Ollscoil Mhá Nuad
Maynooth University

Maynooth University
National University of Ireland Maynooth

Teaching Fellowships 2019

Pictured from left to right: Dr Alison Hood (Dean of Teaching and Learning), Aodhdín Casey (Department of Economics, Finance and Accounting), Professor Aidan Mulkeen (Vice-President Academic, Registrar and Deputy President), Lisa O Regan (Centre for Teaching and Learning), Professor Donal O Neill (Department of Economics, Finance and Accounting), Professor Philip Nolan (President), Dr Fabrice Rousseau (Department of Economics, Finance and Accounting), Dr Alison Fitzgerald (History Department), Dr Kevin Casey (Department of Computer Science), Dr John Keating (Department of Computer Science), Dr Rebecca Maguire (Department of Psychology), Dr Bridget McNally (Department of Economics, Finance and Accounting). Missing from photograph is Dr Ann O Shea (Department of Mathematics and Statistics)

Foreword

The Maynooth University Strategic Plan 2018–22 highlights that Maynooth University 'has always pursued a strategy of balanced excellence by equally valuing teaching and research and recognising the synergies between them, so that engagement in world-class research and scholarship is accompanied by a similar dedication to teaching and student success, and these are seen as mutually supportive activities' (2018: 6). This belief underpins the Teaching and Learning Fellowships 2019 which were designed to be a key part of Maynooth University's ongoing commitment to developing teaching and enhancing the student learning experience.

In 2019 six Fellowships were awarded to colleagues across the three Faculties. This report communicates the work of those Fellows. It outlines the steps taken by the Fellows in completion of their projects, records their findings, captures their reflections and shares their recommendations. In addition, it recognises the Fellows' commitment to the enhancement of the Maynooth University student experience, their engagement in practice-based research into teaching and learning and their contribution to the University in promoting and raising the profile of innovative practices in learning and teaching. In gathering together the accounts of this work in this publication we are acknowledging the Fellows' exceptional efforts to motivate and inspire students to learn. Their fulfilment of the Fellowships, and their record of that work in this report, represents a distinctive and important contribution to the University as a Learning Community.

We strongly encourage you to read the report and to follow up with the Fellows should you wish to learn more about any of the initiatives. Similarly, if you would like to learn about the Maynooth University Fellowship Scheme or other teaching and learning enhancement work please do not hesitate to contact the Centre for Teaching and Learning at **teachingandlearning@mu.ie**

Finally, we wish to thank the Fellows for their wholehearted commitment to their projects and we commend them on their achievements.

Centre for Teaching and Learning
April 2020

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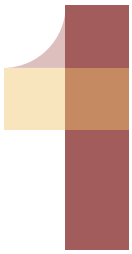

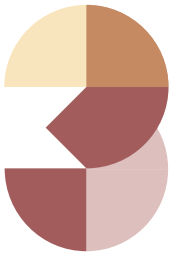

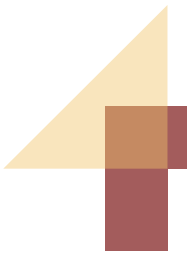

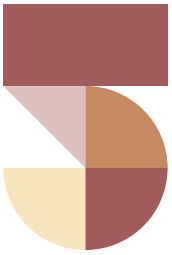

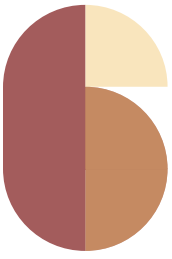

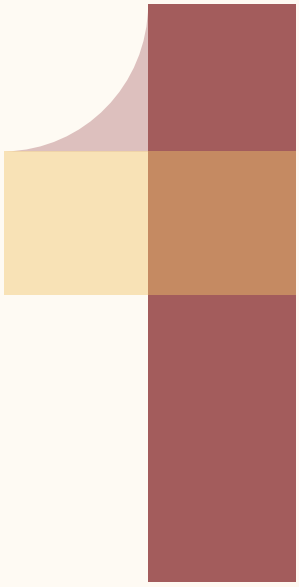

Remote Supports and Instrumented Peer Learning for Programming Students.

Title

Remote Supports and Instrumented Peer Learning for Programming Students.

Fellow

Dr Kevin Casey

Department

Computer Science

Abstract

The aim of this fellowship project was to extend the popular 1st year learning platform for programming Maynooth University Learning Environment (MULE) with the following features:

- Enhanced student support within MULE – this encompasses student-student communication and student-trainer communication.
- Facilitating instrumented peer learning – extending the communication to provide shared creation and editing of resources and to track activity.

The two features are related to communication, the former emphasising giving additional support to students, the latter seeks to support, and measure in a more rigorous way, the peer learning process within MULE.

Overview

We have two main aims:

- **Increased student engagement with support services.** The Computer Science Department runs a Programming Support Centre (PSC) for a number of undergraduate programming modules. We have historical statistics for student engagement with this drop-in service. We will facilitate increased student engagement with the service as a result of the ease at which students can avail of assistance within the online system (instead of physically going to the PSC, students can request help remotely).

- **Facilitating and instrumenting peer learning.** While peer learning is an established part of the Computer Science curriculum (for example it is being used in CS162), there is no underlying system to support or instrument it.

The proposed extensions to MULE will build peer-learning support into the system allowing students to collaborate on exercises and, importantly, with the addition of instrumentation, measure who does what within a collaboration.

The instrumentation of peer learning will also yield data which will be valuable from pedagogical research standpoint, in particular assessment strategies for instrumented peer learning. The generation of this data is considered to be a key outcome.

Literature

This proposal is informed by a significant body of work extolling the virtues of peer learning in the context of computer science education (Leyk et al., 2017). While peer learning has been used before at MU, we are not aware of any instrumented approaches, where collaboration has been actively measured at a fine-grained level. Thus, peer learning research informs our approach, but the data generated from our work will lead to novel work in the same area, for example the gamification of online peer learning and support.

There is also a body of work highlighting the necessity of timely feedback in assessment (Irons, 2018) (which MULE provides in terms of automatic and instant feedback) and timely intervention in the case of students encountering difficulties (Stephenson et al., 2018) (which MULE does not yet facilitate).

Once MULE provides for this type of intervention through this project, the data gathered by the system can answer questions about how important intervention is and how it affects student behaviour subsequently.

The research team overseeing the proposed project already has ethical clearance to cover the collection of data via MULE and subsequent pedagogical research (SRESC-2018-068).

Project Outline

Summer 2019 - Prototyping of additional communication features for MULE (funded portion)

Autumn 2019 - Conversion to production code (preparatory work for Semester 2)

Spring 2020 - Phased roll-out to students over Semester 2 (2019/2020)

Summer 2020 - Initial publication of findings.

Findings

The key finding to date has been the enthusiasm users have for the MULE system. We knew the system was being used, but had not fully appreciated the buy-in from users.

Further findings are pending as the phased roll-out of the updates commence in Spring 2020. Hence, data will become available over the forthcoming semester. There is already strong enthusiasm from the staff (lectures, tutors, demonstrators) involved in the first module (CS162) who will be using the new extensions to MULE in order to provide peer learning opportunities to their students.

Key Reflections

For this project, it was necessary to consult with various stakeholders (lecturers, demonstrators, and students). These confirmed the necessity for the peer learning support in MULE.

Recommendations

New learning technology projects like MULE are similar to start-up consumer products in that they have a finite amount of goodwill from users that must be grown carefully. MULE already has significant goodwill from students, demonstrators, and lecturers (admittedly mostly anecdotal) which has grown over time and we are protecting this by phasing in the new features supported by this grant.

