

2014

DIT Teaching Fellowships Reports 2013-2014

Teaching and Learning Technology Centre, Dublin Institute of Technology

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Teaching and Learning Technology Centre, Dublin Institute of Technology, "DIT Teaching Fellowships Reports 2013-2014" (2014). *Annual Reports*. 3.
<https://arrow.tudublin.ie/tfreports/3>

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DIT Teaching Fellowship Reports 2013–2014

College of Arts and Tourism
College of Business
College of Engineering and Built Environment
College of Sciences and Health

**Supporting the Strategic Themes of Diversity,
Modularisation and E-Learning**

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Foreword

This publication provides a collation of reports of research conducted as part of the 2013–2014 DIT Teaching Fellowship scheme. The DIT Annual Teaching Fellowships were established in 2009 as part of Cycle II of the HEA's Strategic Innovation Funded Enhancement of Learning (EoL) strand of the Dublin Region Higher Education Alliance (DRHEA).

The aim of the DIT Teaching Fellowships is to support key college based educational research projects linked to the wider Institute Teaching, Learning and Assessment Strategy themes. (See Appendix A for the Fellowship Projects 2013/14.) The title of "Teaching Fellow" is awarded to an individual or a team, nominated by the college and who would undertake a research project to support the enhancement of learning and/or curriculum development at a programme, school or college level over a one academic year period. It is intended that evidence gathered from the studies will be utilised to inform relevant policy, practice or similar institutional research activities into the future. (See Appendix B for Teaching Fellowships Evaluation and Feedback.)

The establishment of Teaching Fellowships has been a very successful venture for the DIT and the projects are now financially supported by the DIT. During the last five years of fellowship funding, over 40 Teaching Fellowships have been supported from across a diversity of subject disciplines. Resultant outputs from this academic year include effective strategies to support student creation of short films and peer reviewed quizzes, construction of pedagogical frameworks to prepare and engage students in learning and assessment processes as well as best practice guidelines for fieldwork studies, online resource design and professional skills related development by students.

Outcomes from this research continue to be used to help inform both policy and practice across the Institute. This level of success is, in part, due to the enthusiasm and dedication of all the award recipients and the DIT staff who have supported the Fellowship projects throughout each academic year. I would also like to thank the College Heads of Learning Development and/or local Awards Contacts, my Learning, Teaching and Technology Centre colleagues and, in particular Dr Claire McAvinia who has been responsible for supporting the Fellows over the last year and collating this report publication.

Dr Jen Harvey, Head of the DIT Learning, Teaching and Technology Centre

Summary Overview of 2013-2014 Projects

College of Applied Arts and Tourism

Peter McDermott: **Conservatory of Music and Drama**



The personal made public: an actor-led devised film project

The main objective of the project is to create five short films linked by a challenging, thought-provoking theme defined and generated by the final-year students on the BA in Drama. Using internationally recognised methods, student actors will learn how to generate personal creative material for artistic performance on screen. As well as demanding high-quality screen acting, the project will require student actors to tackle issues of dramatic structure, imagery, pacing, etc. This is part of a mandatory module on the BA in Drama. This innovative process of student-centred learning and creation will give students ownership of their work and raise the status of the actors in the film-making process. The actors are positioned as creative artists, not just interpretive artists. A professional film crew will be assembled for a five-day shoot, giving the students direct experience of acting on a professional film set. By demanding that the students challenge themselves and their audience, the project will set the bar high in terms of artistic excellence. We are planning a one-off public screening in 2014. The five films will also be uploadable and distributable (as a whole or five individual films). Unlike similar theatre projects, this will give the student actors material for their showreels for agents and other aspects of their professional development. It will also provide promotional material for DIT, helping to position DIT as an innovator in arts education.

Kevin Griffin: **School of Hospitality Management and Tourism**



Determining "best practice" methodologies in the pedagogy of tourism related fieldwork

With increased workloads and larger class sizes, academics and institutions across Ireland (and internationally) are increasingly familiar with terminology such as rationalisation and increased efficiencies. This leads programme planning groups to identify areas where non-essential and "extra" activities are being cut back or even eliminated. As a researcher/lecturer I come from a Geography background, whereby fieldwork is an integral component of many modules, and I have continued to utilise Geography-influenced pedagogical approaches in the teaching of tourism-related modules. However, with increased external influences such as concern over "health and safety", insurance, liability, not to mention the time element of organising and running fieldwork related activities, I have begun to question whether the benefits I see in fieldwork might be achieved more efficiently in other ways. The purpose of this project is to commence a dialogue with colleagues in Tourism, Geography and other related disciplines, to explore this social/educational tool, and begin to develop guidelines and frameworks for more efficient and more effective fieldwork activities. Some of the objectives will be to examine: current best practice, limitations (human and institutional), aims and objectives (why do we do it), logistical frameworks (overnight versus daytrips etc.), and educational evaluation processes (how we assess the activity).

College of Business

Tony Buckley: **School of Marketing**



Towards entrepreneurship learning outcomes in business education and beyond – Next practice? Design and guidance

The objective of this Fellowship is to develop a shared entrepreneurship learning outcome that can be achieved in every undergraduate programme in the College of Business. The starting point for this work is the question, in teaching entrepreneurship, what are we trying to achieve? Are we looking for students that understand entrepreneurship and business start-up planning as a module level learning outcome? Students that will have entrepreneurial orientation (EO) in the broader economic and social contexts, at the level of programme learning outcomes? The project has the intended outputs of an appropriate learning outcome targeting the development of entrepreneurial behaviours and learnings (entrepreneurial capital) in all graduates of the College of Business. It will also produce a guide to programme teams on how to incorporate this learning outcome into their programmes.

College of Engineering and the Built Environment

Marisa Llorens-Salvador, Eileen Mageean: **School of Multi-Disciplinary Technologies**

Edmund Nevin: **School of Civil and Structural Engineering**



Online resources platform for mathematics education

The aim of this project is to develop and explore the use of a Sharable Content Object Reference Model (SCORM) integrating a web-based platform for the study of mathematics as part of an active learning environment. The platform will provide active support to engineering students especially those in their first year of study and mature students returning to education. Early use of the platform has the potential to identify possible areas of weakness and provide the self-learning environment required for students to become more proficient in areas where they are weak or are finding the concepts difficult. The platform will consist of a set of tests and applications for the study of engineering mathematics. The tests will adapt and change depending on the answers provided by the student, including video feedback for incorrect answers before progressing to the next question. Based on the idea that teaching a concept is the best way to learn that concept, the students become actively involved in the platform as they create the videos that provide feedback to the other users of the platform. This active learning, constructivist approach will provide an environment of achievement and ownership that will allow students of all levels to enjoy the learning experience. The platform is intended to reinforce foundation concepts and provide students with a multimedia tool created mainly by DIT engineering students.



