A study on alternative strategies for sharing lecture notes using a VLE to promote in-class participation

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Abstract

The use of Virtual Learning Environments (VLEs) has become popular over the last ten years at third level institutions. At the National University of Ireland Maynooth (NUIM) the Moodle VLE is used to disseminate lecture notes, share course related resources, perform assessment, and provide a means for online communication. This paper is interested in how to effectively use a VLE to disseminate lecture notes. At NUIM lectures notes are typically posted on Moodle before a lecture (for example, all notes posted at the start of the semester or several days before an upcoming lecture etc.) or after a lecture with lecturers having a personal preference for a particular method.

In this paper a pilot study on the dissemination of lectures notes through Moodle to a large first year undergraduate class is described in this paper. In previous years student disengagement in this class has been an issue. As such two different approaches were trialed. In the first approach, a summary set of lecture notes to be covered at the next lecture were made available four days in advance. The summary was a one-page document containing at most six slides of the most important material in the lecture. The students were encouraged to read the notes in advance. It was hoped that this would lead to more active participation by the students as they had time to assimilate the material prior to the lecture. In the second approach the students were informed in advance that an in-class assessment would be carried out based on the summary. In both instances a full set of notes were made available on Moodle after the lecture. An overview of the findings of this pilot is presented, including data on student participation during both approaches. In addition, a critique of the potential effects on student results is provided and recommendations based on the findings are discussed.

Keywords

Student Engagement, Large Classes, Lectures, VLE.

1. Introduction and Motivation

Over the past five years there has been a significant rise in the number of students studying first year undergraduate computer science at the National University of Ireland Maynooth, with class sizes, averaging between 250 and 400 students per year. With large class sizes it can be hard to engage students and encourage participation. Students usually take three to four computer science modules in first year and one of these modules is CS143 Introduction to Computer Systems. At the start of this module no lecture notes were provided to the students until after the lecture had taken place (class size ~150 students). Anecdotal evidence indicated that student engagement was low using this approach and in an attempt to improve engagement a pilot study was undertaken that involved the use of a Virtual Learning Environment (VLE) to distribute lecture notes. This paper describes this pilot study. The introduction of VLEs have provided an alternative means of distributing lecture notes, however, there is no agreed optimal approach(s) on how best to do this. The Moodle VLE is used in this pilot to share lecture notes and also to monitor student usage of the material.

2. Literature Review

Over the last number of years the use of VLEs have become extremely popular. VLEs, also referred as "Learning Management Systems" or "Collaborative Learning Environments", offer a variety of useful tools including discussions, blogs, chat, assessment and assignment features (Cosgrave *et al.*, 2011). VLEs should not be seen as a replacement for traditional teaching methods but rather as an aid to enhance the student learning experience and to provide them with a centralised repository of core material and content that can be used to support traditional classroom learning.

The move towards VLEs comes with advantages for certain students within a class. Galofré suggests that VLEs can be used to help learners with special needs to engage in higher and lifelong education on equal conditions with all other students (Galofré and Minguillón, 2008). For example, having an online learning facility mixed with face-to-face experiences that can allow them, in theory, access to learning resources in

adapted forms that are delivered according to their needs and preferences is advantageous (Power *et al.*, 2010).

Considerable advances have been made in VLEs in recent years; however, there are significant challenges which need to be overcome to ensure virtual classrooms can be as good as or better than traditional learning environments (Rajaei and Aldhalaan, 2011). Power *et al.* also note that when VLEs are used, the impact of an inaccessible VLE on a student's learning experiences could be very high and thus detrimental to their learning (Power *et al.*, 2010).

However, VLEs arguably offer the teacher and student a lot more pros than cons. Not only do VLEs provide a space to share material, engage students in forums and allow for assignment submission, amongst other things, they have been shown to be beneficial when student activity is analysed. Wolff showed that analysing the use of VLEs by students can be used to predict at-risk students (Wolff *et al.,* 2013). In their study they show that predictive models for student performance have been developed and tested using historic VLE activity data combined with other data sources, for three Open University modules. This has revealed that it is possible to predict student failure by looking for changes in user's activity in the VLE, when compared against their own previous behaviour, or that of students who can be categorised as having similar learning behaviour.