As per other technological projects, there have been formidable obstacles, some unforeseen. For instance, we initially wanted to roll out MULE to International Engineering College (IEC) Fuzhou, where it could be an ideal tool to help align teaching at MU and IEC, however there are IEC-specific issues that require further support within MULE. We are currently adding that support with a target of introducing MULE at IEC for the 2020/21 academic year.

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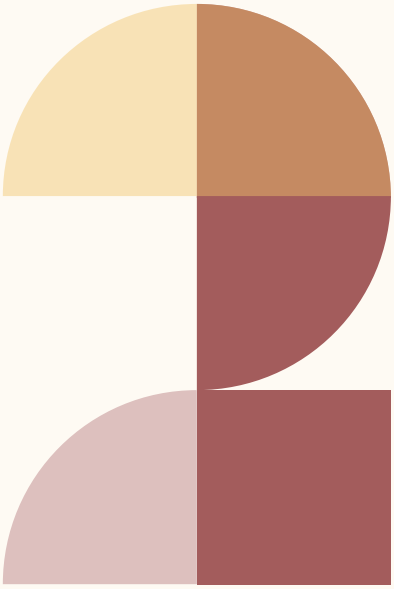
Find Out More: To find out more about this fellowship project, please contact Project Lead Dr Kevin Casey, **kevin.casey@mu.ie** (suggested subject line: MULE CTL Fellowship 2019).



Picturing the Past: Supporting Student Engagement with Technology-Enabled Feedback.

Title
Picturing the Past: Supporting Student Engagement with Technology-Enabled Feedback.

Fellow
Dr Alison FitzGerald

Department
History

Abstract

This project investigated how *Turning-Point* software could be used to facilitate the development of key analytical skills among First Year History students, by accommodating real-time dialogic feedback in large-lecture environments. It involved researching, developing and applying strategies for engaging First-Year (Single Major) students in cultivating skills of critical analysis essential to the discipline of history. The art historian Stephen Bann has asserted that 'art brings us face to face with the past', yet for history students this category of evidence is often greatly underexploited, relative to textual sources. The project involved using *Turning Point* as a pedagogical tool to support student engagement with the potential of paintings, sculptures and other forms of visual material as historical evidence.

Overview

The fundamental aim of the project was to foster student engagement, specifically in terms of the development of key discipline-specific critical skills. It arose from a context where students taking the module *The Practice of History*, were part of a large cohort for which supporting tutorials (whilst ideal) were not a possibility. The classes also centred on the analysis of visual material as primary sources; since the class size and timetabling did not readily allow for site visits to museums and galleries, *Turning Point* offered the potential to incorporate carefully-designed opportunities for interactive engagement/experiential learning in a lecture-hall setting. As Lewis and Williams (1994:3) highlight, 'Experiential education first immerses learners in an experience and then encourages reflection about the experience to develop new skills, new attitudes, or new ways of thinking'. The potential for the use of *Turning Point* in this context was identified as a result of being introduced to the software through a staff development workshop, facilitated by the Centre for Teaching & Learning in October 2018.

Project Outline

August-September 2019 - Conducted research into technology-enabled feedback, to facilitate in particular the formation of effective course design for optimum teacher and peer dialogue using *Turning Point*.

September-December 2019 - Designed and delivered classes for HY132 The Practice of History employing the findings from the project research and incorporating the use of *Turning-Point* software. Liaised with Lisa O'Regan (MU, CTL) at regular intervals to troubleshoot in regard to software queries/ issues as they arose.

November 2019 - Conducted focus group with students to review the impact of the project and implemented key feedback.

December 2019 - Detailed anonymised survey of student response to the module.

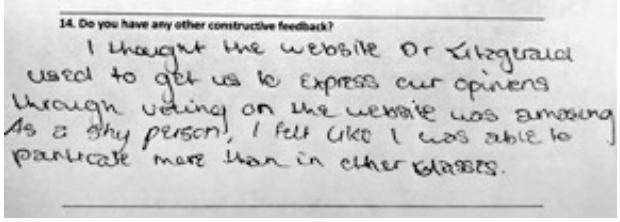
Findings

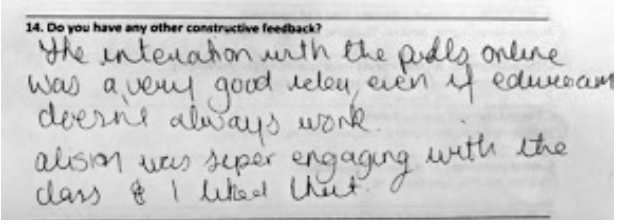
A trial class conducted in the immediate aftermath of the CTL training (2018) indicated a positive endorsement by students of the potential of this interactive polling software on their learning; 98% of students agreed that they would be interested in using the *Turning Point* software in the module again. A more detailed student evaluation conducted at the end of the current project (in conjunction with feedback from a student focus group and peer observation) confirmed that students were receptive to this pedagogical tool and indicated that the active and experiential learning opportunities it facilitated were worthwhile (See Fig. 1 to the right).

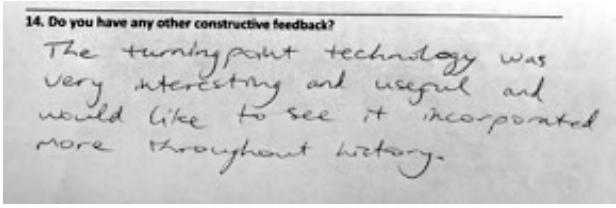
As highlighted in the peer observation report provided by Margaret Keane (MU, CTL), while the students were 'continuously engaged throughout' the class attended, the use of *Turning Point* was an effective tool to encourage students to 'think critically about the information [the lecturer] had just conveyed', or 'to pre-empt the learning', both of which contributed to a deeper understanding of the value of particular types of historical evidence.

As Keane's report identified 'The careful planning of both the presentation of slides, sequence, choice of images and intermittent use of *Turning Point*, allowed the presentation to flow perfectly. The software was almost unnoticed allowing the focus to be on the learning'. Nevertheless, there were also challenges to implementing this initiative. The most significant was the design of question templates currently offered by the service provider. The majority favoured very short answers, which are not always conducive to the needs of Humanities disciplines. Incorporating longer answers involved closing out of the main PowerPoint to access feedback reports, which might work well in a seminar environment, but which was not always ideal in a large-lecture environment; issues with broadband connectivity also caused intermittent challenges.

Figure 1: Sample student feedback from students in HY131 (2019)




14. Do you have any other constructive feedback?
The interaction with the pods online was a very good idea, even if eduroam doesn't always work.
Alison was super engaging with the class & I liked that.


14. Do you have any other constructive feedback?
The turningpoint technology was very interesting and useful and would like to see it incorporated more throughout history.

Key Reflections

Overall, this was a positive, two-way learning experience. While the students were positive about the software, it also provided the lecturer with the opportunity to reflect on teaching methodologies, work more closely with a student focus group, and benefit from the excellent support provided by colleagues from CTL, which was an immensely rewarding experience. Participation in the fellowship scheme overall also highlighted the extent to which optimising student engagement is a critical, cross-disciplinary concern in the sector and the value of blended learning in this context.