College of Sciences and Health

Aaron Mac Raighne: **School of Physics**



Web-based peer tutoring in science education

Problem solving is a highly important graduate attribute which is of particular importance within the scientific community. Students prepare for this by solving many "end-of-chapter" type questions. However, it has been argued that a much deeper understanding of the concepts can be gained by students if they are required to create their own questions. PeerWise creates a student-centred, predominantly student-regulated learning community based on web tools which the students are familiar with. Students are asked to create questions, provide answers and outline short explanations for their questions. All these tasks further raise their cognitive efforts and create deeper understanding. The students create a shared study tool which is focussed on the module and its assessment related content. Feedback is of the utmost importance to students but is highly demanding on staff workload. PeerWise has also been shown to be a very effective tool in facilitating peer-feedback which studies have indicated can have significant advantages to student learning and development. Active learning is promoted throughout not only by the actions of creating and answering question but by the more subtle mechanisms of assessing their own work in the context of others. PeerWise has shown promising first results when implemented in science education. We propose to evaluate this very promising piece of technology in the development of students across a range of science courses in DIT and the University of Glasgow. We will measure staff and student attitudes to PeerWise and any gains in student's conceptual understanding.

Barry Ryan: **School of Food Science and Environmental Health**



The development, implementation and initial evaluation of tailorable resource packs for multimedia based "assessments for learning"

The aim of this Teaching Fellowship is to develop a suite of resources to encourage and enhance the use of multimedia in student-centred assessment for learning. The resources will be downloadable as a tailorable solution that can be adapted by the academic to suit the relevant subject area. Case studies and review of the literature will be available to supplement the hands-on resources. The resources will facilitate both students and academics in the creation, application and assessment of the student driven, creative and engaging continual assignments. Integrating multimedia into the learning journey will help the student to develop tangible lifelong skills and key employability traits such as; collaboration, meaningful student interactions, enhanced communication proficiency, project management skills, peer co-operation and autonomy (Robin 2008). Furthermore, embedding multimedia in this way promotes assignment evolution towards an assessment for learning and thus process becomes a student-orientated, social constructivist activity where the student(s) take ownership of their project and become responsible for the product and, subsequently, their learning (Harel and Papert 1991). To effectively complete a multimedia based assignment students must analyse and synthesise several multimodal sources on the subject content. The student must then brainstorm, storyboard and create. This process is repeated several times and each time the student refines not only their product, but also their understanding of the content.



SELF-CHEM: student engagement in learning through flipped chemistry lectures

This project introduces the idea of "flipped lecturing" to a group of my second year students. The aim of flipped lecturing is to provide much of the "content delivery" of lecture in advance, so that the lecture hour can be devoted to more in-depth discussion, problem solving, etc. As well as development of the material, a formal evaluation is being conducted. Fifty-five students from year 2 Chemical Thermodynamics module took part in this study. Students are provided with online lectures in advance of their lectures, which are held on Wednesdays at 9am and 3 pm for the second half of semester 1. Along with each online lecture, students were given a handout to work through as they watched the video. Each week, a quiz was completed before each lecture which allowed students to check their understanding and provided a grade for their continuous assessment mark. The evaluation is examining both the students' usage of materials and their engagement in lectures. The latter was measured by "interrupting" students as they worked through a problem so that they could be asked four short questions which are drawn from another study, which validated this instrument as a measure of cognitive engagement. I wish to show that as the students are working through their in-lecture tasks, having watched pre-lecture videos, that they are cognitively engaged with the material and task at hand. This information will be coupled with access data to the resources, quiz scores, and student interviews to build up a profile of how the flipped lecture works for middle stage undergraduate students. I also wish to develop a "How To" pack for lecturers considering implementing a similar strategy in their own teaching (assuming the study shows it is worthwhile). I will be updating my progress on my website: www.michaelseery.com

College of Applied Arts and Tourism

1 The personal made public: an actor-led devised film project

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Abstract

This project enabled students on the DIT Conservatory's BA in Drama (Performance) to create five short films on a subject of their own choosing, drawing on their own personal experience. Using methods derived from Jerzy Grotowski and Anne Bogart, the students worked in small groups to workshop ideas and, with the support of two co-directors, to develop their scripts. A professional production team was assembled to shoot the films. After post-production, there was a public screening and the films were made available online.

The project addressed two questions:

1. Through devising, to what extent can actors be more empowered in the creative process?
2. Through film-making, to what extent can the programme help students to be better prepared for film and television work and to promote themselves in the performance industries?

The aims of the project were threefold. Firstly, the project aimed to position the students as creative artists, drawing on personal material to create content. Secondly, the project aimed to provide students with experience on a film set with professional practitioners. Thirdly, the project aimed to provide an artistic product that could be distributed to industry representatives.

Keywords: *acting, actor-training, devising, film-making, student-centred learning*

Introduction

Description and background

This project, carried out between September 2013 and May 2014, enabled final-year students on the DIT Conservatory's BA in Drama (Performance) to create five short films on a subject of their own choosing, drawing on their own personal experience. The students worked in small groups of four and five to workshop ideas and, with the support of two co-directors (one from staff, one from industry), to develop their scripts. A professional production team was assembled to shoot the films. After post-production, there was a public screening and the films were made available online.

The project addressed two contrasting features of contemporary actor-training: the increased prevalence of devising (the generation of original work by performers) within training; and the low emphasis on screen acting, compared to theatre acting, on actor-training courses. Firstly, devising and the notion of the actor as creator or co-creator have become widespread in contemporary actor-training and university theatre courses (Oddey 1996: 10–11; Magnat 2005: 73; Govan, Nicholson and Normington 2010: 33–34). Challenging the traditional model of actor-training as an accumulation of skills, devising asks the actor to create or contribute to an artistic vision and, in doing so, devising harnesses third-level education's emphasis on student empowerment, self-development and self-realisation.

Secondly, recent public discourse in both Ireland and the UK on actor-training has focused on the lack of skills for screen in young actors because training is too theatre-centred (Mullally 2012: 13; Merrifield 2013). This is seen as imperative because formal studies such as the Irish Arts Council's 2005 report on the socio-economic circumstances of theatre practitioners have highlighted the heavy reliance by actors in particular on film and television work due to the higher income such work generates compared to theatre. In both regards, the DIT Conservatory's BA in Drama (Performance) can be seen as typical, as it provides opportunities for small-scale devising throughout the programme and it devotes only one final-year module to screen acting.

Aims of the Project

An opportunity was therefore seen to draw on two of DIT's fundamental strategic aims – student-centred learning and engaging with industry – to create a project that posited two basic questions:

1. Through devising, to what extent can actors be more empowered in the creative process?
2. Through film-making, to what extent can the programme help students to be better prepared for film and television work and to promote themselves in the performance industries?

