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Student's Feedback based Blended Teaching Approach for Effective Learning

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***Abstract*—This paper demonstrates a blended teaching approach based on student's online feedback in an engineering unit at Curtin University, Western Australia and shows how it enhances the overall learning outcomes. The student's feedbacks are collected using a university-wide online survey system known as "eVALUate"-an evaluation instrument for measuring students' perceptions of their engagements and learning outcomes. Students are encouraged to put their feedback through eVALUate in each semester for their enrolled units. In this study, such eVALUate survey data was used for a Civil Engineering unit -Water Engineering 361 for two consecutive years 2008-2009. In 2008, the teaching was done mainly using traditional method and the overall student's satisfaction and the learning outcomes were found to be below the university or faculty agreement. All the suggestions and criticisms in eVALUate were taken into consideration for improvement of the unit in the following year. In 2009, a blended teaching approach composed of traditional and e-learning system based on the student's feedback was adopted. The eVALUate survey data in 2009 shows that the learning outcomes and the overall student's satisfaction exceed the target of university and faculty agreement showing blended teaching approach based on student's feedback could provide satisfactory learning outcomes in an engineering unit.**

***Index Terms*—Students, Feedback, Teaching, Learning**

I. Introduction

There is a very little change in undergraduate engineering education system over the last half century [1]. Regular reviews are taken place in every higher education institutions but these mainly tended to focus on the subject content of degree courses, and its relevance to the needs of engineering employers. However in 1990s, pressure for more radical changes began to build in many countries including United Kingdom [2], Australia [3], the United States [4] and New Zealand [5, 6]. The motivation was more student-centered learning in higher education such as out-come based learning process. In a higher education system, evaluation of units and teaching is an essential part for effective learning and continuous development in teaching learning. The evaluation helps to understand the level of student's understanding the concepts, analyse their different learning styles and to examine ways in which student could get a deeper understanding of the required concepts [7]. Traditionally, student's feedback was obtained in informal way such as classroom questionnaire survey. The main disadvantage of this informal survey was to analyse the qualitative information where most of the handwritten information is not understandable.

Until recently, the massive amount of student feedback collected in the Course Experience Questionnaire (CEQ) went unanalysed (on the national level) except when individual universities performed their own analyses [8]. In order to ensure an unbiased and fair evaluation, a centrally controlled online student evaluation system "eVALUate" has been implemented at Curtin University in Western Australia [9]. *e*VALUate is Curtin's online system for the gathering and reporting of feedback on teaching and learning both quantitatively and qualitatively. eVALUate system is mainly used to carry out the *e*VALUate unit survey and the *e*VALUate teaching survey but it is also used to gather information through the *e*VALUate graduate survey and the *e*VALUate employer survey. In this paper, eVALUate survey results for the unit "Water Engineering 361" are used and all the qualitative data are taken as the student's reflection. Based on this student reflection, the teaching methodology was redesigned and a blended approach was applied as a mode of delivery in the next year. The results of the eVALUate survey were compared and the discussion were made to show how student's reflection enhanced the overall learning outcome in an engineering unit.

II. Online Unit Evaulation

The online *e*VALUate survey system at Curtin University is open to the students for their feedback from the middle of each semester. The survey has eleven quantitative and two qualitative items [10]. The quantitative items ask students to report their level of agreement with statements about (i) what helps their achievement of unit learning outcomes (items 1 to 7), (ii) their motivation and engagement in learning (items 8 to 10) and (iii) their overall satisfaction (item 11). Each quantitative item is accompanied by a 'help text' (shown in italics below). Students may indicate Strongly Agree, Agree, Disagree, Strongly Disagree or Unable to Judge for each item. In addition, students are invited to make constructive comments on the qualitative items (limit of 600 characters) (item 12 to 13). Usually, more than 35% response rate is considered as representative in eVALUate survey. The quantitative and qualitative items are listed in Table 1.