Recommendations

It would be worth extending the trial period/ accommodating wider implementation of this software across the University, subject to budgetary considerations. It offers clear potential for disciplines which use statistical analysis as a central element of teaching, though considerable investment of time is required in terms of slide design etc. to ensure that slides build incrementally deeper levels of understanding. There is also good scope to link student feedback to continuous assessment in the form of digital learning journals.

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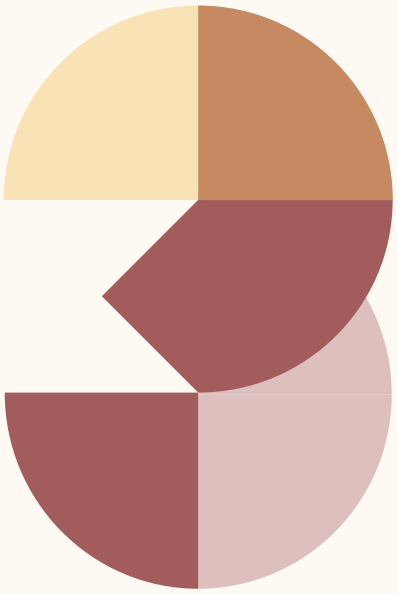
Find Out More: To find out more about this fellowship project, please contact Project Lead, Dr Alison FitzGerald, **alison.fitzgerald@mu.ie**



Development and Evaluation of a Transformative Blended Learning Pedagogy Utilising Collaborative Annotation Software Tools.

Title

Development and Evaluation of a Transformative Blended Learning Pedagogy Utilising Collaborative Annotation Software Tools.

Fellow

Dr John G. Keating

Department

Department of Computer Science

Abstract

The aim of this fellowship project was to deliver a software system that realises a method for implementing and managing collaborative annotation within a custom developed blended learning Virtual Learning Environment (VLE). The project also supported the investigation, and critical evaluation, of all-faculty pedagogical strategies utilising collaborative annotation within blended learning contexts.

Overview

Collaborative Annotation (CA) is a method whereby students may annotate, using textual descriptions, digital objects such as documents, program code or images, uploaded to the VLE by teachers (lectures, tutors, etc.). Pedagogically, CA is an interesting procedure, as it allows collaborative engagement, via online discourse, with primary source material, prior to writing essays.

CA promotes joint productive activity (staff-student and peer) and facilitates stronger argument construction prior to formal writing. In-place annotations are more likely to elicit further annotation, and are preferable, for example, to Moodle discussions which are separate from the digital object of interest. CA is ideal for use in lectures or flipped-classroom scenarios and may be used in both formative and summative assessment contexts. Using the software developed during this fellowship project, teachers can control when annotation occurs, and may limit annotation views to small (tutorial) groups or implement whole-class annotation. The software includes commenting and endorsement facilities that allow deeper engagement with annotations and the original objects, facilitating improved argumentation with, or even correction by, other students.

Literature

Underpinning the practice of Collaborative Annotation (CA), is the process of collaborative learning which has been defined by Gokhale (1995), as “the process whereby individuals work in groups towards a common academic goal” [1]. Collaborative learning has many benefits for students which Laal and Ghodsi (2012) divide into four categories: academic, assessment, psychological and social benefits [2]. Gokhale also demonstrated that students who participated in collaborative learning became better critical thinkers. Johnson and Johnson [3] claimed that students who study in collaborative groups retain information longer than those who study individually. Collaborative learning also allows larger class sizes to become more personalised resulting in increased individual student participation, and also provides opportunities for alternative forms of assessment [4]. Furthermore, working in online collaborative workgroups can reduce classroom anxiety and improve the relationship between students and teachers [5]. Collaborative learning also leads to social interdependence [6] which in turn, when positive, can lead to the development of a social system for learners and strengthen communication skills. More recently, Mader and Bry (2020) report on an implementation of a CA environment that supports collaborative peer review, coupled with an analysis of the associated collaborative discourse for three sample instances. They also provide timely insights into the effectiveness of CA in authentic implementations, and report on potential problems associated with CA systems [7].

Project Outline

Several platforms implementing Collaborative Annotation (CA) with similar goals exist, including AnnotateIt [8] and Hypothesis [9]. However, these platforms store annotation data offsite which introduces privacy concerns. Hypothesis depends on the installation of a Google Chrome extension, which limits its portability across devices. More comprehensive systems include OpenEdx [10] and Lacuna [11] require the software be installed on a server separate to any existing virtual learning environment. As existing offerings all had limitations, this project focused on bespoke development of a system realising CA strategies associated with a range of teaching, learning and assessment requirements. The first stage of the project was to model the use of CA for a variety of learning and assessment scenarios, for example, using CA as a form of assessment “for”, “of”, and “as” learning.

The ultimate aim of this project is to develop a system that utilises the student course and student databases provided by Moodle via the Learning Tools Interoperability (LTI) interface. Thus, any authenticated annotation activities would be achieved via Moodle, and would integrate the CA activities within modules. The second stage of this project, therefore, centred on design, specifically, the design of all aspects of user, data and activity models associated with the development of the CA environment that would fulfil the learning scenarios identified in the first stage of the project. This stage also identified key software tests for both functionality and user experience.

The third stage focussed on development, software and usability testing of a usable prototype which resulted in a version of the CA system that is ready for use in an authentic learning and assessment context.

The next stage of this ongoing project will focus on conducting heuristic evaluations, cognitive walkthroughs, usability and user experience testing with selected test groups using CA in three assessment scenarios. It is expected that during Summer 2020 a second prototype, that integrates with Moodle, will be developed and tested.

Findings

Much of the research on the project thus far has focussed on the development of the online software to support Collaborative Annotation (CA). The fellowship provided the key resources required to engage a team of student software developers and testers who analysed CA for three CA-based assessment contexts. The core team included one MSc (Dependable Systems) student, one Final Year (CSSE student), one Second Year (CSSE) student and one Third-Science student (Astrophysics). The team used annotation extensively throughout the design and testing phases and provided valuable insights into how CA could be used in learning and assessment. All personal learning, recommendations and findings were self-documented by the team as the project progressed. One of the team members reported that they used CA software extensively for their personal learning as they progressed in their studies, and this is as a direct result of the project.

Feedback on using CA in authentic learning (Computer Science and Software Engineering) using project prototypes has been positive, and crucial for enhancing the functionality of the software. Early in the learning design process it became obvious that annotation at a site in the digital asset may require further investigation, or expansion, especially in small team-based CA activities. It was decided to enhance annotation by providing localised options for “commenting”, “explaining” or “discussing”, annotations. This functionality was tested and included in the working prototype. Furthermore, student testers indicated that additional meta-level annotations should be included in order that annotations of a particular type could be highlighted. The Student testers recommended that annotations should be “tagged” (essentially annotating the annotations) and “searchable”, for example, “Show me all occurrences of annotations that relate to ‘metaphor’ in this poem.” It was decided to include this feature in the working prototype.

Other findings related to establishing best models and approaches to manipulating CA data have been useful for planning further authentic CA in Learning and Assessment. The software provides facilities for exporting data amenable to linguistic and other analyses for the purposes of conducting educational research.

Key Reflections

Bespoke educational technology software development is both complex and expensive, and requires considerable investment, goodwill, and commitment from dedicated teams of educators, engineers, teachers and learners. Working collaboratively on this project with students taking on roles as developers, designers, teachers, learners, scientists and testers was an exceptionally rewarding learning experience for everyone involved.

