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Reflections on an intervention to Motivate Student Learning through in-semester Online Assessment

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Introduction

In my experience engineering degree programmes are relatively demanding in terms of class contact hours which are typically up to a factor of two greater than many equivalent arts based courses. The predominant teaching strategy involves lectures and tutorials which usually take on the form of problem solving sessions and laboratory work. This commitment of time taken together with the necessary study required to complete assignments and coursework means that a consistently, steady work pattern is generally a prerequisite of success.

In my role as a lecturer in engineering I have found that increasingly academic ability needs to be supplemented by motivation, effort and a structured work ethic. Furthermore, anecdotal evidence suggests that many students cannot manage their learning without significant levels of support, guidance and direction, particularly at levels 0 and 1. This may in part be attributed to the teaching methods that students have been exposed to earlier in their education which appear to be increasingly prescriptive. However, difficulties are often exacerbated by financial pressures which require an increasing proportion of the student body to undertake part-time work with unsocial working hours often disrupting attendance at classes. A vicious circle can ensue whereby inability to manage learning serves to de-motivate and lack of motivation in turn further reduces the ability to manage study, possibly leading ultimately to failure and/or withdrawal.

In Laws 2002; 2003 and 2004 I explain how I have used a variety of approaches to present material to students utilising a range of methods in an effort to support and motivate students. I have extensively used the Blackboard Virtual Learning Environment (VLE) to provide electronic access to lecture material and tutorial questions (with solutions provided later). Since 2003 I have presented recorded lectures on Blackboard. Whilst these interventions have generally been well received by students it seems that without a positive inducement or requirement for engaging with the VLE there is still a minority who choose not to avail themselves of VLE support. Seemingly a proportion of these simply prefer face to face delivery methods and 'live' class contact. Rather than being switched on by technology they appear to be switched off. I feel that these students are disadvantaged, in that they then do not for example, benefit from the solutions to tutorial questions and the extra materials delivered electronically. Thus I have set out to determine a means of encouraging the reluctant. In the academic year 2004-5 as a pilot exercise, I changed the assessment strategy for two level 1 modules so that 20% of the module mark was allocated to four on-line tests set and taken in 'Blackboard'. I hoped that this would be a sufficient spur to encourage all students to use 'Blackboard'. More significantly perhaps, I also hoped that students would be motivated to work steadily throughout the semester in regular preparation for the on-line assessments (which concentrated on key aspects of module content) and that this would in turn, prove useful in preparation for the end of semester examination.

Piloting On-Line Assessments in Engineering Thermodynamics and Fluid Mechanics at level 1

For the semester 1 module Engineering Thermodynamics I constructed four tests focusing on:

- Basic concepts e.g. closed, open system, flow and non-flow processes and the first law of thermodynamic
- The steady flow energy equation and some applications
- The perfect gas and applications to flow and non-flow processes and gas mixtures
- Steam cycles and the second law

I tried to ensure that each assessment included a balanced mix of questions allowing students to demonstrate basic knowledge and understanding and questions involving mathematical manipulation, application and detailed calculations. I carefully considered the visual impact of the tests and where possible included diagrams and figures to facilitate learning. For each assessment the questions were added to a question pool of (totaling 20 in all) and individual students were allocated a random mix of five to complete in a one hour time slot. The actual assessments were made live at a pre-determined time and the students took them under supervised conditions.

The results from the pilot were encouraging since the majority of students attended on each occasion and the average mark achieved for each test was around 55% with a standard deviation in each case of around 9%. The spread of marks in each test ranged between 20% and 100%. Overall of the 39 students taking

the module (each required to take 4 tests) only eight tests were missed and of the 144 tests taken only eight marks were below 40%.

Students who achieved less than 40% in any individual test were given the opportunity to take the test again at a later date with the proviso that marks would be capped at 40%. Of course steps were taken to ensure that resit candidates would not see questions identical to the original set drawn from the pool. This opportunity was designed to encourage students to maintain effort and work harder if they were having difficulties and to ensure that the assessments did not adversely affect individual progression to the next level (requiring a minimum overall mark of 40% in all modules). In the first test three students chose to re-sit whilst two who could have re-taken chose not to do so having achieved a mark of 30%. A similar pattern emerged in subsequent tests.

The principle of the online assessments was extended in semester II to the Fluid Mechanics module. In addition to the students who had taken the Engineering Thermodynamics module in the previous semester, this module included a cohort of Civil Engineering students for whom the approach was totally new.

The four topics tested for were:

- Pressure measurement
- Forces on Submerged Surfaces
- Application of Bernoulli's Equation and the Momentum Equation
- Dimensional Analysis and losses in pipe systems.

As in Engineering Thermodynamics the tests were taken at set times and in defined supervised locations. However because of the larger number of students involved two

testing sessions were required on each occasion putting pressure on both staff resources and room availability. Once again the students engaged well with the on-line assessments and a positive effect on student learning may be inferred from an overall improvement in student exam marks in this module.

Extending On-line Assessments to Aerofluid Dynamics at level 2

Having considered the pilot to be a relative success I planned to extend the use of on-line assessments to level 2 BEng/MEng cohorts for the academic year 2005-6. I considered introducing the assessments to the parallel BSc cohort at both levels 1 and 2, but decided against it in the light of concerns about managing the testing of so many students. Subsequently as the start of the first semester approached I realised that it was impractical to require the students to undertake the assessments at specified times and places, (the method used in 2004-5). This was because at both levels 1 and 2 some of the students involved were on Pilot Studies programmes which took groups of them out every day for flying sessions and it was impossible to identify any times when tests could be organised. Thus tests were made live on selected days, (notified in advance to the students) and an individual student could choose to take the test any time on that day. Since the students could have access to course materials at the time of taking the test I had to carefully consider the nature of the questions asked. I continued to use a question pool and restricted initial feedback to an overall mark. This was to ensure that those having undergone the assessment could not relay comments to others who had yet to take a test and may have been confronted with the same question.