The aims of the project, which was positioned within the Contemporary Drama module in the final-year curriculum, were threefold. Firstly, the project aimed to position the students as creative artists, with the students drawing on personal material to create content, rather than their being interpretative artists cast in someone else's script. Secondly, the project aimed to provide students with experience on a film set with professional practitioners. Thirdly, the project aimed to provide an artistic product that, unlike a traditional theatre production, was able to be distributed to industry representatives, particularly via the students' own showreels (portfolios) and via online links.

Outline of Project

Stage 1

The methodology used for the creation of content for the films drew on Grotowski's "Statement of Principles", where the revelation of the actor's deeper self is put at the centre of performance (Grotowski 1995: 211–218) and Anne Bogart's strategies of composition (Bogart and Landau 2005: 137–161). While both were formulated in the context of theatre (and the methodology had been successfully implemented on previous theatre projects) Bogart's composition strategies draw heavily on film techniques such as montage and storyboarding and her emphasis on non-theatre spaces for performance can be directly applied to choice and use of location for film.

To provide unity for the project, the whole group of 19 actors agreed on a single question that everyone in the project would be pursuing. The question decided upon dealt with identity: how much of ourselves is really ourselves and how much is how we present ourselves to others? The group were divided into five small groups to begin devising around this question. Students accumulated material (personal stories, texts, images, music, sound) and set creative performance tasks to generate dramatic content. The staff director circulated among the groups to offer advice and suggestions when needed.

Milestones were set during October and November for which each group presented works-in-progress to the rest of the group and to the two co-directors and received feedback on the impact and dramatic viability of the performances.

Stage 2

In late November, deadlines were set for the final decisions on the location of each group's film and the final draft of each script. Other members of the professional creative team were brought in at this stage, being briefed on scripts, interpretation, consulting with actors on costume and props decisions and doing "recces" at the locations. Scripts were rehearsed and shot lists began to be formulated.

The shooting of the films took place over five days in December, with each film allocated one day's shooting. A "handing over" of sorts took place at this stage as, on the film sets, the actors were positioned solely as actors, while the production team made their creative decisions accordingly, based on their expertise. It should be noted that, for each shoot, one of the groups of actors that was not filming assisted with specific roles on set.

Stage 3

The final stage of the project occurred from January to May, after the end of the module, and involved the post-production process of picture and sound editing, music composition and picture grade. While the students' artistic visions were at the forefront of these processes, students' time constraints and the more highly technical know-how required for much of this process meant that the students were not directly involved in this stage.

In April a public screening was held for an invited industry and DIT audience at Cineworld Parnell Street. All five films were shown under the title "Who We May Be". Finally, in May the films were made available online through the DIT Conservatory's YouTube channel, with links emailed to industry stakeholders. Students were given access to the film files for possible inclusion in their showreels, which they were preparing for acting agents and casting directors.



Figure 1.1: Still image from *Fix*, one of the short films



Figure 1.2: Still image from *Boys' Club*, one of the short films

Evaluation and Conclusions

The project was evaluated through a combination of structured reflection by the students after the shooting of the films and, after the availability of the films online, through surveys of the cast and of industry stakeholders¹ and through interviews with the professional production team.

Making a short film

The clearest conclusion to be drawn was the positive significance of the opportunity to create a short film. All of the respondents from the cast said that acting in a short film should be an important part of the training on the programme, in addition to (rather than as a replacement of) the existing module in screen acting (91% saying "extremely important" and 9% saying "somewhat important"). An indicative student response was: "The course needs this film, as realistically when you leave college there are more auditions for film than theatre so we need to have this experience under our belts."

The members of the production team (two of whom have also delivered the screen acting module) emphasised how the context of shooting a short film raises the stakes of the acting compared to the screen acting module because of increased time pressures, increased numbers of personnel on set and the more comprehensive artistic considerations at work. Some 86% of industry respondents (e.g. agents, casting directors) felt that experience on a film set was important when considering an actor for work (29% "extremely important" and 57% "somewhat important"). One stakeholder commented, "Experience, or at least know-how [on a film set], is invaluable ... as long as the person understands their job, role and boundaries." The latter point about roles and boundaries was indeed something negotiated during shooting (see Stage 2 above). so here the project directly tackled an industry concern.

Devising

The positive significance of devising was another conclusion to be clearly drawn. Of cast respondents 82% said that it was important to them that they were co-creators of the film, rather than being cast in someone else's script (64% "extremely important" and 18% "somewhat important"). Further, 81% felt it was important that their own personal experiences formed part of the creative process, though this was less emphatic than being creators (45% "extremely important" and 36% "somewhat important"). Some 71% of industry respondents commented that they found it useful when a performance is created by the actor(s) performing, presumably because it gives an insight into the type of person they are considering hiring. Positioning actors as creative artists is therefore a help to the industry.

The co-director from industry commented that the personal investment by the actors gave the films an "edge" which they might not otherwise have had. He added, however, that the fact that the actors were creators could be an inhibiting factor at times, if the actor's focus strayed to the big picture rather than the essential "in-the-moment" aspect of good acting. The director of photography, who also happened to direct a short film (not devised from the actor's personal experience) with the final-year students at another major actor-training college, said that the devising element meant the actors experienced learning about themselves and about the demands of the process of original creation (i.e. how a creative idea can be realised cinematically). He agreed that, at their most successful, the films had edginess and originality. Citing one of the less successful films, however, he added that at times stronger intervention by the directors was needed to develop the cinematic language of the piece and give it a tighter, more effective narrative structure than the students provided.

¹ Response to the formal surveys was 12 out of 19 cast members and 7 industry stakeholders.

Engagement with industry and promotion

The project's engagement with industry had mixed results. The fact that the films were made with a professional production team was crucial for the students, with 91% of them asserting its importance (73% "extremely important" and 18% "somewhat important"). "It helped us to understand what it would be like working on a professional set," one cast member commented, "which is invaluable going forward into the profession". In all, 71% of industry respondents felt that actortraining courses need to put more emphasis on screen acting than they do at present. So a project such as this responds to that need in the industry in a comprehensive way.

Approximately 80 people from the industry and DIT community attended the screening in Cineworld Parnell Street and the YouTube links to the films were emailed to over 180 industry stakeholders in Ireland and the UK. As of July 2014, the average views of the films was 99, with 141 the highest views of a single film. While more needs to be done to increase the viewing figures, all industry correspondents cited the usefulness of an online link for viewing an actor's performance (71% "extremely useful" and 29% "somewhat useful") and the ongoing potential for increasing audience figures is a clear advantage over a theatre production.

