Feedback system in a blended learning environment to support self-regulated learning: A case study of engineering graphics course

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ABSTRACT – Current assessment and evaluation practice are usually provided in an accumulated score respective to a very generic learning outcome. Without specific mapping to the course content, such practice does not encourage students' self-improvement throughout the learning period. This paper aims to describe the development of a feedback system in a blended learning environment to develop self-regulated learners. The algorithm was established, and the system was embedded into existing learning management system (LMS) following respective assessments. It was found that up to 33% of students attained an increased score for subsequent assessment with respect to the course content.

1. INTRODUCTION

As the Outcome Based-Education paved its way within higher learning institution, there is an increasing expectation among stakeholders for educational transformation towards higher quality learning experiences. Blended learning has become an ideal complement in the teaching and learning practices within many local universities as part of the alternative to attain various aspect of program outcomes. Blended learning is an integration of face-to-face classroom session with online learning experience [1].

Unfortunately, assessment particularly is often regarded as a system of reward or punishment [2]; even in the blended learning setting. Assessments are commonly mapped to a very generic learning outcome. Its results are usually published in an accumulated score without any emphasis on how each student perform respective to the course contents. Such practice lacks the capacity to professionally build and develop self-regulated students who are able to monitor, control and take action based on their performances [2], [3]. One of the alternatives to address such issues is by redesigning the method of feedbacks to provide a clear indication of the students' strength and weaknesses relative to the course content. The meta-analysis study reported by Nicol & Macfarlane-Dick [4] suggested a significantly positive effect on learning attainment among students who received feedback. The aim of this article was to propose a feedback system in a blended learning environment to encourage self-regulated learning among the students.

2. METHODOLOGY

The feedback system was applied to one section of the first-year undergraduate students registered for Engineering Graphics and Computer-Aided Design course, semester 2, year 2018/2019. The class comprises of 52 students from the Faculty of Electronics and Computer Engineering, Universiti Teknikal Malaysia Melaka (UTeM). All students was enrolled in the university's online LMS known as ULearn. The LMS was mainly used as a repository for teaching materials, assignments, and class announcements. The feedback system containing task evaluation was embedded in the ULearn following specific assessments.

2.1 Course Assessment

The feedback system was applied for Assignment 1 and Test 1 which contributed 10% and 20% respectively to the final marks. The mapping of the assessments with respect to the course contents are shown in Table 1. Students' information including matric number, name, and score respective to the assessments and course content was stored in an Excel spreadsheet which acts as the primary database named 'Data'.

Table 1 Mapping of assessments to course content

No	Assessment items	Assignment 1	Test 1
1	Fundamentals of engineering drawing.	✓	✓
2	Basic sketching.		✓
3	Understanding to 2D drawing projection.	✓	✓
4	Ability to construct 3D drawing based on 2D-ortographic projection.	✓	✓

2.1 Feedback System

The feedback system was developed using a new spreadsheet named 'Main' in the same Excel file. The algorithm of the feedback system is shown in Figure 1. The developed file was protected for security purpose. The Excel file was then uploaded into a OneDrive folder to allow online sharing. The embed code was then generated with specific customization to only preview the 'Main' spreadsheet which serves as the Graphic User Interface between the student and the feedback system. The systen was then embedded in the university's LMS using the generated code.