Once all students had taken the assessment more detailed feedback was made available. Furthermore, to introduce a measure of 'policing' I split the cohort into four different groups and each student was e-mailed the day before the test with a password to enable them to access their assessment. In general this method of testing worked well – there were occasional difficulties with the 'Blackboard' server going down or a test being timed out whilst some students were mid-test but these were overcome by simply re-setting the test and enabling the student to start again (with a different set of questions).

Students' reactions to online assessment and impact on attendance at timetabled classes: preliminary insights

In trying to persuade colleagues to use learning technologies to supplement and enhance their teaching a fairly common concern appears to be that provision of materials that students can access remotely inadvertently encourages them to miss classes with an attendant adverse impact on opportunities for learning. In my experience however, this is not the case.

In order to try to gauge the impact of the use of learning technologies, as outlined, on student engagement with face-to-face sessions I have tried to carefully monitor attendance at timetabled classes. The results from the 2004-5 pilot initially suggested that a variety of media in teaching had encouraged students to attend classes.

Student attendance at timetabled classes was similarly monitored in 2005-6 at levels 1 and 2. As outlined earlier, there were two distinct streams BEng/MEng and BSc all of whom were supplied with course

materials via 'Blackboard' but only the former group underwent 20% of their module assessment based on online testing throughout the semester. Preliminary findings from the monitoring exercise suggest that 65% (24 of a total of 37 students) of the B. Eng/M. Eng cohort taking the Engineering Thermodynamics module attended 70% or more of the timetabled classes. The equivalent figure for the B.Sc. cohort is 42% (13 of a total of 31). Preliminary results for the Aerofluid Dynamics module are more striking with 28 of a total of 37 (76%) attending 70% or more of timetabled classes, as compared with three out of 15 (20%) for the B.Sc. cohort. These preliminary findings therefore suggest that, whilst it is not possible to positively correlate the use of 'Blackboard' assessments with face-to-face contact in any systematic way, there is little to suggest any negative influence. These very tentative findings are corroborated by data regarding 'Blackboard' access. For the level 1 B. Eng./M. Eng. cohort, 1,959 of the accesses were associated with assessments, the number of accesses excluding assessments was 2,914. Adjusting for the number of students in each stream average accesses of Blackboard for this cohort was 78.7 the equivalent figure for the B. Sc. being 39. For the level 2 B. Eng. /M. Eng cohort 1,482 of the accesses were associated with assessment, the number of accesses excluding assessment being 2,175. Again adjusting the figures for the number of students in each stream, the B. Eng. / M. Eng. students registered average accesses to 'Blackboard' of 58.8 whilst for the B. Sc. stream the equivalent was 36.3. Thus for both level 1 and level 2 students more use has been made of the support material available through 'Blackboard' for assessment purposes.

Initial student reaction to online assessment has been gauged by a questionnaire circulated to students during and at the end of the semester and by analysis of Module Evaluation Questionnaires (MEQs). The questionnaire survey for the Engineering Thermodynamics module (level 1) in 2004-5 was completed by 29 students. 93% (n=27) found the module 'very demanding' or 'demanding' but 83% (n=24) also found that the materials provided via 'Blackboard' were 'very useful' or 'useful' and 72% (n=21) agreed or strongly agreed with the statement 'In terms of the 'Blackboard' assessments staged throughout the module which account for 20% of the module mark, have you found that they have encouraged you to study this material on a regular basis?' The module evaluation questionnaires completed by 24 students have shown that 63% (n=15) would recommend the module to a friend and 10 students singled out the 'Blackboard' tests as a 'like' in the module. Again preliminary results for 2005-6 are more striking with 18 of a total of 21 (86%) students being 'satisfied', 'very satisfied' or 'extremely satisfied' with the module and 71% (n=15) willing to recommend the module to a friend. Interestingly, similar to findings from the questionnaire survey of the 2004-5 cohorts, whilst nine students recorded the 'Blackboard' tests as a 'like' in their evaluation nine also felt that the module was 'difficult'.

Module Evaluation Questionnaires for the level 2 Aerofluid Mechanics module in 2005-6, which included online assessment, have been analysed. In all 26 students completed the MEQ and 21 (81%) claimed to be 'extremely satisfied', 'very satisfied' or 'satisfied' with the module. 20 students (77%) also felt that they would recommend the module to a friend, whilst 16 students identified the 'Blackboard' tests as a 'like' in the module.

Conclusions

This work – in – progress tentatively suggests that providing learning resources via a VLE and combining them with regular in-semester assessments that are taken online, and contribute to the overall module mark may contribute towards a learning environment which encourages students to work steadily throughout the semester to achieve learning objectives. In comparison with a parallel stream for which on-line assessments were not used the cohorts with on-line assessments demonstrated an increased engagement with both the 'Blackboard' material and face-to-face timetabled sessions. The corollary of this is that the 'Blackboard' tests may have fuelled students' interest and motivation for study. Further research will explore this proposition in more depth and seek to determine the influence of in-semester online assessment on end of module student performance.

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Blackboard

<http://www.Blackboard.com>