Only 50% of the cast said they would use the film for their showreels and 20% said maybe. On the positive side, cast members using the films said that the films were "essential" to their showreels and "some of the best stuff I have". Reservations expressed included whether the film had "enough" of just themselves or whether the content was "appropriate" in terms of promotion. The 30% who said they would not use the film did not offer reasons. This might point to a possible discrepancy between the artistic criteria of the films and the needs of an actor regarding self-promotion; however, further investigation would need to be done to uncover the reasons behind the reluctance to use the films.

Overall conclusions

Overall, the project was creatively empowering for the student actors and has made them better prepared for work in the industry. A project such as this also serves a number of key industry needs. More work needs to be done to determine whether the final products can serve the promotional needs of more students.

Recommendations to DIT

Drama provision in the DIT Conservatory needs to respond to the importance that students and industry stakeholders accord to screen acting and experience on a film set. Embedding the making of a short film or films within the regular curriculum is one comprehensive way of doing that. To ensure students are prepared for film-making in the industry, it is imperative that the experience includes a professional production team. Whether that film is devised or not is a more open question, as the creative empowerment brought by devising could be provided within a theatre context instead, where devising is more established as a practice and the actors are more present in the final phases of creation (see Stage 3 above). This question should be dealt with, in the first place, at the level of the Programme Team. Finally, more sharply focused research needs to be done regarding students own promotional needs as actors and regarding generating interest from more industry stakeholders.

Proposed Future Work

A similar project should be developed in the near future. In addition to that, further research could be done in relation to how other training programmes in Ireland and the UK have responded to the increasing demand for screen acting and filmmaking. Collaborations might be possible with other film-making projects within the institute, provided the opportunity for the students to work with professionals is not sacrificed. The programme could also establish stronger links with organisations and key individuals in the film and television industry, along the lines of the links the programme currently has to theatre organisations and companies.

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2 Determining “best practice” methodologies in the pedagogy of tourism related fieldwork

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Abstract

This project explores issues around the practice of fieldwork related activity which is undertaken as a teaching and learning methodology in third-level education. The main focus in this project is to glean best practice examples from colleagues who undertake fieldwork in the broad area of Tourism education (encompassing hospitality, leisure and event management), but also related disciplines of Geography and Business/Management.

Having initially scoped out the available literature and explored the topic in strategic interviews with colleagues (Irish and international), it appeared that very little work has been undertaken heretofore on the particular angle being investigated – that of planning and managing fieldwork. A reasonably solid body of work exists on the learning outcomes of fieldwork (albeit very descriptive and focused on individual iterations – see Bibliography), but very little material has emerged related to the management of such activity.

In order to commence a dialogue on this topic, an online survey was administered, with a range of closed and open-ended questions. In total 152 usable surveys were returned, with 45% of respondents from Ireland, the remainder being from 29 different countries.

Overall, the project finds that educators who use fieldwork as a teaching tool are very enthusiastic about the practice and think deeply about the pedagogical value of this activity. However there are many concerns in evidence, ranging from health and safety, financing of trips, to the amount of additional time that is required to plan and manage such trips.

This project has merely opened the doors for a discussion, but the enthusiasm of respondents and their desire to engage with any future action suggests that a rich vein of research has just begun.

Keywords: *fieldtrips, pedagogical methods, tourism education*

Introduction

With increased workloads and larger class sizes, academics and institutions across Ireland (and internationally) are suffering the impacts of terminology such as rationalisation and increased efficiencies. This leads programme planning groups to identify areas where non-essential and “extra” activities are being cut back or even eliminated.

As a researcher/lecturer I come from a Geography background, whereby fieldwork is an integral component of many modules, and I have continued to utilise Geography-influenced pedagogical approaches in the teaching of tourism-related modules. However, with increased external influences such as concern over “health and safety”, insurance, liability, not to mention the time element of organising and running fieldwork related activities, I have begun to question whether the benefits I see in fieldwork might be achieved more efficiently in other ways.

The purpose of this project is to commence a dialogue with colleagues in Tourism, Geography and other related disciplines, to explore this social/educational tool, and begin to develop guidelines and frameworks for more efficient and more effective fieldwork activities. Some of the objectives set at the outset were to examine:

- current best practice,
- limitations (human and institutional),
- aims and objectives (why do we do it),
- logistical frameworks (overnight versus daytrips etc.)
- educational evaluation processes (how we assess the activity).

Outline of Project

Phase 1: Literature review

This initial phase involved scoping of extant literature (see sample bibliographical information at end of this paper) and seeking buy-in from colleagues within DIT, more broadly within Ireland and internationally – mainly in the Tourism discipline, but also in other areas such as Geography.

Phases 2 and 3: Strategic conversations – best practice and international best practice

The next phase was highly qualitative and involved one-to-one strategic conversations with programme tutors, lecturers and administrators. These elements were undertaken via telephone Skype and in person, face-to-face.

Portions of this work were undertaken at the Travel and Tourism Research Association International conference which provided an opportunity to undertake a range of conversations with international colleagues in a relaxed and convenient situation.

Throughout the various conversations, it emerged that a broad range of activities/practices and methods are being utilised by colleagues, and that therefore a survey could/would yield valuable results in a more efficient manner. Thus, a 20 minute broad-spectrum survey was developed and distributed to approximately 1,000 respondents, the large majority being known or linked via research networks to the researcher. The final result was 152 completed surveys. A larger response rate could have been attained by broadcasting the survey via listservers/facebook pages, but it was felt that this may be utilised at some future stage in seeking more refined answers. Because of the “scoping” nature of the survey, it was felt more appropriate to only deal with respondents who would know or be acquainted with the researcher.

Phase 4: Development of best practice guidelines

What has been learned from this research has been distilled and refined into a set of themes regarding best practice and, ideally, with further work will lead to the development of best practice fieldwork guidelines. It is expected that these will be produced using a Delphi-style research model, utilising the enthusiasm and expertise of the various participants (national and international) who responded to the survey. The first stage of this process will be the development of material to be “tested” in a conference presentation in December 2014.

Phase 5: Dissemination

The researcher will offer papers at a number of conferences and will publish findings in the form of book chapter(s) and academic paper(s).

Preliminary Findings

The findings from the survey are very extensive, and I have only begun to explore them in detail. The following sections illustrate some of the richness of this material.

Operational elements

This section illustrates how academics perceive the importance they, their students, and their institutions place on various logistical elements of fieldwork. Interesting patterns emerge, such as institutional interest in “insurance” and student interest in “fun”.

Educational issues

Figure 2.1 illustrates the importance that the academics place on the learning/educational aspects of fieldwork. The large majority (90%) claim that such aspects are very important, however, they feel that this importance is not placed on fieldwork by either students or their institution (50% and 53% respectively in the “very important” category).

