Blended Learning for the Softer Side of Computing

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Abstract

Computing students tend to like '2+2=4' types of modules, where the topics are clear and logical and have a definite right answer. They like structured materials and this ties in well with their programming skills. However, most computing students will end up interacting with non-computing personnel in the workplace and this can sometimes be a challenge for them. In recent years, industry leaders have said that computing students need to improve their soft skills. They want students who are not only technically competent, but can also communicate well with others. This paper describes two different university courses that use Moodle to provide a blended learning environment for students. Course A (n=75) focuses on technical communication skills for third year computing students, while course B (n=130) focuses on digital innovation and enterprise. Both courses make extensive use of Moodle, not only for lecture notes, but also for quizzes, group wikis, questionnaires and webinars. Moodle enables the lecturer to deliver materials in a variety of ways as well as the option to receive feedback from students throughout the semester. This is especially important as many of the students are outside their comfort zone in these modules. This paper notes some of the problems that can occur and provides suggestions for future improvements.

Keywords: soft skills, blended learning, problem based learning, Moodle

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Introduction

Computing students favor the 'hard' subjects. These include subjects such as computer programming, logic, databases software engineering and technology related subjects. They prefer subjects where there are clear answers and a systematic approach can be adopted. On the other hand, computing students tend not to like the 'softer' subject, where softer skills are required. These skills include writing, presentation skills, project management, group work and general communications skills. These softer skills can sometimes be more challenging for computing students, as they can be harder to define, and initially at least, seem less logical and straightforward. However, computing students need soft skills. Unless they are working exclusively with other computing specialists, they will need to interact with non-computing people. They will need to be able to understand clients and end-users and communicate with them in an accessible manner. They will need to improve their writing skills and learn how to write in a professional manner. They need to learn presentation skills, as they may be required to give presentations to both technical colleagues and non-technical clients. They must understand project management concepts, both for general projects and software projects. Group work is a key feature in the software industry and it is a skill sought by employers, so it is important for computing students to work in groups.

While it may be easier from a delivery point of view to simply give lectures on the soft skills, it is not an effective means of educating students. They need to learn the skills by actually doing and producing work.

Approach

There are three main pedagogical features in use in the two courses described in this paper. An active learning approach (Bonwell and Eison, 1991) means that the students are not just told what to do, they have to go and do the activity. Co-operative learning is another pedagogical feature of the soft skills courses. Co-operative learning means that the students learn and work together in groups. It can be intellectually demanding yet creative, open-ended and involve higher order thinking tasks (Ross and Smyth, 1995).

A Project Based Learning (PBL) approach (Blumenfeld et al., 1991) is adopted in these soft-skills courses. The students learn through engagement in a real-world problem, where they are expected to develop and use thinking strategies and apply and enhance their domain knowledge. PBL is not a new concept, but is has become increasing popular in recent years. With a traditional learning approach, students are told what they need to know, they memorise it and problems are often simplified to show how to solve them. With PBL, students may be assigned a problem or choose a suitable one. They then have to identify what they need to know in order to deal with the problem. They have to go and find out the information and learn and apply new skills and knowledge to solve the problem.

The goals of PBL include developing flexible knowledge, foster effective problem solving skills and effective collaboration. It also aims to encourage self-directed learning and intrinsic motivation. These are important skills for 21st century learners, and while not all of them will be developed with a given PBL scenario, it is good pedagogical practice to design courses with these goals in mind. In the context of this paper, striving for flexible knowledge is important for computing students. They will need to have adaptive expertise as the skills and knowledge they will require in the future are constantly changing. They cannot expect to learn everything they need to know during their time at university. Obviously, problem solving is a key skill for computing students, as it is a core component of their work. They will need to work and liaise with people of different computing abilities and therefore they will need to be comfortable working collaboratively. While self-directed learning and intrinsic motivation are desirable, given the confines of the course structure, they are somewhat aspirational goals for the majority of the students.

A blended learning approach (Garrison and Kanuka, 2004) was used for the two courses. There was a combination of face-to-face lectures, and the use of a Virtual Learning Environment (VLE). The lectures were given by the module co-ordinator, along with guest speakers from research centres. The students on course A were provided with hands-on online research skills training and told that websites were not the only source of knowledge. They were told the importance of searching for academic resources and were shown how to use the online academic resources of the library. Students were required to give 2 presentations. These presentations were recorded and sent to students individually. Email was the main out-of-class communications mechanism. Individual student queries were replied and sent to the entire class where appropriate.

