Peer learning and deep learning through online discussion boards

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Structured Abstract

BACKGROUND

According to Glasser (1998), we learn 10% of what we read, 20% of what we hear, but 70% of what we talk over with others, and 80% of what we use in real life. Therefore discussion of the topics with other students would be a promising approach to gain deep learning. Online educators who use discussion boards successfully estimate that their interaction with students can be as much as three times the interaction with face-to-face students, and that peer-to-peer interaction is even many times more than that (University of Oregon, 2013). Therefore, an online discussion board website (www.meccforum.com) was created to allow students in Mechatronic Engineering at Griffith University to register as users, post topics and discuss with peers the contents learnt in the class.

PURPOSE

To investigate the effect of using online discussion board on the engagement and deep learning in an engineering course, and to explore the benefits gained from exploiting the social networks for students and academics.

DESIGN/METHOD

An online discussion board was built using phpBB open source software to accommodate posts and responses by students, academics, and any other professional users outside the class. Unlike the forum in Blackboard Learn 9.1 system provided by the Griffith University, the phpBB based online discussion board is open to a wider community to offer the students opportunities to talk to industrial engineers and researchers. Furthermore, students are able to access the posts and discussions made by students in the same discipline in previous years. Data, including the number of users, the number of posts, the number of 'likes' and 'dislikes' for a particular post, is able to be collected by the phpBB software. A survey was conducted at the end of the semester to evaluate the impact of the online discussion board on the student engagement in learning.

RESULTS

Statistical analysis of the survey responses shows that most students like the atmosphere of the peer discussion outside the class. Some interesting and innovative 'burning' questions frequently came out from the students and led some vigorous discussions. The number of posts recorded through the whole semester (13 weeks) shows that the marks awarded for posts and the due time for the posts are crucial to keep the student participation for the active discussion. Also, gamification (Smith, 2013) through the use of reputation features in the phpBB software (thumb-up and thumb-down) stimulates and encourages students to contribute discussion posts.

CONCLUSIONS

A pilot trial has been implemented in a Mechatronic Engineering course using custom-made online discussion board. The outcomes of the research show that the student engagement has been improved by peer learning and discussion outside of the class. Several improvement strategies are proposed based on the survey and the statistical analysis from the data collected.

KEYWORDS

Online discussion boards, Gamification, Student engagement.

Introduction

According to Glasser (1998), we learn 10% of what we read, 20% of what we hear, but 70% of what we talk over with others, and 80% of what we use in real life. Therefore discussion of the topics with other students would be a promising approach to gain deep learning. The authors' view of teaching and learning is not just to tell students a story, but also to engage them to participate in and experience the story. Students will feel that they are actors on the stage, not just the audience, and they can take ownership of the learning experience. Online educators who use discussion boards successfully estimate that their interaction with students can be as much as three times the interaction with face-to-face students, and that peer-to-peer interaction is even many times more than that (University of Oregon, 2013). However, few research has been carried out to find the relationship between the online discussion and deep learning results, for example, some form of structured assessments. Therefore, an online discussion board website (www.meccforum.com) was created to allow the students in Mechatronic Engineering at Griffith University to register as users, post topics and discuss with peers the contents learnt in the class.

The purpose of this paper is to investigate the impact of using online discussion boards on the engagement and deep learning in an engineering course, and to explore the experiences and benefits gained from exploiting the social networks for students and academics.

A pilot trial using custom-made online discussion boards has been implemented in a Mechatronic Engineering course in the school of engineering at Griffith University in semester 1, 2014. In 2013, the Student Experience of Course (SEC) overall score in the course of 3318ENG-Sensors and Actuators was 4.6 out of 5, which is reasonable good. However, the lowest score of all 6 questions of SEC was 4.2 out of 5 from the question of "This course engaged me in learning". Therefore, to improve student engagement in learning, an online discussion activity has been introduced in the same course in semester 1, 2014. 3318ENG-Sensors and Actuators is a core course for third year students in Mechatronic Engineering, also an elective course for other disciplines, for example Electrical and Electronics Engineering. In 2014, totally 21 students enrolled in this course, including 13 from Mechatronic Engineering, and 8 from other disciplines.

Sensors and actuators are important components of mechatronic products and systems. This course outlines the fundamentals of how they work, how to assess and select them properly, and how to integrate them into an overall system. It addresses operation and integration of a wide variety of transducers and actuators, and also discusses technical details and practical applications. Learning activities consist of lectures, assignments and labs. Assessment is by laboratory work, and examinations. The details of the assessments are listed in the following table.