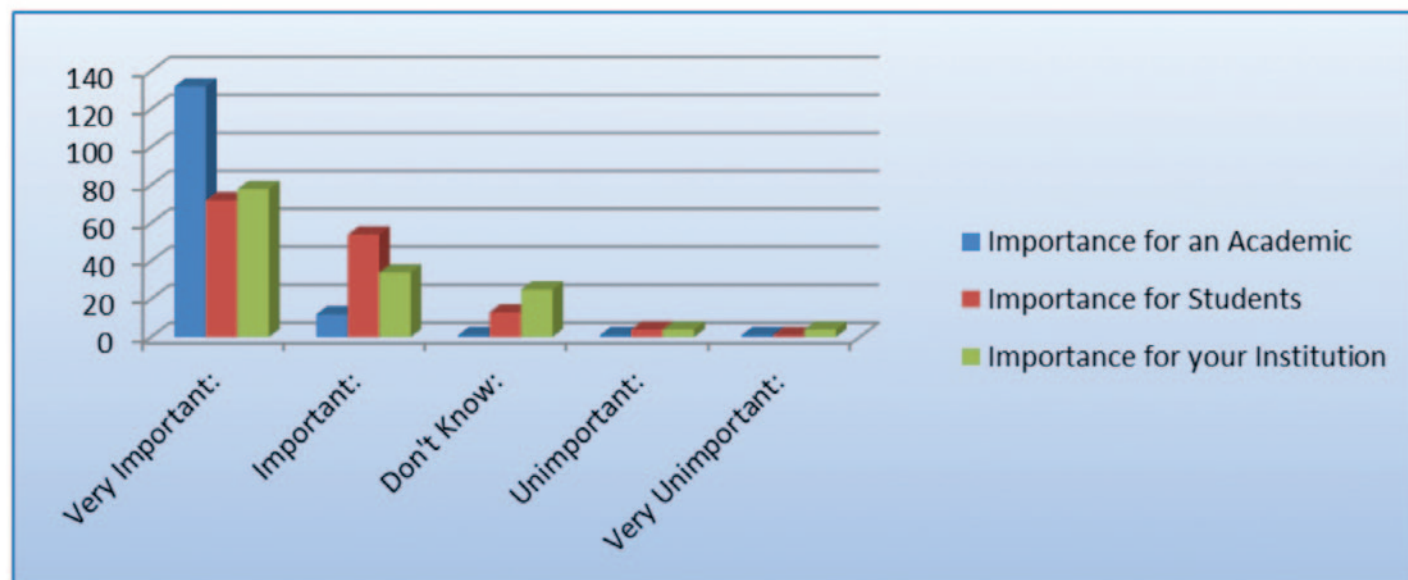


Figure 2.1: How important are learning/educational issues?

Logistics

A number of discussions undertaken in Phase 2 of the project suggested the importance of correctly and effectively planning and organising fieldtrips. This importance is reflected in Figure 2.2. Interestingly and somewhat curiously, 13% of academics feel that students place little or no importance on the logistical issues regarding fieldtrips.

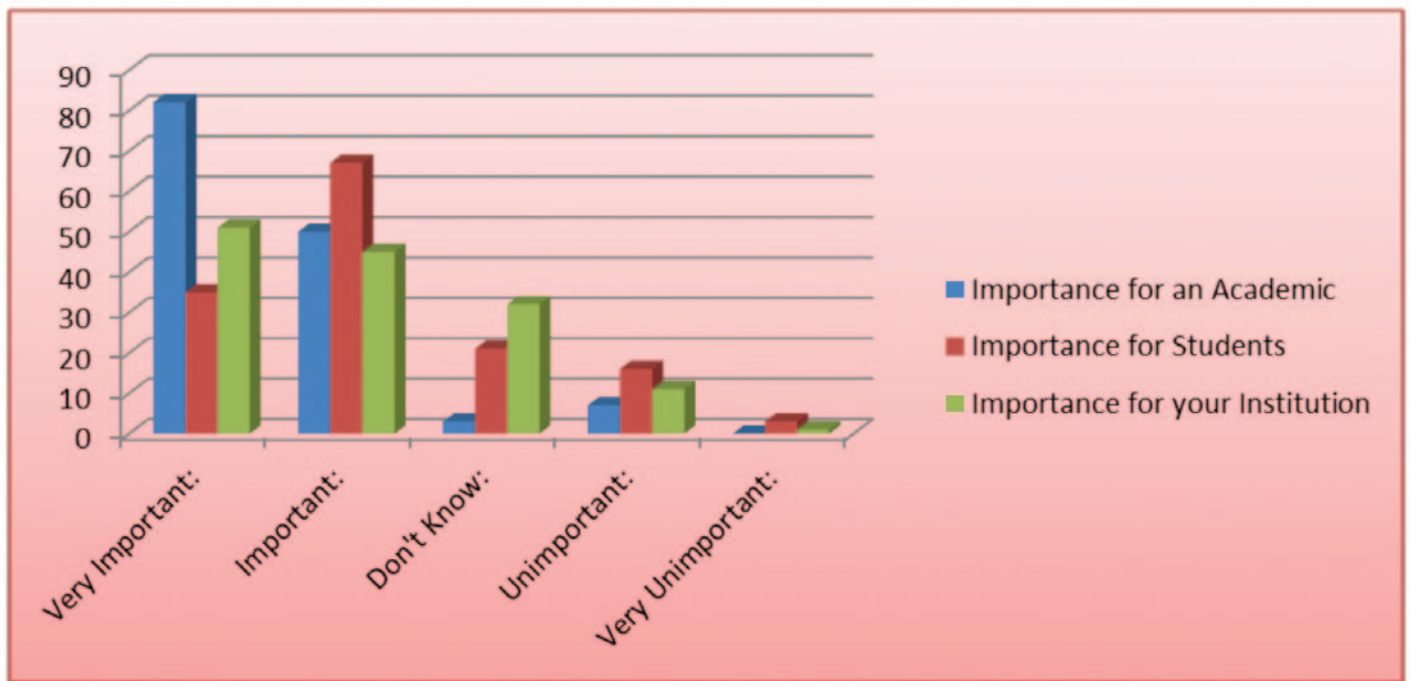


Figure 2.2: How important are issues of logistics?

Insurance

In an increasingly litigious environment, it is not surprising that insurance is seen as being important for both academics (81% of academics see insurance as important or very important) and institutions (88% regard insurance as important or very important). The unimportance of insurance for students (only 46% viewing it as important or very important) raises various issues, and perhaps suggests that students could be encouraged to take more ownership of such issues, which potentially have major importance in their future careers. For instance, many of the respondents working in tourism and hospitality education are producing graduates who will be dealing professionally with travel-related activity in the near future.