Moodle (Moodle, 2015) was used as the VLE on both courses. It was used to disseminate lecture notes, run quizzes and questionnaires and provide links to relevant/interesting material. It was also used for group wikis, assignment submission and webinars. Assignment rubrics and associated feedback were also available on Moodle

Overview of Course A

Course A was a technical communications skills and project management course for 3rd year computing students. The students had to give two oral presentations, one on a non-technical subject and the other on a technical topic, but with a non-technical audience in mind. They had an individual and group writing component. The students learnt about project analysis and the alphabet soup of acronyms associated with it (e.g. SWOT SWOC, PEST, STEEPLE) and project management. They covered professional ethics from legal and moral viewpoints. The course is designed as a 12-week course, delivered in three weeks so it is very intensive. The students take the course just before going to work on a 6-month industry placement. The course materials include information on presentation, writing, research and group skills. They also learn about screen casting and project management tools.

As part of the course assessment, the students in groups have to assume the role of a software consultancy company. They have to research a 'technology in society' topic. Sample topics include "Improving IT in the Irish Health Service", "The role of technology in Irish sport" and "Technology in Irish schools: future changes in the classroom". The groups have to prepare a short screencast, providing an executive overview of the report's findings. They have to give a group presentation to the whole class as well as writing a professional standard final report. The groups are mainly self-selecting and the students are expected to make their contributions to the group's work visible via the group wiki. All outputs (apart from those to the group wiki) must be technically correct and intelligible to a non-technical audience.

Students were provided with rubrics for each of the assessed components. A rubric is a coherent group of criteria used to access students' work (Brookhart, 2013). A rubric generally includes descriptions of levels of performance quality on the criteria. The purpose of rubrics is to show students what is required for each assignment and enable the lecturer to focus on learning and not teaching. Rubrics help to co-ordinate instruction and assessment (Andrade, 2000). They provide students with clear information of what is expected of them and make the marking process transparent to them. For example, the rubrics for the writing components assessed students on the quality of the content, organisation and language of the report. Levels of achievement ranged from poor to professional and for each achievement level, students were provided with a text description of what standard would be expected for that level.

Overview of Course B

Course B was a course on Digital Innovation Management and Enterprise (DIME). It was delivered to 1st year computing students. It was the first soft skills course for this cohort of students and some of them would have preferred a more 'technical' course. The students attended seminars with speakers from technical research centres, as well as talks on digital marketing, e-commerce, tech start-ups and associated technical, legal and ethical issues. They also had some lectures on writing, general research skills, group skills and project management. Moodle quizzes were used to check their knowledge of the research areas. Students had to write an individual (reflective) blog after each seminar/lecture. Each group had to come up with an idea for a website or a mobile app as part of the PBL component of the course. App ideas included a sensor for a cow's neck, a smart dog/cat flap for a door and an interactive food allergy website. They had to produce a poster, a group website and write a group report. They also had to learn a new programming language (javascript) to add an interactive component to their website. They had to learn this without lecturer support or direct instruction. App ideas included a sensor for a cow's neck, a smart dog/cat flap and an interactive food allergy website.

Discussion

There were several components of the courses that were successful. Although blended, the face-to-face aspect was important, especially to clear up any confusion

about course assessments. It was good to have a hands-on session with the library's online resources, including academic journals and ebooks. The process of recording each individual student's presentation and sending them the video file was a little tricky, but it was good for the students to watch themselves and see what areas could be improved. They were provided with immediate feedback after their presentation, but the ability to view their video file gave them more time to reflect on it. The strategy of answering questions to the whole class cut down on repeat query emails.

The VLE was essential to both courses – it would not have been possible to run and administer the courses otherwise. The students expect the lecture notes to be available online. The online quizzes were good for low-stakes assessment. They were marked automatically and feedback to the students was immediate. The importance of immediate, individual feedback has been extensively reported in the literature, but without a VLE (or some other technical support), it would have been difficult, if not impossible, to provide.

Apart from providing students with a facility to share materials and ideas, the group wiki provided a means of checking student participation in the group activities. Some courses carry out a module review at the end of the module. However, if there are problems with the module and the lecturer is only made aware of them after the module has finished, it is too late to fix them. For this reason, a module review is carried out in week 6 (of Course B). It is anonymous and students are encouraged to provide honest feedback and can raise any problems or issues with the module.

Moodle provides a facility to host webinars and this is useful for students as their future work environments may involve working with developers in different continents via online communications tools and webinars. Also, some students enjoy different format and the different mode of interaction. The Moodle link facility worked well for providing supplementary materials toe the students. The online assignment submission was more efficient, convenient and environmentally-friendly than paper-based submission. It was essential for the screencast submissions. Also, the use of online submissions makes the tasks of plagiarism detection easier (via TurnItin). The assessment rubrics were clear and the grading feature of Moodle meant that marks and feedback could be provided to the students more quickly than before.