The team used annotation, and other collaborative tools, extensively throughout, and became convinced that if the tool being developed already existed, the work would have been easier. The project provided an opportunity for the team leader to create and investigate assessment "for", "of" and "as" learning scenarios using prototypes and mock-up. Specifically, it provided insight into how these might be used in personal teaching/research in software development (annotating code), digital humanities (transcription/translation studies), and linguistics (textual analysis). Experience gained from the design of CA software (as educational technology) has been directly incorporated into an MSc Interaction Design module offered by Computer Science.

Recommendations

This project conducted extensive user and data modelling, user story generation, and software testing associated with dialogic engagement in an online collaborative learning environment. The project leader would welcome queries from anyone interested in pursuing similar projects and to share development and research experiences. It is worth noting that considerable investment in design, development and coding is required initially and it takes time before that effort is realised in a useable system. It is recommended that both stand-alone and integrated versions of such systems should be available, if possible. Bespoke software requires hosting and support from IT services, and GDPR advice and support may also be required. User and User Experience testing is a normal part of software development, and doesn't normally require ethical approval, but testing learning scenarios will require approval from the appropriate ethics committee.

Online software requires continued maintenance and is almost always moving from prototype to prototype because the necessary underlying web technologies are constantly evolving. A project of this nature requires about five years investment.

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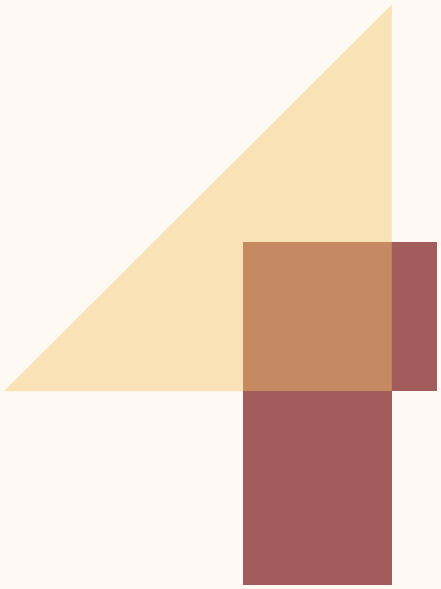
Find Out More: To find out more about this fellowship project, please contact Dr John G Keating, **john.keating@mu.ie**



Exploring the Potential of Reflective Learning to Enhance Behavioural, Cognitive and Affective Engagement in Psychology.

Title

Exploring the Potential of Reflective Learning to Enhance Behavioural, Cognitive and Affective Engagement in Psychology.

Fellow

Dr Rebecca Maguire

Department

Psychology

Abstract

The aim of this fellowship project was to establish whether structured reflective learning would enhance students' engagement in a large-group psychology module. Measures of reflection, as well as various aspects of engagement, were taken at the start and end of semester. Students were prompted to complete weekly reflective exercises on Moodle, with results discussed in class on a regular basis. While participation rates were lower than hoped, feedback on the intervention was largely positive. Reasons for non-participation included perceived lack of time and the fact that exercises did not count towards assessment. Those completing exercises engaged in deeper reflection at semester end, with associations found between reflection and both cognitive and affective engagement. Implications for teaching and learning are discussed.

Overview

Understanding how to foster student engagement and, consequently, to encourage learning, is an important goal for all educators, however this can be challenging in large group settings where students come from a diverse range of backgrounds. Students may also experience isolation in such contexts, becoming at risk of low "affective" engagement. While Moodle can be helpful in supporting learning, in practice students interact with this platform in a passive way that is disconnected from peers and lecturers. Separately, another means of enhancing learning is through the process of reflection, yet this is rarely incorporated into curriculum design. We wished to determine if structured reflective learning could be facilitated through Moodle to support students' learning, and to explore the implications of this for engagement in a psychology module.

Specifically, the project aimed to:

- establish whether reflective learning could be implemented in an online learning environment, and,
- explore associations between reflective learning and various indicators of student engagement.

Literature

We have previously demonstrated the importance of acknowledging various forms of student engagement in higher education and have shown that engagement is influenced by a range of factors beyond academic ability (Maguire et al., 2017). This work informed the development of the fellowship project, along with previous research in reflective learning. The value of reflection in education has long been acknowledged (Boyd & Fales, 1983; Brockbank, 2007), and more recently it has become common to include reflection as a component of assessment (Ryan & Ryan, 2012). However, actively supporting reflective learning is not routinely practiced in module design and delivery, especially in scientific and theoretical subjects.

Online and blended learning environments such as Moodle offer a potential means of supporting structured reflective learning in all modules, to supplement, rather than replace, course content. This may also encourage greater peer support, which is a valuable component in higher education (Ryder et al., 2017) that is linked to a greater sense of engagement (Kiefer et al., 2015).

Project Outline

Ethical approval was initially obtained prior to project commencement. Students were informed of the nature of the study and invited to complete a questionnaire at the start of semester. This gathered basic sociodemographic information (e.g. age, gender), as well as measures of cognitive and affective engagement (Grier-Reed et al., 2012), reflective learning (Kember et al., 2000) and module expectations. A total of 168 students (response rate 66%) participated in this initial phase.

The intervention itself involved the development of weekly online reflective learning questions which were designed to get students to assess their initial understanding of the course content, as well as their plans for enhancing their study. This involved a mixture of closed (Likert-scale) and open questions, the responses of which were amalgamated and discussed in class when time allowed. In the middle of semester more focus was paid on goal setting as an important aspect of reflection. Students were also invited to engage in peer support via an open forum.

At the end of semester students were again invited to complete a questionnaire collecting measures of engagement and reflective learning, as well as collecting information on their participation and views on the intervention, and general module feedback. While 110 responded to this (65% of original sample), it was only possible to link 56 responses for both survey phases.

Data from both the reflective learning exercises and from the two surveys were collated and analysed. Measures were standardised from 0-100 to allow for easier comparison.

Findings

Student engagement and levels of reflection

Figure 1 displays the levels of affective and cognitive engagement and reflection at the start and end of semester for those students whose data could be linked (n=56). Paired sample t-tests found no significant difference between the two time points on these measures (p>.05), however some other interesting trends emerged from the data. For example, at both time points, reflective ability was significantly associated with both cognitive and affective engagement, suggesting that these constructs are closely related (see Table 1).

Figure 1: Engagement and reflection at start and end of semester.

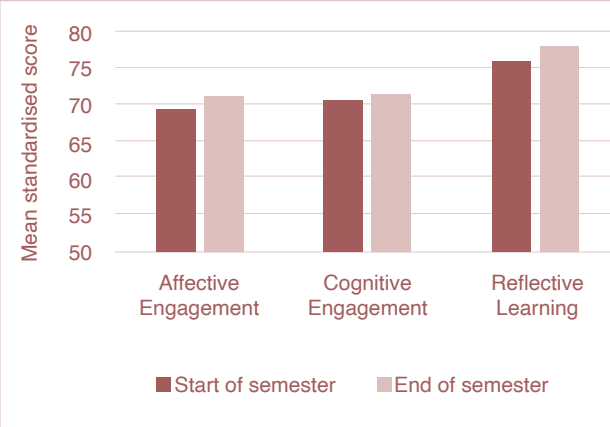


Table 1: Correlations* between measures

	1	2	3	4	5	6
1. Cog. Eng T1	1					
2. Aff. Eng T1	**.47**	1				
3. Reflection T1	**.46**	**.35**	1			
4. Cog Eng T2	**.64**	**.33**	**.48**	1		
5. Aff. Eng T2	**.28**	**.57**	.19	**.60**	1	
6. Reflection T2	**.31**	.27	**.60**	**.43**	**.35**	1