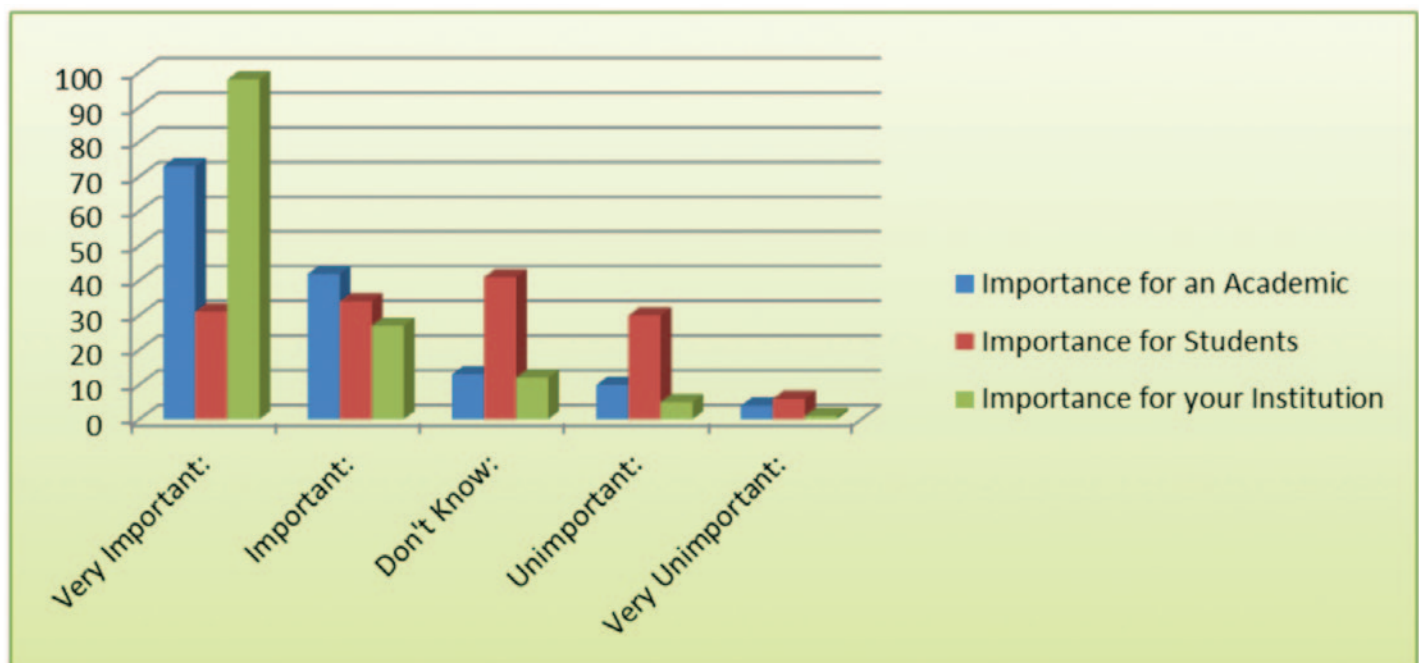


Figure 2.3: How important is insurance?

Health and safety

Mirroring the views of insurance outlined above, Figure 2.4 demonstrates that students place little importance on issues related to health and safety, whereas this issue is very important for 74% of both academics and institutions.

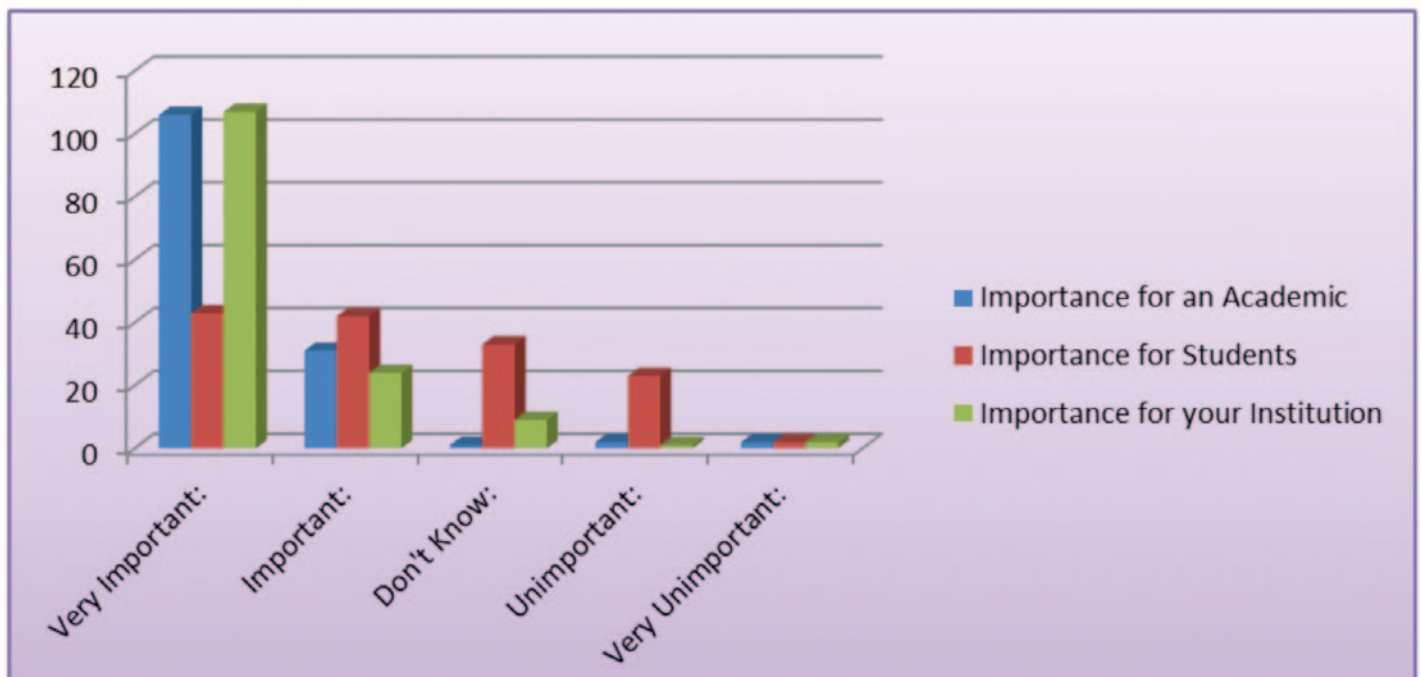


Figure 2.4: How important is health and safety?