Despite innovations in instructional technology (like VLEs), lecture time remains the primary method to communicate course content to students (Adib-Hajbaghery M and Aghajani M, 2011; Cashin 2010; Castello and Monereo, 2005). Some studies have found that instructor-provided notes appear to enhance student learning, while others suggest that students benefit from the act of taking detailed notes since it engages them in the learning process more than just listening (Raver and Maydosz, 2010). Proponents of this theory believe that by taking notes students deepen their understanding and relate lecture topics to current knowledge, which, in turn, may have a positive influence on their academic performance (Brazeau, 2006). The process of note taking in class may have an influence on the encoding function of the brain by requiring students to prioritise and paraphrase information. This process appears to

serve one or both of the following two functions, namely, an external storage mechanism and an encoding mechanism. When studying the material at a later date, effective students tend to review their lecture notes that have been externally stored and added to this the associations and inferences which occur to them while taking notes enhance what is stored (DiVesta and Gray, 1972).

Landrum performed a study to determine both student and lecturer perceptions of providing notes to students. Not surprisingly students felt that lecturers should provide lecture notes and that the provision of these would improve their grades in the modules. Lecturers however felt more strongly than students that providing notes to students before class would mean a lower attendance at the lectures (Landrum, 2010).

Raver and Maydosz (2010) carried out a study on the impact of providing lecture notes on student learning and more specifically on the timing of these provisions. The study was carried out in an introductory special education class of 154 students. Three methods were used in this study: (a): no lecture notes were provided to the students, (b): lecture notes were made available immediately after the lectures and, (c): lecture notes were available before the lecture. The study found that the students who did not receive any notes received statistically significant lower test scores than students who received instructor-provided lecture notes before or after lectures. The study found that the timing of these notes, whether given before or after lectures, did not have a critical influence on performance. However, other studies have expressed concerns that giving full notes before lectures might lessen input requirements from students and may encourage inattention and non-attendance (Neef *et al.,* 2006).

3. Participants and Setting
 The pilot study was carried out with students studying CS143 Introduction to Computer Systems which incorporates students from over ten different degree programmes providing considerable diversity and specialisms within the class. Student retention is a very important issue so being able to engage students in first year is considerably important for their future success in computer science.

Students with disabilities account for approximately 5% of the cohort within the module on a yearly basis. The main disabilities within the class are dyslexia, dyspraxia, dyscalculia and Asperger's. A goal of the authors is to create an even playing field for these students without giving any student an advantage over anyone else. Where necessary, a student is provided with a digital copy of the full lecture material before the lecture.

As with many first year classes in third level, attendance at the start of the semester is usually very high and decreases as the semester progresses. Attendance peeks during assessment periods and again towards the end of the semester. An issue with this module is that it spans two semesters with only one hour of lectures and one hour of labs per week for 24 weeks. This is in contrast with all other modules on the first year programme which have two-lecture hours and two-lab hours per week in a single semester. This can lead to a sense of discontinuity and disconnectedness for the students. The problem is further compounded by the timing of the lecture which occurs late each Thursday (5pm – 6pm) at the end of a very busy day. Every year students indicate that they struggle to find the energy and enthusiasm to attend this lecture. Based on these issues the authors were motivated to look at how to improve participation and attendance in an attempt to foster a better learning environment and improve student experience.

The National University of Ireland Maynooth uses Moodle as its institutional Virtual Learning Environment. Moodle provides an individual virtual space for each taught module and as such can be used to provide lecture notes or summaries of notes in real-time. Prior to this study the approach taken in this module was to make the lecture notes available after each lecture had been held, in the hope that students would engage within the lecture and take notes. The goal of the pilot was to look at alternative ways of utilising Moodle for disseminating notes and to evaluate the advantages and disadvantages of any change. An overview of the pilot is provided in the following section.