*Values in bold illustrate significant relationships (Pearson's r, $p < .05$)

Examples of reflective experiences and goal setting

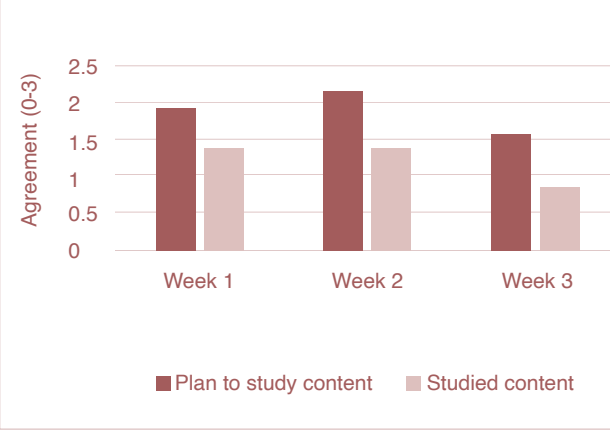
While not possible to display all the data collected, some examples of that gathered from the reflective learning exercises are shown below.

Each week students were asked to report their intentions to study, as well as their level of study/reading in the previous week. An example of some responses after the first week are shown in Figure 2, but as evidenced from Figure 3, there were often mismatches between students' intentions and their behaviours.

Figure 2: Example of responses to closed questions, week 1

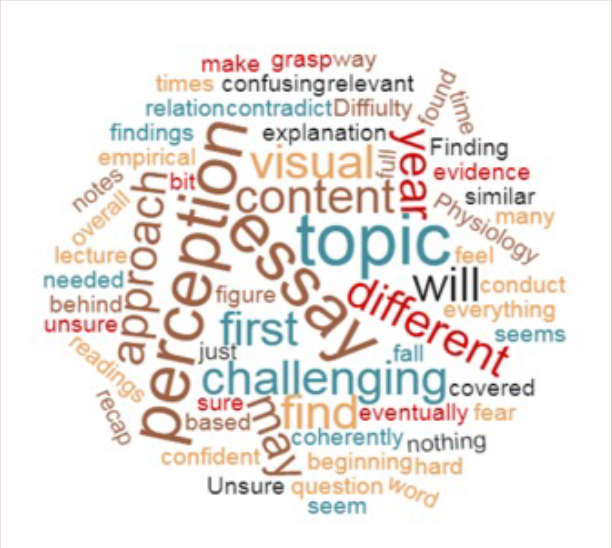
	strongly agree	agree	neither agree nor disagree	disagree	strongly agree	
After this week, I understand what is involved in PS251.						1.4 (1.4)
I know what I have to do for PS251.						1.6 (1.6)
I understand the content covered in week 1.						1.8 (1.8)
I am confused about some of the topics covered in week 1.						3.5 (3.5)
I plan to study the content of week 1 over the next few days.						2.2 (2.2)
I plan to study the content of week 1 before the exam.						1.8 (1.8)
I plan to seek out material relevant to week 1 from the recommended textbooks.						2.0 (2.0)

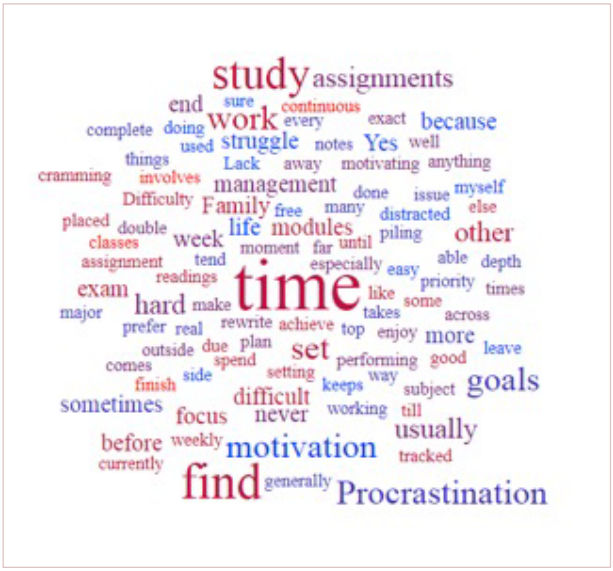
Figure 3: Comparing plans vs. behaviours in first 3 weeks



A number of open-ended questions were asked each week which revealed interesting findings. For example, in week 2, students were asked what their biggest challenges were that week. In week 6, students were asked to identify study goals. Word clouds were used to amalgamate responses which allowed for different themes to emerge (see Figures 4 and 5).

Figures 4 and 5: Examples of word clouds generated from qualitative responses





In week 6, students were also asked some general questions relating to their perceptions of their progress up to that point; 72% reported being happy with their progress, with 91% seeing how the topics related, however only 19% reported having read advanced material suggesting that this was something students struggled with.

Participation and experiences of reflective learning exercises

At the end of semester, students were asked how frequently they completed the reflective learning exercises. Consistent with Moodle log data, few reported engaging in this practice on a regular basis, with many having only completed the exercises once or twice (see Figure 6). When asked to specify the reasons for non-engagement, many reported lack of time, while many others indicated they did not think these would be useful (see Table 2).

Figure 6: Frequency of engagement with reflective exercises

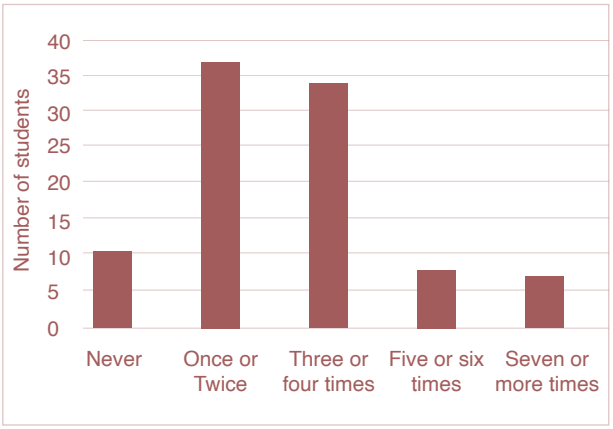


Table 2: Reasons for non-completion

Reasons for not completing exercises	N
Did not think they would be useful	21
Had no time to complete	20
Did not count towards assessment	6
Forgot about them	5
Did not know about them	4

Analysis suggests that cognitive engagement at the start of semester was associated with completion rates ($r = .470$, $p < .001$). Those who had participated had deeper levels of reflection at semester end, however they were also more likely to attend lectures suggesting that those students who participated were already highly engaged. Additional regression analysis suggested that both cognitive and affective engagement in addition to engagement with exercises was predictive of levels of reflection at the end of semester.