Fun

The respondents (as demonstrated in Figure 2.5.) suggest that while fun is more important for students than academics, both see the importance of fun in fieldtrip activity. In total 82% of academics see fun as either important or very important, whereas 93% of academics suggest this is the case for students. The unimportance of fun for institutions is clearly evident, as is the fact that 15% of academics see fun as unimportant (13%) or very unimportant (2%).

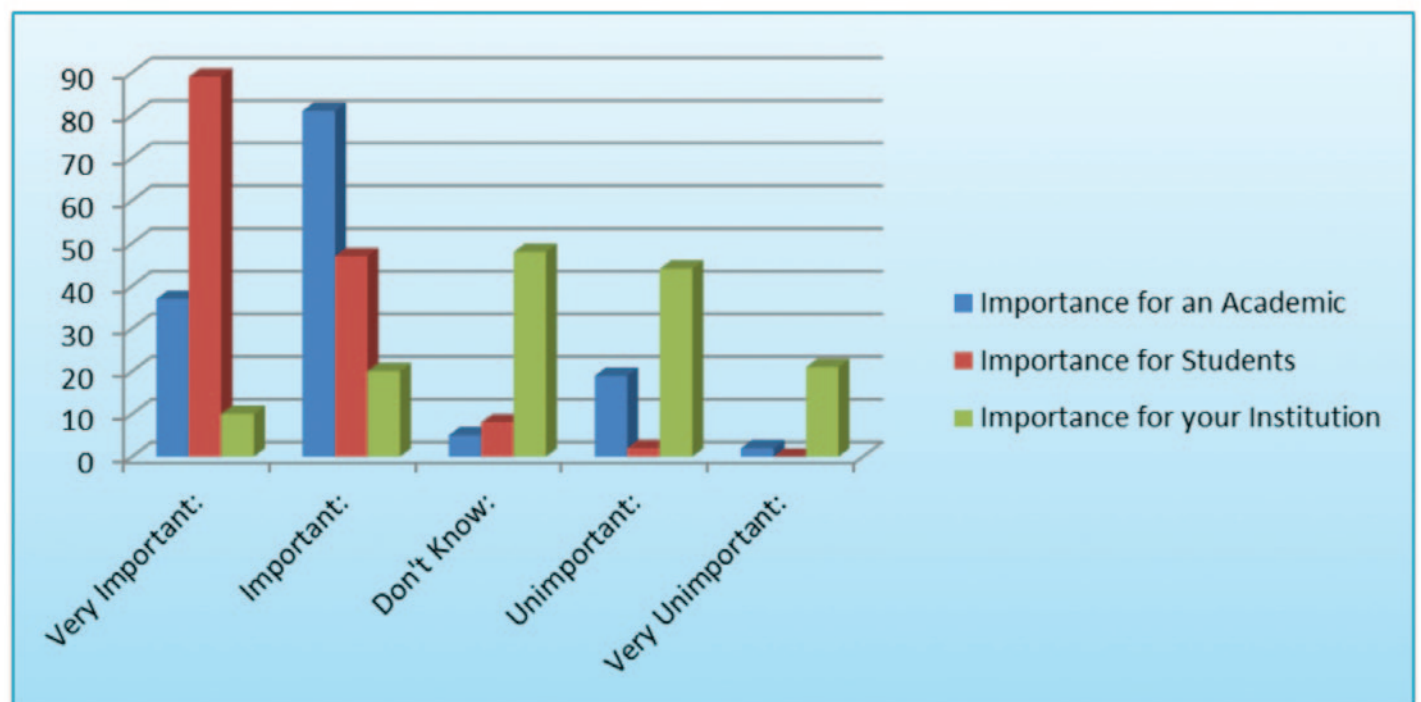


Figure 2.5: How important is fun?

Educational alignment

Figure 2.6 clearly demonstrates the importance for academics to have fieldtrips aligned to their educational objectives. For 75% it is very important and for a further 21% it is important. Students are least interested in educational alignment (11% unimportant or very unimportant) whereas only 4% of institutions are perceived to view this element as unimportant.

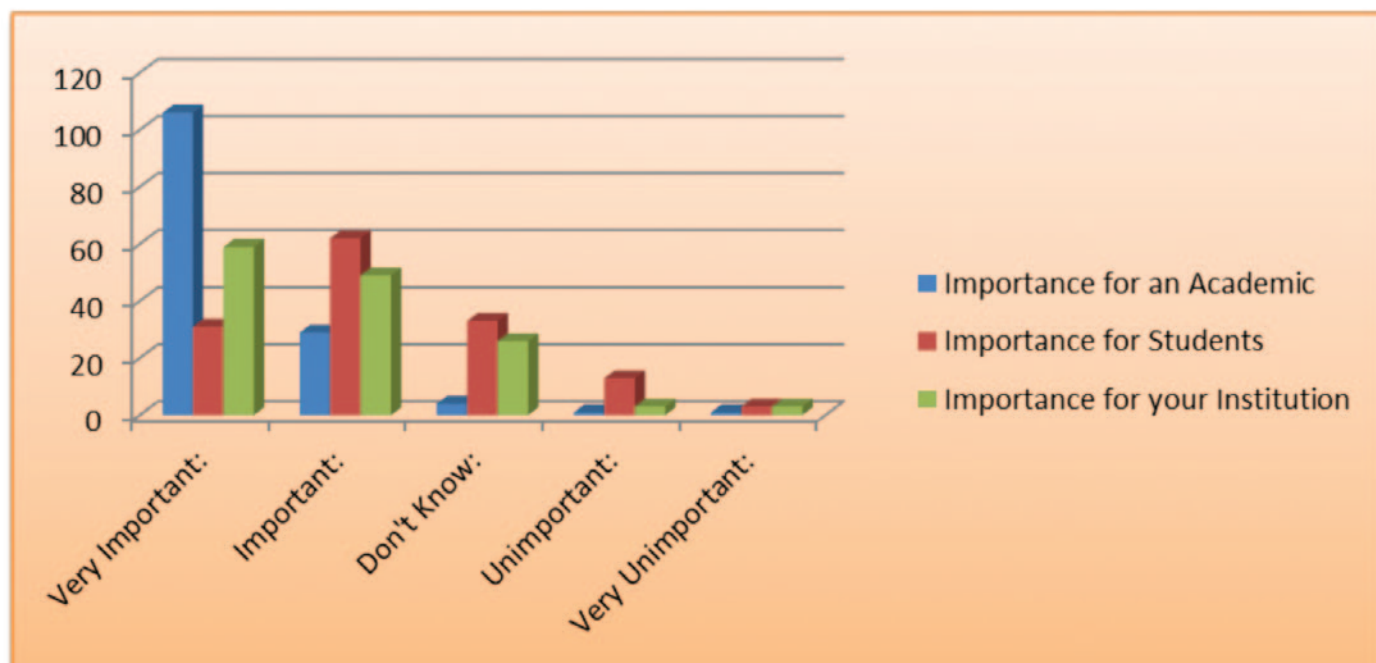


Figure 2.6: How important is educational alignment?