4. Implementation and Results

4.1 Pilot Overview:

Three approaches were taken in the study for distributing lecture notes, namely: (a) lecture notes made available after the lecture, (b) summary notes of the lecture were provided in advance, and (c) as with (b) but in addition the class were informed that an in-class assessment based on the notes would take place. The study focused predominantly on the changes made using (b) and (c).

The first approach undertaken was to give the students no lecture notes in advance of the lectures. The students were expected to take notes on the material presented to them and after the lecture the notes were made available to them on Moodle. During this time the authors maintained a reflective journal and captured their primary thoughts on how this was working. This included some commentary on anecdotal feedback from students. It became clear from the entries in this journal that there was a low level of student engagement at these lectures and further action was required.

The second approach was to make a summary of the lecture notes available to the students a number of days before the lecture. The notes were placed on Moodle each Monday morning, with the lecture taking place each Thursday evening. The notes comprised a one-page document of the main points that would be covered in the upcoming lecture. The students were encouraged to access, download and read these notes in advance of the lecture and to prepare questions they may have had relating to the material. The students were also encouraged to bring the notes to the lecture.

The third approach undertaken was to hold an in-class assessment at the lecture based on the material presented in the summary lecture notes. This was implemented to see if this would improve attendance and engagement.

In the latter two approaches features of Moodle were used to gather statistical data on usage and participation. Specifically, the logs provided information about the proportion of students accessing content and allowed the authors to analyse unique views of material by students.

4.2 Results:

As discussed a review of the reflective journal of the module lecturer indicated that engagement levels were low in the lectures where no material was provided until after the lectures. This low level of engagement prompted the decision to give the students access to a portion of the lecture notes in advance of the lectures using two approaches as discussed. It was subsequently observed and noted in the reflective journal that there was more interaction in the classroom and the students were asking more questions with the introduction of phases (b) and (c). Some of the students appeared to be much better prepared for class with questions prepared from reading the pre-lecture notes. We observed that when the in-class marked assessment was introduced attendance, not surprisingly, at the lectures increased.

Figure 4.1 shows the average attendance levels for this module. It can be seen that the average attendance level for phase (a), i.e. where no lecture notes were distributed before the lectures, was 52%. For phase (b), i.e. where the pre-lecture summary notes were provided it can be seen that the average attendance increased to 58%. For phase (c) (where the pre-lecture notes were provided and an in-class assessment took place) the average attendance level again increased to 63%. This increase in attendance where assessment marks were available provides further evidence that student motivation is driven by exams. Analysis of the logs on Moodle provides further justification of this theory as discussed next.
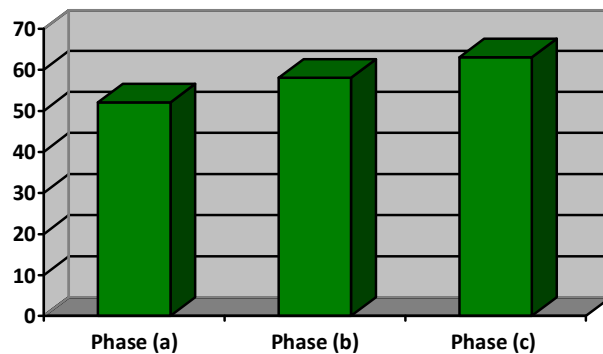

Fig 4.1: Average Percentage Attendance at stages (a), (b) and (c).

Figure 4.2 shows the number of students who viewed the pre-lecture notes before the lecture. It can be seen that the number of unique views was an average of 27% for phase (b) and 35% for phase (c).
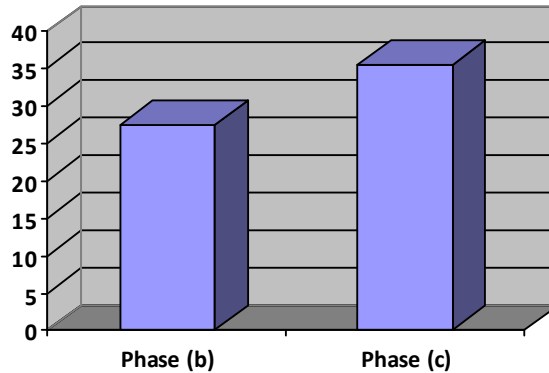

Fig 4.2: Average Percentage Unique Student Views of Lecture Notes.