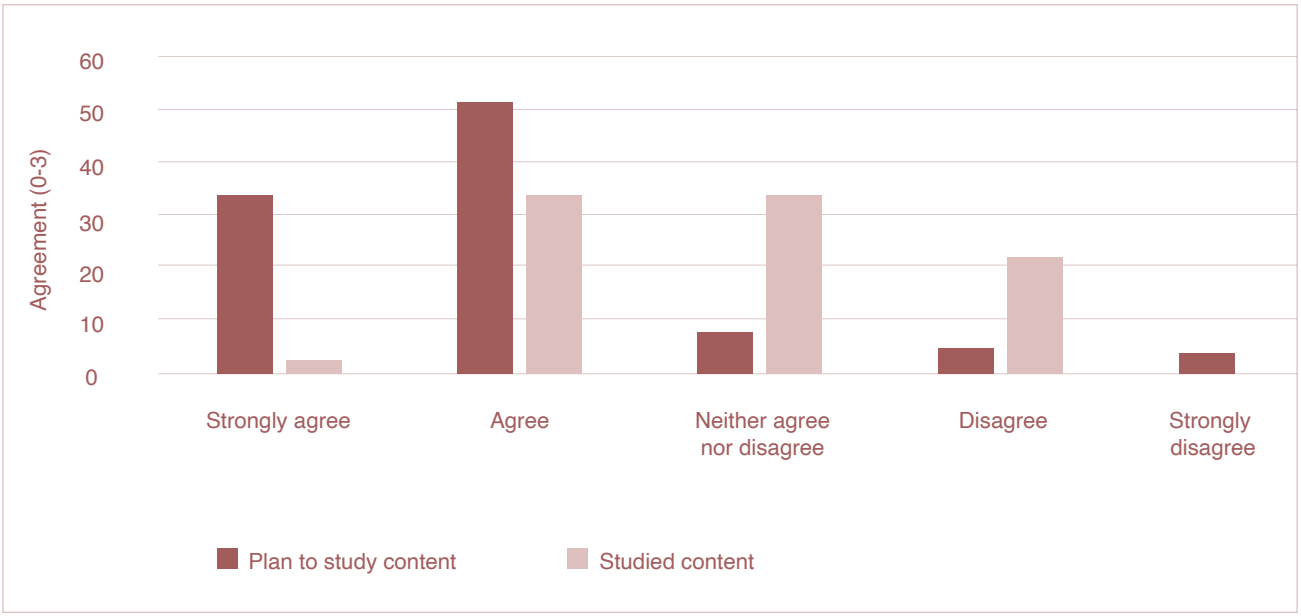
Table 3: Comparison between students who had a low vs. high participation rate

Completed exercises	Reflective learning (0-100)	Lecture attendance (scale of 1-5)	Cognitive engagement
0-2 times	54-40 (16.71)	3.94 (.845)	66.54 (9.73)
At least 3 times	61.27 (14.15)	4.53 (.680)	73.09 (10.18)

Student Feedback

Overall, student feedback of the module was very positive, with 88% agreeing that they enjoyed the course. However, while a relationship between module enjoyment and perception of reflective learning exercises was found ($r=.23$, $p=.012$), it cannot be clear if enjoyment was affected by the reflective learning exercises themselves. In contrast to overall module perceptions, only 43% agreed that the exercises were useful, suggesting that there were mixed perceptions of the intervention.

Figure 7: Student Feedback Summary



Key Reflections

The results from this project are inconclusive regarding the benefits of structured reflective learning. While those who did complete the exercises had better reflective learning at semester end, it is uncertain whether this had any direct effect on their engagement. The low level of participation in the weekly exercises was unfortunate, however student feedback was helpful in explaining why this was the case. The fact that almost all students surveyed suggested that they enjoyed the module is, in itself, positive.

From my own perspective as the lecturer, I found this intervention very helpful. It allowed me to have a better grasp of student understanding of various topics, as well as getting a sense of what students were finding challenging. I will certainly continue to encourage and incorporate student reflection into my teaching practice.

Recommendations

This project has the potential to be transferred to a range of settings. As only Moodle is needed to support this strategy, it is possible to apply and tailor a similar approach to support teaching in other modules in the University. The key concern is the lack of sustained take-up of the exercises from students. As a number of barriers have been identified from the students however, it may be possible to tackle these to encourage uptake (e.g. by rewarding participation as part of assessment).

The value of reflection is widely recognised and was generally positively received by students. Therefore, it is recommended to continue to implement, but refine, this practice, along with other mechanisms to support reflective learning.

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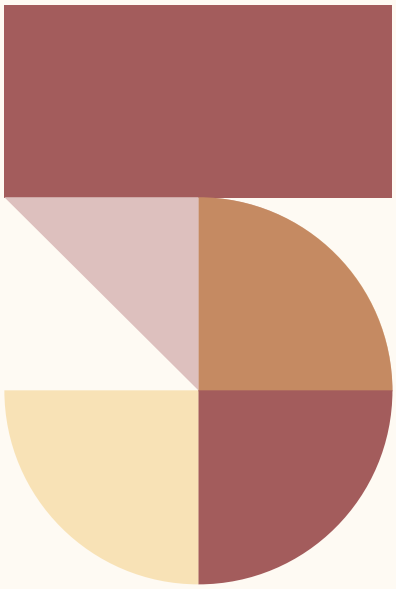
Find Out More: To find out more about this fellowship project, please contact Project Lead, Dr Rebecca Maguire, **rebecca.maguire@mu.ie**



A Blended Learning Approach to the Mathematics Proficiency Course.

Title
A Blended Learning Approach to the Mathematics Proficiency Course.

Fellow
Dr Ann O'Shea

Department
Mathematics and Statistics

Abstract

The aim of this project was to re-design the online Mathematics Proficiency Course (MPC) to make it more usable and effective. This course has been available for the last 10 years to any MU student, and is recommended for students who are deemed at-risk of failing 1st year mathematics modules. In this fellowship project, I used educational research findings to redesign the module and to create modern online learning materials and face-to-face workshops. I used the funding to hire an experienced tutor as well as an undergraduate student to help me design the learning objects. The re-vamped course ran on Moodle in the first semester of 2019/20 and had over 100,000 visits.

Overview

The aim of this project was to re-design the Mathematics Proficiency Course (MPC) to make it more usable and effective. International research has shown that students are entering university with large gaps in their mathematical knowledge, and that these gaps hinder their progression in Science, Finance, and other numerate subjects. High failure rates in first year mathematics courses are common across the world, and we in Maynooth have been at the forefront of developing resources and supports to help students to succeed. One of these resources is the MPC which has been delivered through Moodle for the last 10 years. This course is available to any MU student and is recommended to students who are deemed at-risk of failing 1st year mathematics modules. Although initially very successful at helping students to develop mathematical understanding, the module has recently suffered from low levels of engagement. One reason may be that the learning objects were dated, for example, it used a bank of video tutorials each of which was 30 minutes long.

In this fellowship project I carried out an extensive literature review on research into methods of teaching basic mathematical skills and problem-solving techniques to undergraduates, and design principles for creating online materials for this cohort. Using findings from this research, I created learning materials such as videos, animations, and quizzes. I used the funding to hire an experienced tutor as well as an undergraduate student to help me design the learning objects.

Literature

The literature that informed this project was drawn from two main research areas: the teaching of developmental mathematics at university level; and blended and e-learning in mathematics education.

Research has shown, both in Ireland and internationally, that many first-year university students have serious difficulties with basic mathematics (Fitzmaurice, Walsh and Burke, 2019). These difficulties can limit students' potential for advancement in areas such as Science and Engineering, Finance, and Education. Many efforts have been made to solve this problem, and I read related articles and reports from the UK, Canada and the USA (e.g. Stevenson, 2016; Sierpinska, Bobos & Knipping, 2008; The Royal Society/JMC 1996). These reports outlined the problems in various countries as well as interventions that have been made. These studies influenced the design of the Mathematics Proficiency Course. It was also important to delve into the conceptual problems that students have with basic Algebra (Bush & Karp, 2013), and the teaching methods that others have found useful (Watson, Jones & Pratt, 2013). In particular, we were interested in the cognitive approach to teaching (Winstead, 2004).