While there were many things that worked, there were also some components that did not work. As part of the process of improving the modules, it is important to reflect on what areas can be improved. Due to the fact that different speakers delivered the lectures and seminars, it meant that the style of each lecture was different and there were some different assumptions made as to the prior knowledge of the students. In future, the lecturer should make sure that each guest speaker is aware of the students' level of knowledge on each topic.

Although the students are probably classified as digital natives, they did not really use their online skills as much as the lecturer intended. Their participation in the

group wiki was limited and most read far more often than they posted. Training users in how to use a system is important to ensure that they actually do use the system (Hubbard, 2004) and perhaps more training is required for this component. While the video recordings of the presentations are helpful from a pedagogical point of view, the process of recording and sending each student presentation is only semi-automatic and still requires a manual review component. It is important to make sure that each student only gets his or her presentation video. Students can sometimes expect an almost immediate response to emails, but sometimes there is a time-lag when replying to emails – this can be an issue, especially around assessment deadlines.

The VLE was an essential tool for the courses. However, there is room for improvement. Sometimes there was a delay in putting the lecture notes online. This arose when the guest lecturer delayed sending the notes to the module lecturer. This was problematic for the students, as they would have liked to have access to the notes as soon as possible after each talk, in order to write their blog. Also, the notes served as a record of the talk and the students could review them to see if there were any interesting ideas for their group project.

From a student point of view, the quizzes were fine, but from a lecturer point of view there was a lot of effort involved. It is challenging to design good questions with suitable distractors. The area of question design is interesting and complex and there are many factors to be taken into consideration. For example, it is important that the correct answer and the distractors have more or less the same number of words. If there is a discrepancy between answers, some students will automatically pick the one with the largest number of words. As a matter of course, the answers should be shown in random order – otherwise, there might be a tendency to place the correct answer in the same order each time. Also, care needs to be taken with "All of the above" or "None of the above" type answers. Research has shown that males are more likely to select these as the correct answer. Therefore, while setting questions and answers, it is important to be aware of the literature in the area to ensure that quizzes are well-designed.

The module questionnaire can provide useful information to the lecturer. However, sometimes the response rate could be better. The number of students that respond to the questionnaires is linked to when they are asked to answer it. If the students are in the lab for a lab-based activity, it is convenient for them to fill it out either at the start or the end of the lab. However, if the students are asked to fill out the questionnaire "in their own time" the response rate will be much lower. One short-term trend identified in the Horizon Report on Education (Johnson et al., 2014) is that of Bring Your Own Device (BYOD). In this case, a period of time could be set aside before, during or after a lecture for students to answer the questionnaire.

The webinar was interesting for the students. However, from a lecturer's point of view, they require more preparation and are more challenging for the lecturer. It is harder to gauge students' level of engagement due to the lack of face-to-face contact. Also there is a need to keep talking during the webinar and to encourage interaction. If students 'hear' silence during a webinar, they may incorrectly assume

that there is a problem with the internet connection and this may cause confusion. While a lecturer may want to see a lot of student participation during a webinar, it is important to be aware of passive participants and not to assume that they are not benefiting from the webinar just because they are not visibly participating. As expected, there were no major problems with the links, but obviously, they should be checked to make sure they are valid.

Moodle assignments can have submission deadlines and occasionally there may be issues with late submissions. The Moodle rubrics and grading facilities are very useful for providing feedback. However, there is a trade-off between the granularity of feedback and providing it in a speedy manner. For example, if a course-grained approach is adopted, the lecturer can provide feedback quickly, however, this feedback may fail to capture differences between students. It is difficult to achieve a balance between quick feedback and informative feedback. One final observation, is that one occasion, there were some problems with file submission formats, especially for the screencasts and the presentations. These problems could be addressed by providing students with better specifications for the assignments.

Module Feedback

Student Feedback

It is important to hear the student feedback on modules. Sometimes the feedback confirms things the lecturer may have already expected and sometimes there are surprises. Students on Course A reported that the presentations and writing skills were very useful. On the other hand, some of them did not find the writing skills useful as they thought they were not necessary for them. However, this does not seem to be the case in reality. For example, one student said "First few Lecturers on grammar, punctuation etc for me werent necessary for me".

Students on Course B reported that they liked the research information and the different delivery and assessment approaches. When asked what they liked, student comments include "You get to see the lecture slides after and research further if interested", "Get to explore areas of IT other than core programming" and "Flexibility of module as a whole". However, some students would have liked to see the module lecturer more often (probably more administration reasons) ("I dislike how infrequently we get to see our lecturer"). They disliked having to learn something new without lecturer support and guidance. For example, one student reported that s/he disliked being ".. left to figure out things by ourself", while another student commented "Don't expect students to self learn javascript".