To analyse the number of students who had viewed the lecture notes and subsequently attended the lectures we cross-referenced the attendance sheet taken during the lecture with the logs available from Moodle. When these numbers are analysed a considerable increase can be seen in phase (c) with 26% of students viewing the notes and attending, over phase (b) with only 13% viewing the notes and subsequently attending, as shown in Figure 4.3. This could be looked at in two ways – perhaps the students were getting used to the pre-lecture notes and liked to be informed before the lecture as to what was going to happen in the lecture, or more likely, in our opionion were preparing for the in-class assignment.
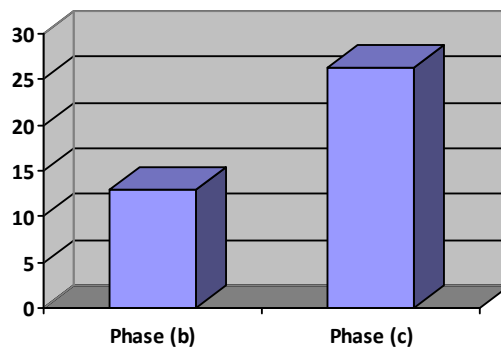

Fig 4.3: Average Percentage of overall class who viewed the pre-lectures notes and attended the corresponding lecture.

A portion of students who looked at the pre-lecture notes did not attend the corresponding lecture and the corresponding statistics are illustrated in Fig. 4.4. It can be seen that there is a substantial decrease in the percentages of students as phase (c) commenced. An average of 58% of the students who viewed the lecture notes for phase (c) did not attend the lectures in comparison to 78% of the students who viewed the lecture notes for phase (b) but did not attend. This again highlights the value students put on continuous assessment marks.
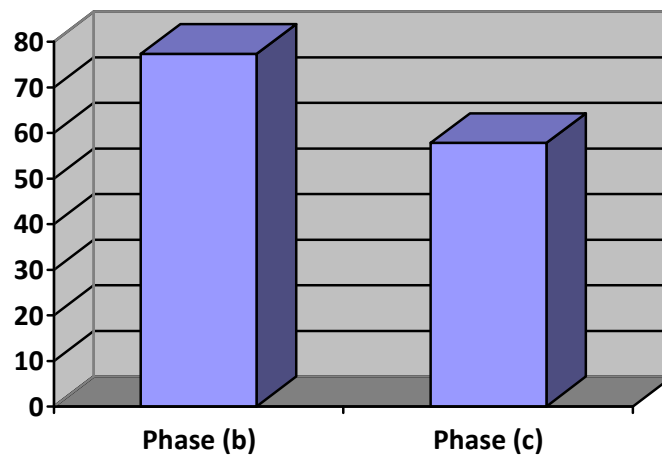

Fig 4.4: Average Percentage people who had viewed the pre-lecture notes who did not attend the corresponding lecture.

We also wanted to gauge how students who had engaged fully with this process performed on the module. The Moodle logs were analysed and it was determined that 10% of students had looked at all of the pre-lecture notes for each of the lectures where they were made available, this cohort of students are refered to the noteviewers in this section. Further analysis on how the note viewers performed in their CA component of the module was carried out. The CA component was worth 30% of the module mark with the remaining 70% going for a final written exam. It was observed that the noteviewers had passed the CA component with the exception of one student. The highest CA mark among these students was 83%, which was in fact the highest mark of any student in the module for their CA. The average mark among these students for the CA component was 61% with a median of 64%. The average mark for the CA component for the entire class was 43% with a median of 46%.

We then analysed how the note viewers performed in the end of year exam. The lowest mark obtained was 37% and in total 13% of these students failed the written exam component. The highest mark obtained by one of these students was 71%. Of these students the end of year average mark was 58% and the median was 53%. In terms of the overall class the average written exam mark was 50% and the median was 53%.