Research on teaching mathematics online has been carried out for many years. One of the first studies in this area was instigated by Engelbrecht and Harding (2005). Since then the area has grown enormously. A major area of growth is that of blended learning (Borbo et al., 2016). In this project, we were influenced by Lo and Chen's (2017) work on design principles for mathematics flipped classrooms. We also found a handbook developed by the University of Massachusetts on online teaching extremely helpful.

Project Outline

- I carried out a literature review on research into teaching developmental mathematics courses to undergraduates, and into the use of technology to engage students.
- I recruited an experienced tutor to act as a research assistant, and an undergraduate student to work on a summer project. Two university tutors also worked on the project.
- We used the results of the literature review to develop a suite of short videos (about 5 minutes long) to replace the ones currently used (which are each at least 30 minutes long).
- We also developed some short animations, and online quizzes which incorporate individualised feedback.
- The new Mathematics Proficiency Course was assembled using the materials developed in 3 above and trialled.
- The course went live in September 2019. The Department of Mathematics and Statistics decided to incorporate the course into a first year module. 571 students were enrolled on the MPC.

- Students' attendance and engagement with the module was monitored between October 2019 and December 2019. In December 2019 we administered a survey to all 1st year mathematics students to gather data on why students engaged or did not engage with the new materials, their opinions on the new materials and their value as learning objects, their view of the impact of the module on their own mathematical understanding and confidence. A small group of students will be interviewed on this subject in February 2020.

- The quantitative survey data was analysed. Further data from interviews and from first year module grades will be analysed once it is available.

Findings

The Mathematics Proficiency Course consisted of nine segments on nine pre-calculus topics. Each segment contained some short videos, practice quizzes, and a graded quiz. The course had more than 108,000 visits in the first semester of 2019/20. Of the 571 students who were enrolled on the module, all but 17 took at least one of the graded quizzes, 204 students completed all of the graded quizzes, and the median number of graded quizzes completed was 8 out of 9. Usage of the practice quizzes and videos was lower, with the numbers of students who viewed the videos ranging from 293 to 111 (over the 9 topics) and the numbers taking practice quizzes ranging from 351 to 111. Students' scores on the graded quizzes were quite high (the mean was 75% and the median was 78%). As yet, we have not had the opportunity to carry out a full analysis of the impact of the Mathematics Proficiency Course on first-year grades, but this will be done in due course.

A course evaluation was posted on Moodle in December and to date 72 students have completed it. Of these 71% found the new videos useful or very useful, 72% found the practice quizzes useful or very useful, and 82% found the graded quizzes useful or very useful. Students remarked that the course made them work to revise their algebra skills, that it helped their understanding of concepts in their Calculus course, and that they liked the flexibility of being able to work on the material in their own time. They suggested improvements such as the provision of more workshops and links to extra material.

Our data analysis has shown that the students engaged with the course and found it useful.

Key Reflections

For me, one of the most rewarding aspects of this project was the opportunity to work with a group of postgraduate and undergraduate students, as well as tutors. The people involved were Dara Mac Conville (undergraduate student), Conor Brennan (postgraduate student), Rachel O'Neill, and James O'Malley (both University Tutors). The group met frequently over the summer and experimented with different methods of producing videos as well as different styles of quiz questions. We also reviewed each other's work carefully and modified it if necessary. We tried at all times to focus on what materials would be appropriate for and appreciated by first-year students. I believe that the diverse range of backgrounds and experience of our group helped us to do this effectively.

The material that the course covered is difficult to teach; most students in the course have seen all of this material in school but many of them still have serious difficulties with it. In this module we presented the material with a dual focus on explanation and practice. Students worked on the topics alone in their own time. It would be interesting to study whether the introduction of group work or peer-tutoring would help students develop understanding of pre-calculus material.

Engagement with the Mathematics Proficiency Course was high, but this was mostly to do with the fact that participation was linked to grades for the first time.

Recommendations

The development of the online course was a rewarding experience but it was quite time-consuming. For this reason, I would recommend that the university supports others who would like to develop online courses by providing funding to allow them time to work on the project. I would also recommend that CTL continues to provide short courses on topics such as the development of online resources.

It would be beneficial if a community of practice of people who are interested in the provision of online courses could be established. This would allow us to learn from each other and to develop our expertise.

I would recommend involving students in the design of learning resources.

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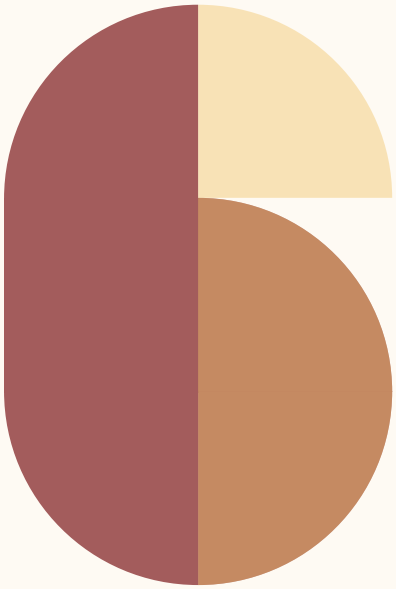
Find Out More: To find out more about this fellowship project, please contact Project Lead Dr Ann O'Shea, **ann.oshea@mu.ie**



Evaluating the use of E-learning Approaches for Undergraduate and Executive Teaching in a Maynooth University Department.

Title

Evaluating the use of E-learning Approaches for Undergraduate and Executive Teaching in a Maynooth University Department.

Fellows

Aodhdín Casey, Dr Bridget McNally, Professor Donal O'Neil, Dr Fabrice Rousseau

Department

Department of Economics, Finance and Accounting

Abstract

The aim of this fellowship project was to assess the merits of different means for providing online academic support to students and draw conclusions on the best approach to integrating e-learning. We examined the piloting of blended learning approaches across numerical and non-numerical (discursive) modules, at both undergraduate and postgraduate levels. Our results suggest that a blended approach to teaching, which includes e-learning components proved very popular with students and has the potential to improve learning outcomes. Furthermore, the student responses suggest that different aspects of e-learning may be tailored to different learning outcomes. It is hoped the results of our research project will help design an appropriate approach to e-learning as an integral element of undergraduate, postgraduate and executive education, at Maynooth University.

Introduction

Given the rapid advances in technology in recent years the way students access and process information has changed dramatically. By exploring the use of e-learning we aim to develop approaches to teaching that motivate and inspire students to learn, while recognising these technological advances. In addition, the use of e-learning has the potential to overcome traditional barriers that sometimes inhibit learning.

It has also become increasingly apparent to the Department that in order to tender competitively for the delivery of executive programmes and develop new Maynooth University executive education programmes, significant upskilling of staff will be required around developing, delivering and managing blended learning programmes.

It is envisaged that these programmes would incorporate a mixture of on-site tuition, distance learning, online lectures and tutorials, virtual office hours and virtual interactive discussion groups. The need for flexibility and a blended approach to teaching is likely to be a necessity, rather than an option, for these students.

This project focuses on the design and implementation of e-learning across a range of settings in the Department of Economics, Finance and Accounting. It investigates in principle, what works best, in what settings and with what resources. It identifies the challenges faced and both positive and negative outcomes experienced from a series of pilot blended and online learning mini projects.

