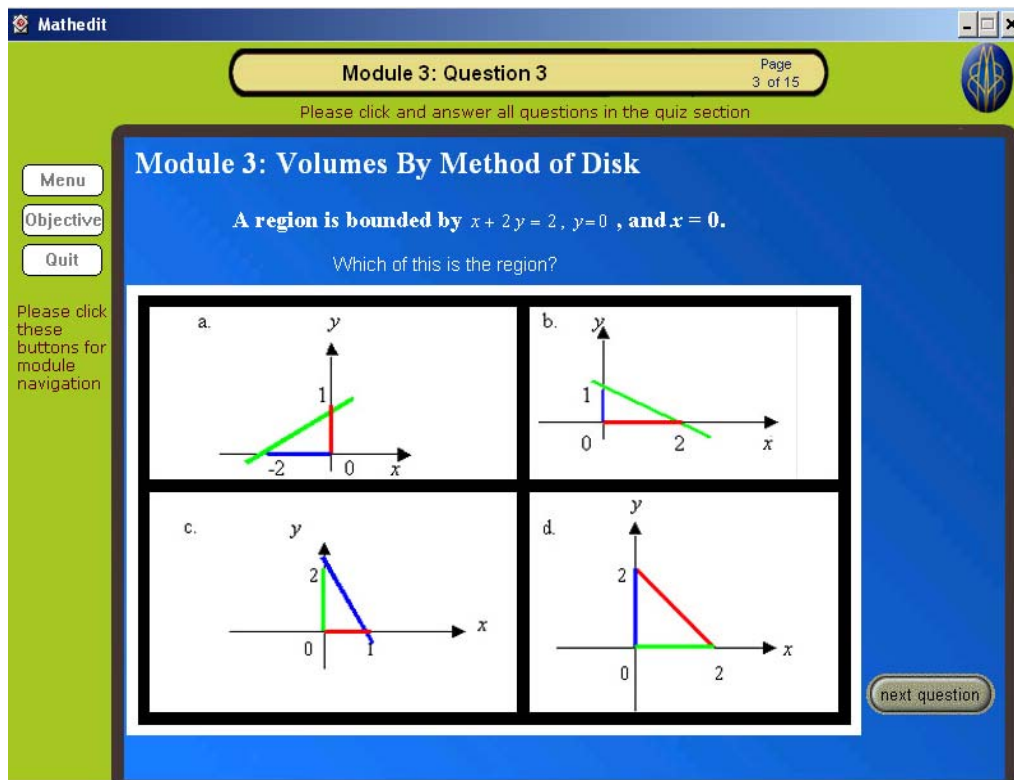


Figure 4 Interface of Module 3 – Question 3

5. Method of study

Thirty students from Engineering Math Foundation 2 (second semester) were involved in this study. They attended 3 hour lecture per week for two weeks. Besides that, they also have to attend a tutorial class an hour per week for the two weeks also. The courseware and exercises from the textbook were given to the students in the tutorial class with the supervision of the same instructor. At the same time, the courseware was also made available to the students on the e-learning. The courseware covers 6 modules in two weeks. In the beginning of the tutorial class, the students were informed of the teaching methods that will be used for the group. At the end of the two weeks, the students were given a set of questionnaire. 10 questions on perceptions were given in Section A. Responses to these questions are based on a Likert scale (1 strongly disagree to 5 strongly agree). Section B is open ended questions. Pre-test and post-test questions were also given to the students. The questions were design to assess the students' understanding of application of integration. The pre-test questions were given before the lecture on the topic was introduced, while the post-test was given after they have finished the topic. Students were required to answer 10 questions on each of the test.

5.1 Limitation

Only 30 engineering students with two tutorial sessions were involved in the study. This might not represent the perceptions of the total number of students taking Foundation Mathematics II.

6. Results and Discussions

As a result of the questionnaire, ninety five percent of the respondents indicated that they are satisfied with the different delivery methods (BL) used in teaching the topic and the overall results are given in Table 1. The average mean for each item is between 3.5 and 4 out of 5. The results imply that the use of BL in teaching this topic has positive feedback on students' learning. The mean score of 3.71 further highlighted the positive perceptions of students towards this approach of learning the topic.

Table 1

Items	Score
easy to learn the topic using the courseware	3.75
learn the topic better using the methods used compared to textbook	3.87
easy to visualize the important concepts	3.75
able to analyze better	3.5
appreciate on learning integration	3.87
find that mathematics is interesting	4

Furthermore, there is a significant increase (p – value 0.00) in the means of the pre-test and post test, from 4.08 to 9.00. This result shows that the adoption of a Blended learning approach to teaching application of integration has resulted in an improved students' performance. In addition, majority of the students (87.5%) indicated that the teaching methods had helped them to learn the topic better. This was further supported by the comments given by the students: the different delivery methods (BL) used had assist them in understanding the important concepts especially regarding the topics of area and volume, had helped them to visualize, learn at their own pace and time, and motivate them in solving the exercises from the textbook.

The results of this study imply that students have shown positive interests and perceptions in studying mathematics in particular in application of integration. The similar results in learning mathematics have been shown in [7] and [10]. This shows that BL which combine the different types of deliveries are able to motivate students to learn this topic.

7. Conclusion and Recommendations

Teaching and learning is one of the areas in education which has been influenced by the rapid rate of innovation in technology. This paper describes a blended learning approach in teaching application of integration. The BL approach used consists of face to face instruction, exercises from textbooks and developed courseware which was used in the tutorial class and also made available on the e-learning. Results obtained from the study involving the BL approach have shown that students demonstrate positive perceptions towards learning. Therefore, with the help of technology, BL can be used as an alternative approach in teaching and learning mathematics in order to motivate students. It is recommended that the courseware to be made available online and to carry out further study on a larger scale to confirm the positive results.

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