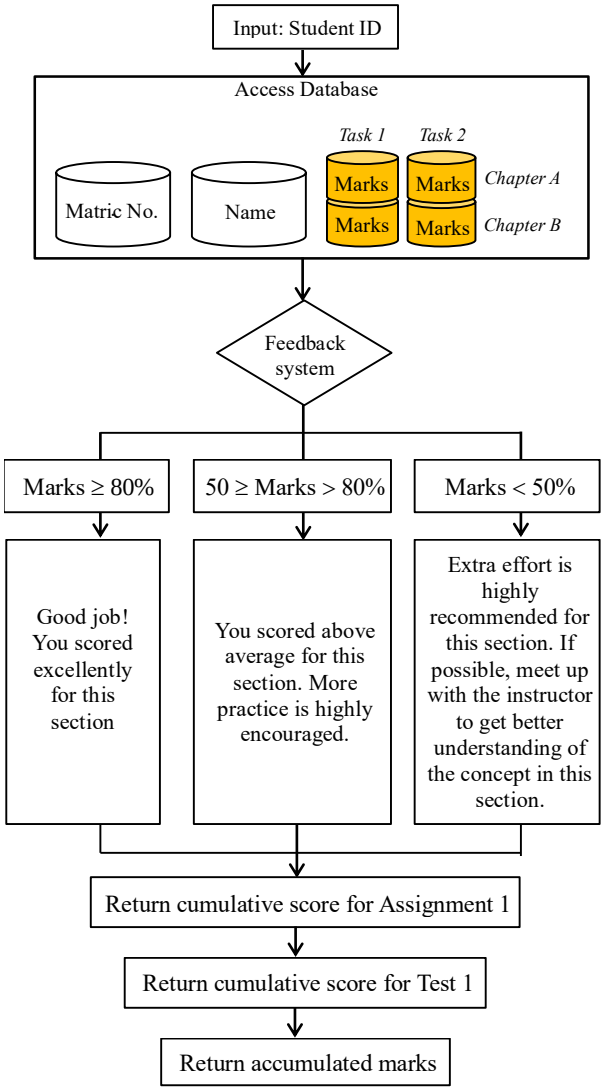

Figure 1 Algorithm of the feedback system

3. RESULTS AND DISCUSSION

Figure 2 shows the 'Main' spreadsheet embedded at the LMS which act as the interface between the student and the feedback system. After the student key-in their student ID, the system will generate their individual results with the specific feedback corresponding to the course content. Performance of the entire class was also developed and shared in the LMS platform. Students' attainment for each assessment relative to the course content is shown in Figure 3.

The feedback system was first published for Assignment 1, one week before the students sit for Test 1. Comparisons between Assignment 1 and Test 1 was performed to identify students who performed better in the latter assessment. Results showed that four students attained increased score for fundamental questions (7.7%), while 2D drawing projection recorded improved performance among 16 students (30.8%) and 17 students (32.7%) attained higher score for 3D drawing. Availability of the feedback system following each assessment is suggested to be one of the variables which improve students' performance.

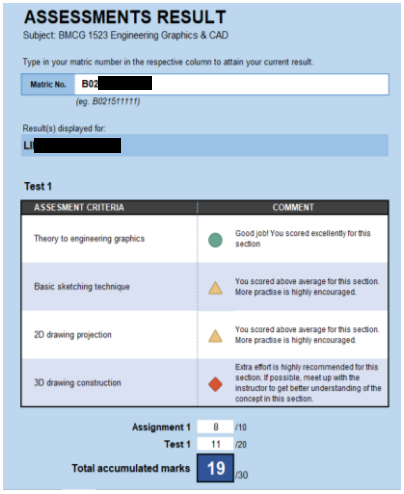

Figure 2 Print screen display of 'Main' spreadsheet

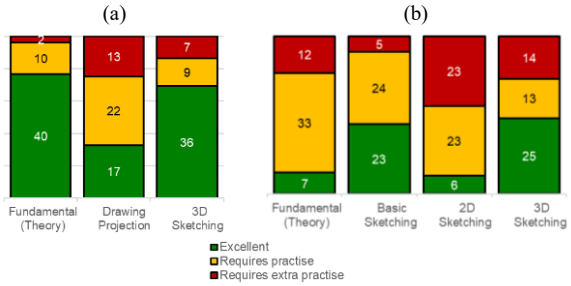

Figure 3 Class performance to respective course content for (a) Assignment 1, and (2) Test 1.

4. CONCLUSIONS

This paper presents the development of a systematic feedback practice for a blended learning environment. Results showed improved students' performance (6 – 33%) respective to the course contents. Although it is assumed that the feedback system improves students' performance, nonetheless such assumptions shall be treated with care as other factors including assessment type, difficulty level and the timeline between feedback and subsequent assessment may also influence students' performance.

5. ACKNOWLEDGMENT

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