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III. The Unit Water Engineering 361

The unit 'Water Engineering 361' (civil engineering hydraulics) is a core unit which is offered for 3rd year civil engineering students at Curtin University, Western Australia (WA). This unit is run simultaneously at Curtin Bentley campus, WA and Curtin Miri Campus, Malaysia. The unit coordinator is from Bentley campus and he is the principal lecturer of this unit. Currently all the lecture notes are prepared in Microsoft PowerPoint and made available to the students through University-wide online learning resources "Blackboard". Blackboard has been started at Curtin in 2009 and before that; another online learning platform was used such as, "WebCT". But the lecturer was new and used traditional teaching method in 2008 but a blended teaching approach of traditional and online resources was introduced in 2009 by the same lecturer. This unit mainly has two parts, pump hydraulics and open channel hydraulics. Each part again has two components, lectures and a laboratory component. The unit outline is made available to the students at the beginning of the semester where all aspects of the units are described especially the syllabuses, unit outcomes, assessment procedure and lecture schedule. The main unit outcomes of this unit are the appreciation of the application of civil engineering hydraulics in particular to the principles relating to hydraulic pumps and open channel hydraulics. In Water Engineering 361, the student numbers enrolled were 150 in 2008 and 121 in 2009 respectively. In this paper, eVALUate survey results on 11 quantitative items and 2 qualitative items were considered for 2008 and 2009 respectively.

TABLE I. Quantitative And Qualitative Items Used For Unit Evaluation [10]

Quantitative items:
1. **The learning outcomes in this unit are clearly identified.** *The learning outcomes are what you are expected to know, understand or be able to do in order to be successful in this unit*
2. **The learning experiences in this unit help me to achieve the learning outcomes.** *The learning experiences could include: face-to-face lectures, tutorials, laboratories, clinical practicums, fieldwork, directed learning tasks, and online and distance education experiences*.
3. The learning resources in this unit help me to achieve the learning outcomes. *Learning resources could include print, multimedia and online study materials, and equipment available in lectures, laboratories, clinics or studios.*
4. The assessment tasks in this unit evaluate my achievement of the learning outcomes. *Assessment tasks are those which are rewarded by marks, grades or feedback. Assessment tasks directly assess your achievement of the learning outcomes*.
5. **Feedback on my work in this unit helps me to achieve the learning outcomes.** *Feedback includes written or verbal comments on your work.*
6. The workload in this unit is appropriate to the achievement of the learning outcomes. *Workload includes class attendance, reading, researching, group activities and assessment tasks.*
7. The quality of teaching in this unit helps me to achieve the learning outcomes. *Quality teaching occurs when knowledgeable and enthusiastic teaching staff interacts positively with students in well-organised teaching and learning experiences.*
8. I am motivated to achieve the learning outcomes in this unit. *Being motivated means having the desire or drive to learn, to complete tasks and to willingly strive for goals.*
9. I make best use of the learning experiences in this unit. *I prepare for and follow up on the learning experiences offered in this unit.*
10. I think about how I can learn more effectively in this unit. *I take time to think about how I can learn more effectively.*
11. Overall, I am satisfied with this unit. *Overall, this unit provides a quality learning experience.*
Qualitative items
12. What are the most helpful aspects of this unit?
13. How do you think this unit might be improved?

IV. Survey Results and Discussion

A. Quantitative Survey

The eVALUate survey results on the unit are reported in terms of Full Unit Report (FUR) and a Unit Summary Report (USR) [11]. Unit summary reports are automatically published and anybody from Curtin online users can see the report. The unit coordinators are expected to provide their response onto the USR where he has the opportunity to mention how he is going to consider the students' feedback for future improvement of the unit. Providing the online response, unit coordinator can get points towards his Teaching Performance Index (TPI). In 2008, percentage of respondents in Water Engineering 361 was 35% and unit agreement in most of the items was below the University or Faculty agreement. This was mainly because of the use of traditional teaching methodology and the unavailability of online lecture materials in due time. In 2009, percentage of respondent increase to 41% and unit agreement in all 11 items were above the University or Faculty agreement. The quantitative survey results are presented for 2008 and 2009 in Table 2. The results revealed that the student's feedback based blended teaching approach provides better learning outcome.

B. Qualitative Survey

Students put their qualitative evaluation in two evaluation criteria as given in Table 1. They first identify the most helpful aspects of the unit during their learning process and later, put their thoughts how to improve the unit for better outcome. There were some contradictory opinions on the teaching method which may be due to the student group did not attend all the lectures but participated in eVALUate.

However, analysis of qualitative data revealed that this percentage is very low. The qualitative data obtained in 2008 was summarized and most useful suggestions were listed. All the useful feedback from 2008 were taken into consideration and presented in the beginning of the lecture in 2009 and discussed with the students how these will be incorporated into the teaching methodology. This new introduction was mainly towards the concept of blended teaching approach using traditional and e-learning processes including problem based learning, quiz competition in the revision class and the new assessment methods such as continuous assessment with prompt marker's feedback.