In terms of the overall module mark these students had an average of 59% with a median of 54%. This compares with the overall class average of 51% and a median of 52%. These findings are shown in Fig. 4.5.
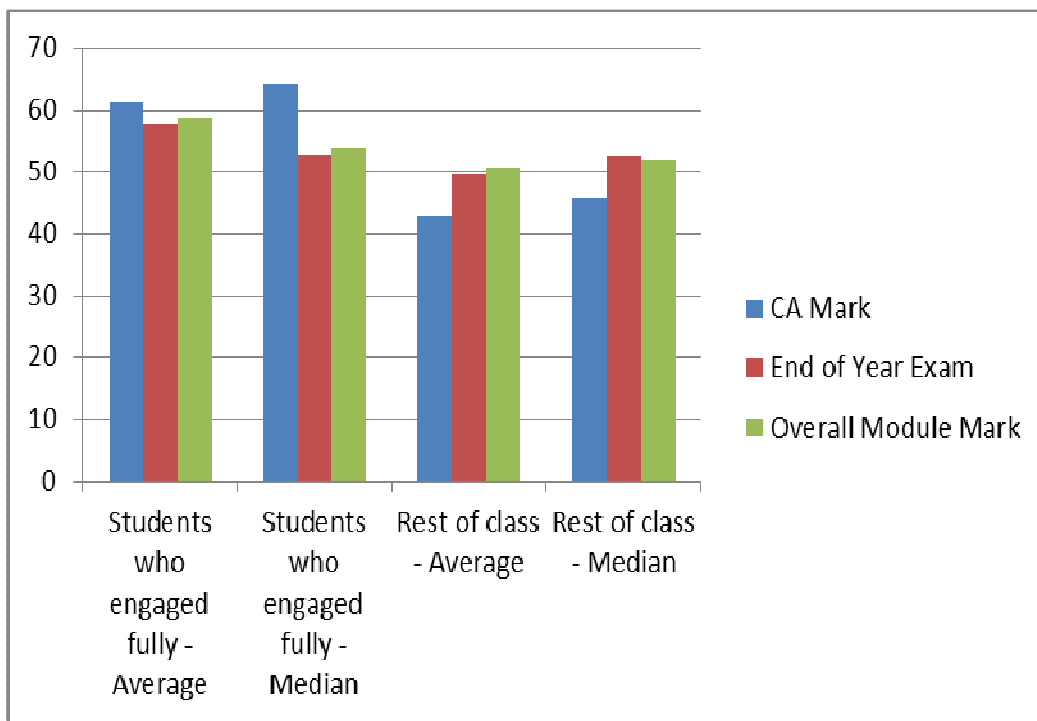

Fig 4.5: An analysis of how students who engaged fully with the pilot performed in relation to the rest of the class.

5. Conclusions

This pilot attempted to improve engagement and in-class participation in a large first year undergraduate class. The pilot looked at changing the delivery style of lecture notes. A system whereby a set of pre-lecture notes were distributed to the class prior to the lecture was incorporated. A modification was performed on this to include an in-class assessment based on these lectures notes in a later phase of the study. From analysing all of the statistics available one of the main findings is that certain students are driven by exam marks and the possibility of getting good continuous assessment marks before sitting the final exam, which is to be expected.

Engagement levels within the class improved for a portion of the class as they embraced the changes, downloaded the pre-lecture notes and prepared questions for discussion in class. In terms of student performance in the module, the students who engaged fully in the changes, by accessing all the pre-lecture notes and attending the corresponding lecture, appeared to perform well in comparison to the remainder of the class. This would suggest that it tends to be the stronger students who engage more fully in their learning process and also in any changes that are introduced. As always, there is a cohort of students who like to just sit back in lectures and try to obtain the bare minimum of material to successfully complete a module. For the remainder of the students it is felt that the introduction of these pre-lecture notes were well accepted by the students and has shown statistically to lead to students performing well in the module. It is recommended that this form of lecture note distribution appears to have a positive impact on student engagement and learning and in particular where students are aware that some reward in the way of marks is being offered.

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