Given the limited budget allocated to the Fellowship, our analysis can only be considered a scoping project for the potential use of e-learning. However, the results of our analysis could form the basis of a scaled-up evaluation of the use of blended and online learning throughout the University.

Literature

A chronological review of the literature in this area identifies a number of distinct themes: early literature is concerned with the definition, development and maturity of e-learning. There are two further distinct themes, one focusses on e-learning as a stand-alone tool to deliver a curriculum or programme of instruction, the second is concerned with e-learning as part of a blended learning exercise involving both e-learning and class-room instruction.

The use of technology to support learning goes back to at least the 1980s and coincided with the dissemination of computers for personal use in the home (MohdAlwi et al., 2010).

Originally used in higher education to define courses delivered over the internet, e-learning has grown to include virtually any use of technology to deliver curriculum or instruction (Fletcher, 2004). E-learning is the use of internet technologies to enhance knowledge and performance and offers learners control over content, learning sequence, pace of learning, time and often media, allowing them to tailor their experiences to meet their personal learning objectives (Ruiz et al., 2006).

Jethro et al. (2012) found that the effectiveness of e-learning has been demonstrated primarily by studies of higher education, government, corporate, and military environments. Three aspects of e-learning have been consistently explored: product utility, cost-effectiveness, and learner satisfaction. The studies used a variety of designs in both training and academic environments, with inconsistent results for many outcomes. Yet, learners' knowledge, measured by pre-post test scores, was shown to improve. Moreover, learners using computer-based instruction learned more efficiently and demonstrated better retention.

E-learning is a large and growing market with great potential in higher education. Means et al. (2010) identified more than 1000 empirical studies of online learning and conducted a meta-analysis of a small subset of these studies. Their findings suggest that students in online conditions performed modestly better on average than those taught through traditional face-to-face instruction. Most of the variations in the way in which different studies implemented online learning had no effect on student learning outcomes, with two exceptions; the use of a blended approach resulted in higher gains, as did the use of an instructor directed approach rather than independent, self-directed instruction. Furthermore, studies in which the analyst judged the curriculum and instruction to be identical across the components of the

blended approach had smaller effects than those in which the approaches varied. In order for e-learning to be effective it must be introduced so as to act as a complement to traditional methods and not simply replicate traditional approaches using technology. Torrisi-Steele and Drew (2013) in their review of the literature on blended learning in higher education found that there is a lack of literature seeking to understand academics' current blended practices. They argue that this is problematical in terms of formulating the required professional development and support. The paper uncovers the need for further research into understanding not only why academics may choose to engage in blended learning, but also, once engaged, why some choose to integrate technology to create transformative blends while others choose minimally impacting blends.

Project Outline

There were a number of planning meetings to narrow down and agree on the focus of our research. Ultimately it was agreed to focus on;

- The use of podcasts, Khan Style videos and screencasts as a teaching aid at undergraduate and postgraduate levels.
- The use of podcasts and screencasts as a revision aid for repeat undergraduate students.
- The use of Adobe Connect to deliver live virtual office hours.
- The use of Adobe Connect to deliver live virtual revision classes for repeat undergraduate students.
- The use of Adobe Connect to conduct virtual/online PhD supervisory meetings where all parties are not on campus.
- The use of screencasts in a flipped classroom approach.

Modules for the conduct of the pilots were agreed as well as timings for delivery, survey of feed-back, write-up of findings etc.

The delivery of the e-learning component of the chosen modules required the creation of a large number of videos, screencasts and podcasts, as well as the provision of training to students on the use of Adobe Connect. In total over the duration of the Fellowship the team created and circulated 109 screencast videos and 36 podcasts.

The e-learning initiatives were introduced and implemented during the summer and autumn terms.

Following implementation, feedback was obtained through a series of student surveys for each module. Members of the team agreed a common questionnaire for feedback and required permissions for the conduct of surveys were requested from the Research Ethics Committee within the University.

Student feedback was analysed and summaries prepared for inclusion in the Fellowship Report. Members of the fellowship recorded their work and findings on MS TEAMS (a specific group was established on MS TEAMS for this purpose).

The substantial detail on the draft report on MS TEAMS was narrowed down to be incorporated in this Fellowship report.

Findings

- There was strong positive feedback from students for the podcasts, Khan Style videos and screencasts as a learning, revision and exam preparation tool. Students were appreciative of key subject matter being focussed on, that the recordings could be listened to multiple times and paused/restarted as required. For one particular module, captions were required on the videos as one student had a hearing disability. Whilst it was possible to add captions, it was time consuming as checking and editing was required to ensure the written and spoken words were consistent.

  Example feedback:

  "They explained very well in depth key points that I found difficult, Only for the video tutorial I wouldn't have understood it fully"

  "Much more useful than looking at notes or textbook. I wish more lectures would use them"

- A comparison of the feedback on the relative use of podcasts and video tutorials across two different modules suggested that these features may address distinct components of the learning process. When providing feedback on video tutorials students emphasised their value in helping with the initial understanding of material. In contrast, podcasts were seen as a more valuable tool when revising for exams.

- The screencast technology was also used to provide class feedback on overall performance on assignments and in a flipped classroom approach whereby screencasts were used to draw attention to additional aspects of tutorial questions which students were asked to consider/complete in advance of a forthcoming tutorial.

  The screencast feedback on assignments reduced the number of individual questions for the lecturer/tutor but only the very interested students engaged in the flipped classroom approach and completed the additional tutorial preparation assigned in the screencasts.

- There was appreciation of the availability of virtual office hours outside term-time via Adobe Connect, albeit some students did not find the allocated time slot suited! There was a greater training and hardware resource requirement for the use of Adobe Connect as all users required a PC/laptop with Adobe Connect licence, camera and audio capability. Training was required for both lecturers and students and the hardware did malfunction on occasion due mainly to poor Internet coverage for some users.

Example of feedback:

"For someone who has no confidence asking questions in a crowded lecture hall, the adobe connect allows you to ask these questions without feeling intimidated."

- The use of Adobe Connect for PhD supervision meetings where supervisors and their students are in different locations, could be very valuable subject to the proviso that users are adequately trained and have confidence in the hardware, and have the IT support necessary for the successful running of such a meeting which could last up to one hour. Breakdowns in audio and visual connection lead to frustrations for all users.

Key Reflections

E-learning is both necessary and valuable as we move forward in 3rd level education. It requires hardware and software investment and appropriate training for all users. It requires, sometimes, a significant upfront investment of time on the part of the lecturer/ tutor to prepare the resources. However, there is significant flexibility for most resources to be used over a number of years.

E-learning can be tailored to address different components of the learning process. Care needs to be taken to ensure the e-learning offerings can be availed of by all students including students with disabilities.

Recommendations

Given the limited budget allocated to the Fellowship, our analysis can only be considered a scoping project for the potential use of e-learning. However, the results of our analysis are sufficiently positive to recommend a scaled-up evaluation of the use of blended and online learning throughout the University. This scale-up evaluation is the more necessary as the University has clearly established in its Strategic Plan 2018-2022 its desire to launch "… three blended e-learning programmes in the 2019-2021 period, and will use our experience of these to develop a Maynooth University Strategy and Action Plan for blended and e-learning."[1] The University Strategic Plan 2018-2022 also highlights its focus on digital transformation and wants to "…continue to enhance the teaching and learning technologies that underpin engaging and flexible delivery of our academic programmes."[2]

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Find Out More: To find out more about this fellowship project, please contact Project Lead Dr Fabrice Rousseau, **fabrice.rousseau@mu.ie**

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