C. Student's Performance

Students' performance in this unit was analyzed for the two consecutive years and frequency of students and their obtained grades are plotted in a histogram which is shown in Fig. 1. The results revealed that the number of student's grades above 7 in 2009 is higher than 2008 and the average marks also increased from 65 in 2008 to 74 in 2009. The histogram shows that the overall curve is skewed towards the better performance in 2009.

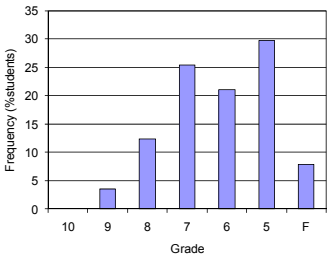
D. Blended Teaching Approach

In this paper, blended approach is defined as the use of online resources and the traditional method simultaneously. Online lecture materials were uploaded onto the blackboard well before the lecture schedule. The use of flexible mode of delivery such as, simultaneous use of white board- marker and power point slides made the student engagement more effective in the class. At the same time, there were also combined use of Wikipedia, online movie clip and group based problem solving which made the class room learning environment more interesting. All the lectures were recorded electronically and the i-lectures were made available online to all the users of the unit. Based on the student's feedback, continuous assessment was introduced instead of having only one final exam at the end.

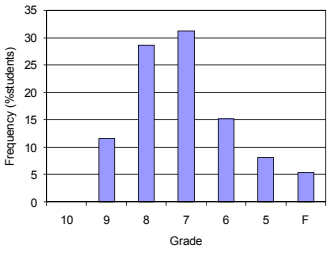
E. Student's Engagements and Effective Learning

All the major student's feedbacks were summarized from 2008 eVALUate data of Water Engineering 361 and presented in the introductory lecturer in week 1. The lecturer also provided his responses to each feedback and described how he would incorporate their feedbacks in the lectures and assessments. This introductory session provided a feeling to the students that the lecturer really look into their comments carefully and improves the unit accordingly. In the revision class (last lecture in week 12), the same slides were shown again and explained about the deliveries what was promised at the beginning. Students were very keen to see that their feedbacks are implemented for the improvement of the unit which can be seen from the response rate increased from 35% to 41%.

Problem based learning is mainly defined where the students work collaboratively in a group to solve a particular problem. The problem, which may be interdisciplinary, drives the curriculum; students must define the problem, identify and acquire the skills and knowledge needed to solve it, and work through the solution [6]. The problems are mostly related to the real life and industry based. Engineers see themselves as problem-solvers, so the learning context is seen by students as being relevant. Engineering students gain experience in the integration and application of analytical knowledge. In Water Engineering 361 unit, the curriculum is entirely problem-based. Each chapter of the unit starts with the theoretical background and immediately supported by practical examples which provides the students to think deeply into the problem and realize the simultaneous applications of the theories. Students loved the lecture materials of this unit and the teaching styles of the lecturer as given by their feedback comments in 2009 *"Very well-organized lecture notes with useful practice questions"* and *"Persistant in getting us to understand the procedures"*. However, the lecture materials were updated and the teaching style was adopted based on the student's feedback given in 2008. Students' engagements in the classroom became more active because of the introduction of the blended teaching approach in 2009. Group based problem solving styles in the class room provide the students to be more engaged and think critically. As engineering problems are open eneded, group works help the students to come up with the best possible solution and develop their teamwork skill which is an essential criteria for a professional engineer. In this unit, usually students worked in groups on design-oriented problems which were supported by lectures, reading materials, group discussion, tutorials, laboratory sessions and practical exercises as appropriate. As a result, the learning outcomes in different items were achieved better in 2009 than 2008 (see Table 2) and the revamping of the unit improved the overall satisfaction rating significantly from 63% in 2008 to 92% in 2009 which is far above the faculty average of 81% and the university average of 83% respectively.