Table 1: Assessment Summary for 3318ENG-Sensors and Actuators in 2013 and 2014

Assessment Items	Weighting (%) in 2013	Weighting (%) in 2014
Peer Leaning and Discussion	N/A	7
Laboratory Activities and Reports (7×)	35	28
Mid Semester Exam	15	15
End of Semester Exam	50	50

As illustrated in Table 1, an additional assessment item of 'Peer Learning and Discussion' was designed and introduced in 2014 to engage student in learning. Three traditional

assessment items were implemented in 2013. Student feedback showed that they felt they were passive knowledge receiver, and just followed what their instructors asked them to do. To be an active learner, student needs to be more engaged in the course, for example more discussion and deep understanding of the topics in the lectures.

APPROACH

An online discussion board was built using phpBB open source software to accommodate posts and responses by students, academics, and any other professional users outside the class. Unlike the forum in Blackboard Learn 9.1 system provided by Griffith University, the phpBB based online discussion board is open to a wider community to offer the students opportunities to talk to industrial engineers and researchers. Furthermore, students are able to access the posts and discussions made by students in the same discipline in previous years. Also, gamification (Smith, 2013) through the use of reputation features in the phpBB software (thumb-up and thumb-down) stimulates and encourages students to contribute discussion posts. Data, including the number of users, the number of posts, the number of 'likes' and 'dislikes' for a particular post, is able to be collected by the phpBB software.
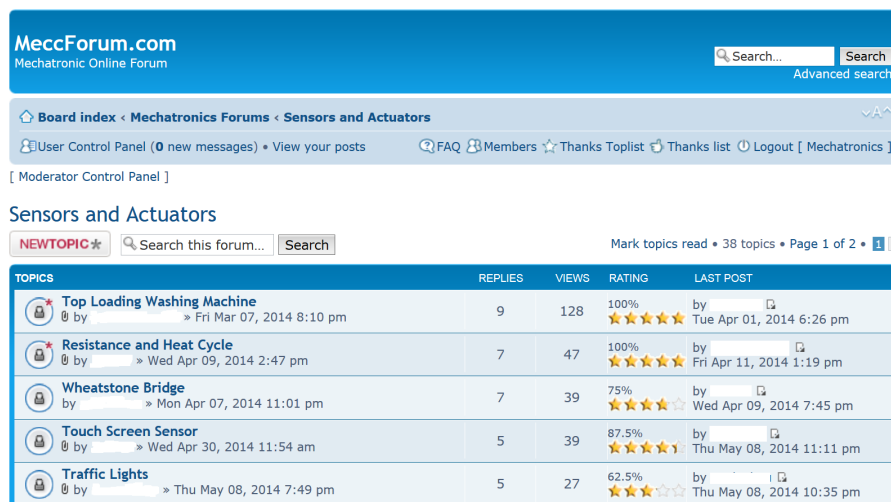

Figure 1: The front page of the online discussion boards

The front page of the online discussion boards is illustrated in Figure 1. To engage students in learning and continue topic discussion outside normal time-tabled classes, students are required to register as users on the discussion boards and post a minimum of 14 relevant posts (4 as topics and 10 as responses). To ensure the quality of the posts, each topic needs to have more than 100 words, and each response needs to have more 50 words. The diagrams, pictures and links are recommended. The forum moderators (course convener/demonstrators) will decide the relevance and offer up to 7 marks according to the relevance, understanding, and quality of the topics and discussions. Students need to effectively communicate using discussion forums and play a key role as a member of the course community. The assessment details are listed in Table 2.

Table 2: Assessment Details for Peer Learning and Discussion

Due Time	Topics No. (1 mark each)	Responses No. (0.3 mark each)	Contents	Marks
End of Week6	2	5	Weeks 1-6	3.5
End of Week9	1	2	Weeks 8-9	1.6
End of Week12	1	3	Weeks 10-12	1.9

FINDINGS

At the beginning of the semester, no due times were set aside for students to post topics and responses on the discussion boards. After approximate 4 weeks, it was found that the participation was very poor as students were engaged in other learning activities which have deadlines. Therefore, from week 5, three due times were introduced that student has to post certain number of posts before the ends of week 6, 9, and 12. Table 2 shows the detailed requirements including number of topics and responses, topic contents and marks.