Lecturer Feedback

While overall both modules were successful and the students attained the learning outcomes, it is important to reflect on areas for future improvement. Sometimes it was hard to motivate students. In some cases, they think the already know and have

mastered a particular skill. As the grammatically incorrect comment from one student shows ("First few Lecturers on grammar, punctuation etc for me werent necessary for me"), this is not always the case. Also, there was some confusion about what was expected in the screencast. Students said they knew how to do a screencast, but it transpired that they knew how to record a screencast, but were unaware of how to design and delivery a good screencast. Another issue is that sometimes students felt that a particular skill was not relevant to them, and it was hard to motivate them to learn it in this situation. In many cases, the module assignments deadlines for these courses clashed with assignment deadlines on other courses and students occasionally took a pragmatic decision as to which assignment merited their attention. As both courses were 100% continuous assessment, with no written end of module exam, there were quite a few pieces of assessment in each course. Clashing assignment deadlines was particularly acute near the end of semester.

Using rubrics helps to make the marking process more transparent and helps to standardise the marking process. The students can see what is expected of them, and with large class sizes it facilitates marking by several assessors. There are many rubrics available and the ones used in these courses have evolved over several years. However, a rubric is never perfect and each year, it is important to review the rubrics and make changes as necessary.

Both these courses are based on practical skills. However, there is a need to make the courses even more practical than they are now. There is a need to have more workshops rather than just lectures on some of the module components. For these skills, students learn by doing, rather than by just listening. Although workshops involve more pre-planning on the lecturer's part, they are beneficial for the learners and are particularly useful for practical skills.

One final lecturer observation is that the increasing numbers of students taking the courses means that it makes the assessment process more challenging. There are logistical issues to be handled, especially in Course A, which is particularly intensive. For example, given the window of time available for the assessment of the presentations, it is almost logistically impossible for one person to assess all the presentations. Future iterations of the course will need the help of other assessors to be able to run smoothly.

Suggestions for Improvement

It is important to listen to the student voice in education. Lecturers are not 'all seeing, all knowing' and can learn from students. Students were asked for their suggestions for improvements to the course and they came up with several suggestions. In Course A, it was surprising to see that they wanted more presentations. Most students do not enjoy doing the presentations, while some of them actually dread them. However, they realise the benefit of giving presentations and would like the opportunity to do more. They would like to do more practical work in class and this makes sense for some of the practical skills involved in the

course. Their other suggestions were mainly administrative, including having more information no assignment deliverables and improvements to the timetable.

Based on experience and the student feedback, the lecturer would also like to see improvements in the modules. There is a need to make some course elements, particularly the writing component, more practical and this will be addressed in the next iteration of the courses. Given the increasing student numbers, it is necessary to have additional assistance on the courses, especially for marking assessments. This is especially important for the presentations in order to be able to fit all students into the limited window available for these assessments. There is also room to improve blending on the courses. For example, when assessing the student presentations, instead of writing the students' marks on paper and manually transferring them online, it makes more sense to enter the marks into the VLE in real-time. Another potentially useful avenue for investigation is the use of computational linguistics tools to help analyse the students' writing. This could be informative for both the students and the lecturer. Gamification and learning analytics are two of the emerging buzz words in the field of education. It would be interesting to introduce 'gameful' aspects to the courses. Badges might be a gameful approach that might help in terms of student motivation. Learning analytics could provide insights into how the students are actually using the VLE and provide near real-time analysis to the lecturer on students' progress.

Conclusion

Soft skills are important for computing students. The following observations can be made when reflecting on the two courses described in this paper. A blended learning approach is required for both courses. In the past, there were student complaints that Course A was "*boring*". While it may not be the most exciting course for the students, it is now at least less boring, as few students mention this. Using a VLE facilitates working with large numbers. While the number of students on these courses is relatively small, as Massively Open Online Courses (MOOCs) become more popular, it will be interesting to learn from the experience of others when dealing with larg(ish) classes. The multi-faceted, multi-modal approach used on both courses was suitable and will be continued. One thing to note is that the courses are not frozen in stone. They are constantly evolving and hopefully, constantly improving. Features such as BYOD (Bring Your Own Device) and real-time in-class quizzes can help improve the course. The flipped classroom approach might work with Course A (the third year cohort), but may be less suitable for the first year cohort of Course B. There is a lot of emerging research in the area of learning analytics, but some thought will be required to figure out how this can be applied to both courses.

The key thing to remember is to use technology to aid the teaching and learning process. It should not be the driver, only the facilitator. The pedagogy come first and the technology second. It is important to learn from others. Finally, remember that no one size fits all, and what works in one context may not work in another. However, it is beneficial to be aware of what others have tried and to see if it would work in your context – only you can be the judge of that.

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