(a)



(b)

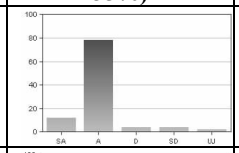
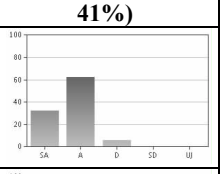
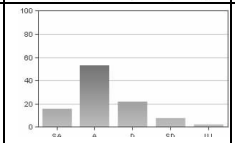
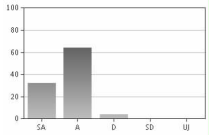
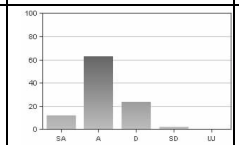
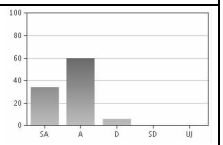
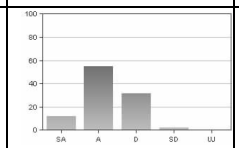
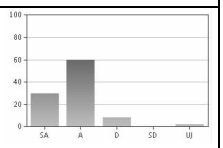
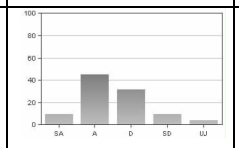
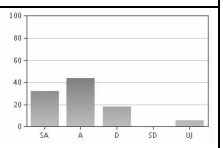
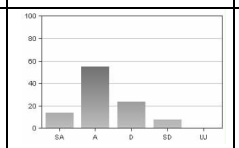
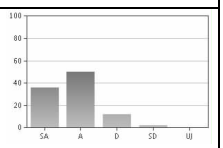
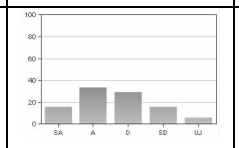
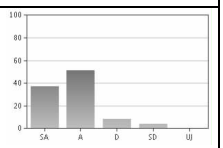
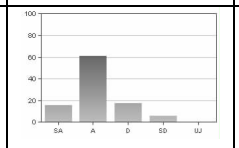
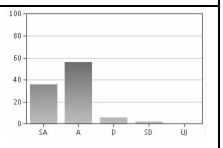
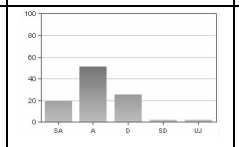
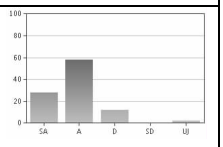
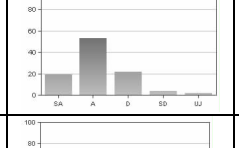
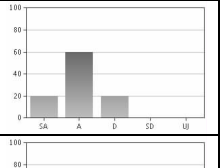
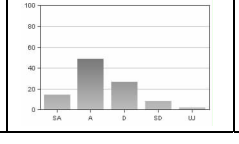
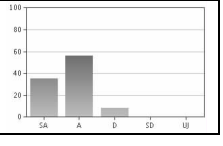
Figure 1. Student performances in Water Engineering 361 in (a) 2008 (n=150) and (b) 2009 (n=121)

V. Conclusions

This paper illustrates the use of online student's feedback for a blended teaching approach and shows how it enhances the teaching and learning in an engineering unit. The online survey data were used for two consecutive years for the unit

"Water Engineering 361" using the university online evaluating system "eVALUate". The results on the 1st year show that the unit satisfaction was below the target of university or faculty because of the use of traditional teaching method. The 1st year eVALUate data were summarized and the unit was redesigned for the next year using a new blended approach. This new teaching approach integrates the students' feedback together with the traditional teaching method and online learning resources. This new method enhanced the learning outcome which shows significant improvement in the overall unit satisfaction rating from 63% to 92%. This rating was far above the faculty average of 81% and the university average of 83% respectively. However, to achieve improved learning further, the course content delivery structure needs to be reviewed on a regular basis and made as clear as possible.

TABLE II. UNIT SURVEY RESULTS FOR WATER ENGINEERING 361 IN TWO CONSECUTIVE YEARS (SOURCE: [11])

Unit survey item	2008 (Response rate 35%)	2009 (Response rate 41%)
1. The learning outcomes in this unit are clearly identified.		
2. The learning experiences in this unit help me to achieve the learning outcomes.		
3. The learning resources in this unit help me to achieve the learning outcomes.		
4. The assessment tasks in this unit evaluate my achievement of the learning outcomes.		
5. Feedback on my work in this unit helps me to achieve the learning outcomes.		
6. The workload in this unit is appropriate to the achievement of the learning outcomes.		
7. The quality of teaching in this unit helps me to achieve the learning outcomes.		
8. I am motivated to achieve the learning outcomes in this unit.		
9. I make best use of the learning experiences in this unit.		
10. I think about how I can learn more effectively in this unit.		
11. Overall, I am satisfied with this unit.		

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