Statistic data collected at the end of semester showed that the due times were crucial to attract student's posts and discussions. As illustrated in Figure 2, 20 out of 21 students registered as users on the forums, and the peaks of the numbers of topics and responses occurred at the due times.
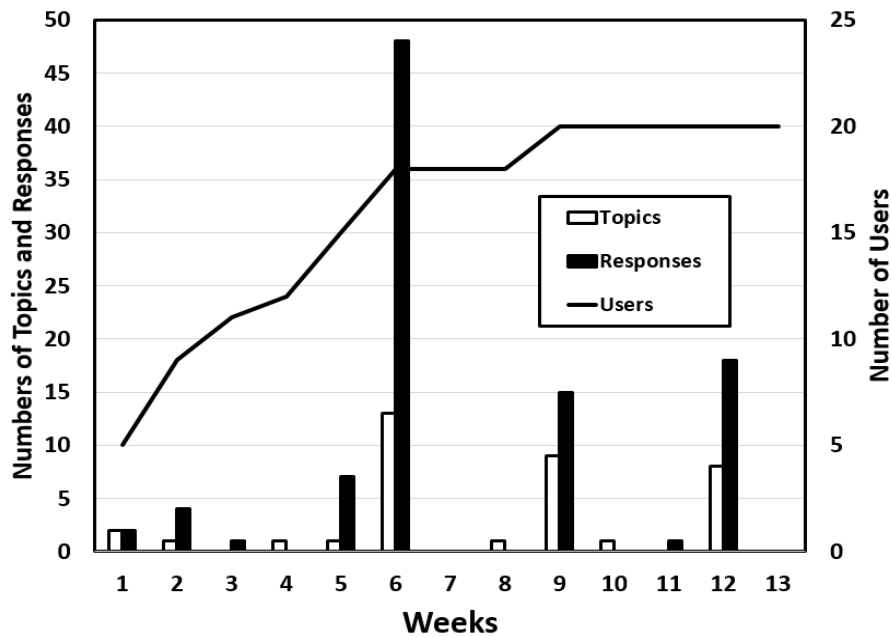

Figure 2: Weekly numbers of topics, responses, and users in whole semester
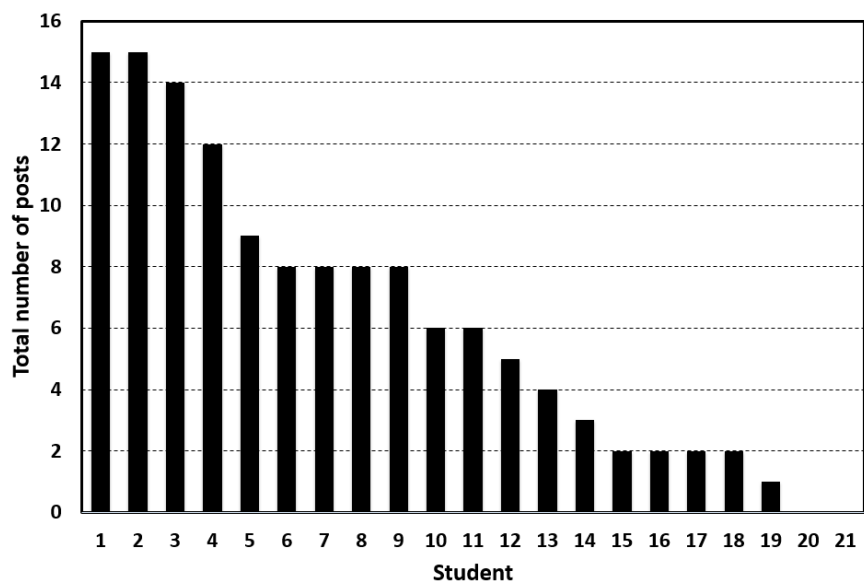

Figure 3: Distribution of student posts

Figure 3 shows the distribution of student posts including topics and responses. The student participation rate was high: 19 out of 21 students had posts, 3 of them had equal or more than the expected number of posts (14).

Apart from the quantity of the posts, the quality can be reflected by the size of topic thread. The more responses a topic thread attracted, the higher quality the topic thread had. As shown in Figure 4, the most common sizes of the topic threads were from 1 to 6. 10 topics attracted 2 responses, and one most popular topic attracted 10 responses.
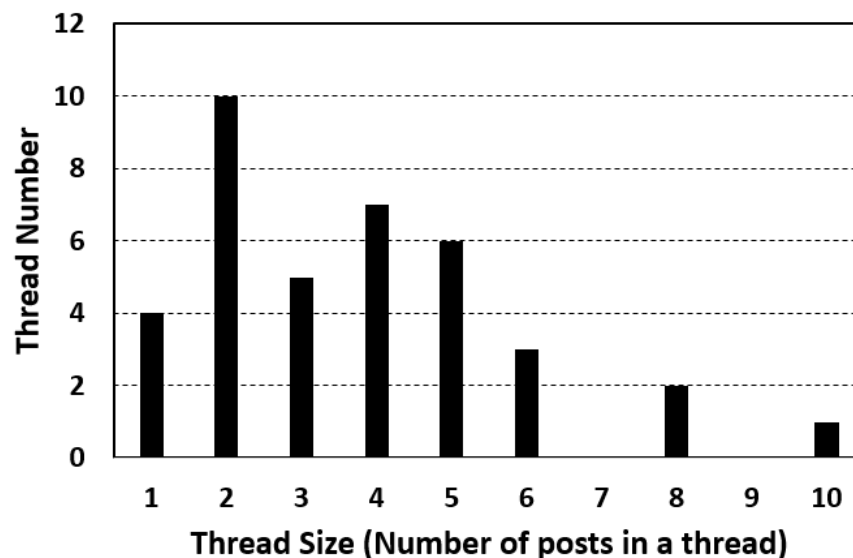

Figure 4: Distribution of topic thread size

An anonymous survey was conducted at the end of the semester to evaluate the impact of the online discussion board on the student engagement in learning. The question of "Do you think the use of the Discussion Boards in this course engaged me in learning?" was posted on the boards. It achieved 64% positive, 18% neutral, and 18% negative responses (anonymous). Statistical analysis of the survey responses shows that most students like the atmosphere of the peer discussion outside the class. Some interesting and innovative 'burning' questions frequently came out from the students and led some vigorous discussions. Some student comments are quoted as blow:

"I think this forum is great. I'm very much enjoying the responses and topics of the forum and the possibilities it provides" (student email-3318ENG-2014).

"This online discussion board helped me re-think my understanding of the course's content" (online survey-3318ENG-2014).

Figure 5 shows the comparison of Student Experience of Course (SEC) scores in 2013 and 2014. It can be seen that the survey scores for all questions from 1 to 6 of SEC in 2014 have been improved significantly compared to those in 2013. Especially, the online discussion did help to improve the student engagement: the score for question 4 regarding the engagement has been increased from 4.2 (2013) to 4.6 (2014).
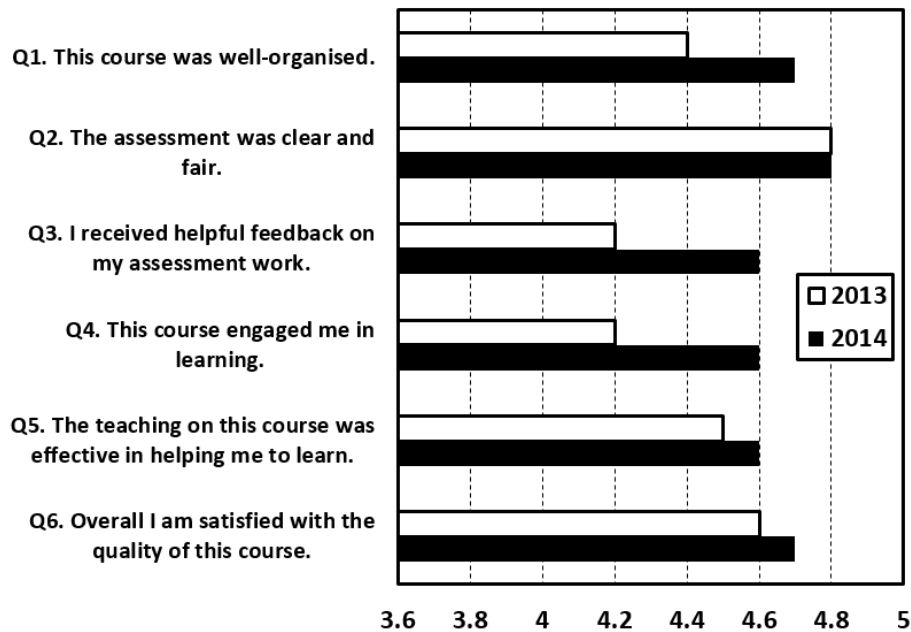
Figure 5: Comparison of Student Experience of Course (SEC) scores in 2013 and 2014

CONCLUSIONS

A pilot trial has been implemented in a Mechatronic Engineering course using custom-made online discussion boards. The outcomes of the research show that the student engagement has been improved by peer learning and discussion outside of the class. Several improvement strategies are proposed based on the survey and the statistical analysis from the data collected.

The number of posts recorded through the whole semester (13 weeks) shows that the marks awarded for posts and the due time for the posts are crucial to keep the student participation for the active discussions. Also, gamification (Smith, 2013) through the use of reputation features in the phpBB software (thumb-up and thumb-down) stimulates and encourages students to contribute discussion posts.

Some students also pointed that they were struggled to post the topics, sometimes they had to 'make up' some simple questions/topics with known answers. Therefore, the future work could introduce more guided discussions to act as seed topics to ignite student discussions.

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