Educational considerations

Most important elements of fieldwork

Table 2.1 illustrates the many different elements that the academic respondents include in their fieldwork activities. While social elements (35%) and nightlife (8%) are important to some, the large majority of important activities are related to pedagogical and programmatic motives (i.e. observation, 88%; talks by professionals, 78%; walking tours, 55% etc.).

Activity	No. Respondents	% Respondents
Observation	134	88.2%
Talks by professionals on-site	118	77.6%
Walking Tour	83	54.6%
Recording – photography	78	51.3%
Survey work of landscape / facilities etc	63	41.5%
Interviewing locals / tourists	63	41.5%
Socialising	53	34.9%
Bus Tour	36	23.7%
Nightlife	12	8.0%
Other	12	8.0%

Figure 2.1: How important are learning/educational issues?

Evaluation of fieldwork learning

Educational feedback/assessment is important for many of the participants, with a broad range of methodologies being employed. Many participants utilise a variety of assessment methods, with Table 2.2. outlining the main approaches taken. The interesting finding from this is the broad range of summative and formative methods of assessment.

Activity	No. Respondents	% Respondents
Feedback sessions (formative)	86	56.6%
On-trip activity (formative)	73	48.0%
Integrated into my module assessments	72	47.4%
Essay style report	65	42.8%
Unstructured feedback from participants	57	37.5%
Word of mouth	26	17.1%
Integrated into a variety of module assessments	24	15.8%
Other	16	10.5%

Table 2.2: Assessment methods

Issues and challenges

Biggest issues and challenges

Interestingly, when asked to identify the category of challenge which they found to be most difficult, only 9.7% of respondents find educational challenges to be the most important, whereas by far the largest challenges (53.1% of respondents) are seen as operational and logistical. In total, 29.7% of respondents cited bureaucratic challenges as being the most difficult to deal with.

Educational challenges:	9.7%	14
Logistical / operational challenges:	53.1%	77
Bureaucratic challenges:	29.7%	43
Other (please specify):	7.6%	11

Table 2.3: Biggest challenges in organising fieldtrips

Biggest challenges

Figure 2.7 outlines the answers presented when respondents were asked to comment on what they saw as the single most challenging issue for fieldtrip organisers. Health and safety issues are of concern for many of the respondents, finance of costs are challenging for others, while many have concerns about the amount of time that this form of activity takes. Basic logistics and the level of paperwork involved are further issues. Interestingly, very few educational challenges were expressed, other than the challenge of motivating some of the students involved and some comments on the absence of guidance or training from institutions.

Evaluation and Conclusions

The main evaluation of this project will be peer response/reaction to the formal outputs of the work; these will be in the form of a conference paper and a book chapter.

In addition, all participants were invited to comment/provide feedback. The following word cloud summarises the various comments that were made.



Figure 2.9: Feedback word cloud

Recommendations to DIT

Analysis of the findings is at too early a stage to provide detailed recommendations to the DIT. However, some preliminary findings include the following.

- Respondents clearly emphasised the importance of “experience” when organising fieldtrips; therefore the institute should consider formally supporting communities of best practice in this area.
- Funding is a major issue for colleagues in Ireland and abroad; therefore if pedagogical outputs are important, the institute should explore creative ways of financially supporting colleagues who undertake fieldwork.
- Throughout the survey, colleagues note that the passion of individuals drives this form of academic activity, however they also comment that organising and running fieldtrips is very time consuming and this activity is usually undertaken over and above an academic’s timetabled work.

At a later stage of the research, best practice guidelines and recommendations will be presented to the Institute.

Proposed Future Work

Follow-up research (in the form of more focused identification of a Best Practice Model) is being planned by the researcher. In the meantime, the current work will be presented at a well-regarded academic conference in December 2014, and will be disseminated through a peer-reviewed book chapter in 2015.

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College of Business

2 Towards entrepreneurship learning outcomes in business education and beyond – Next practice? Design and guidance

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Abstract

High growth economies can be differentiated from low growth economies by their high investment in knowledge, low knowledge filter and high levels of entrepreneurial capital. These states help create entrepreneurial capital by providing their citizens with opportunities to learn to be more enterprising in their pursuit of value creation and capture. What should be taught, how and what are the appropriate learning outcomes of entrepreneurship education and training (EET) then become the relevant questions. This paper reviews the relevant EET literature, assesses current thinking and practice and concludes, in the absence of empirical evidence in favour of a particular pedagogical approach, that a portfolio of practicebased methods is an appropriate approach to developing value-based learning outcomes at this time. These pedagogical approaches focus on students' attempts to create and capture value by experiencing, playing, observing, creating and reflective thinking, and not just understanding, knowing and talking as in more traditional approaches (Neck and Greene 2011). The paper concludes by suggesting a framework for assisting the leadership group in DIT in developing appropriate entrepreneurial learning outcomes at Institute, College, School, Programme and Module levels.

Key words: *business creation, entrepreneurship learning outcomes, value creation*

Introduction

High and low growth regions or sovereign states can be differentiated in terms of their high investment in knowledge, low knowledge filter and high levels of entrepreneurial capital (Acs et al. 2004). Thus in regions where high levels of entrepreneurial capital have been created, entrepreneurial learning and behaviours diffuse across other value creating areas in society such as the social, community, family, education and government sectors. Baumol (1990) reminds us that "the entrepreneur is always with us" and that entrepreneurial thinking and behaviour is determined by the opportunity and incentive structures in place in the state. Entrepreneurship therefore can be productive, unproductive or destructive. Supportive entrepreneurial and innovation ecosystems (Edquist and Hommen 2008; Lundvall 2010) encourage citizens to be more enterprising by providing them with the opportunities to develop the knowledge, skills and abilities (KSAs) (Mincer 1958; Becker 1964) relevant to value discovery, creation, capture and evaluation. Individuals living in such a supportive entrepreneurial society can therefore learn to be more enterprising (Kuratko 2005; Drucker 2007). Garavan, Birdthistle, Cinnéide and Collet note in the context of Ireland that:

Business educators and policy-makers in Ireland have evolved beyond the myth that entrepreneurs are born not made. Given that Ireland's major growth is partially explained by the creation of new ventures, the question of whether it is possible to teach entrepreneurship has become redundant. The more pertinent question focuses on what should be taught and how entrepreneurship programmes should be structured and delivered to ensure a sufficient supply of entrepreneurs and the development of entrepreneurial thinking.

(Garavan et al. 2010: 243)

Outline of Project

The College of Business in DIT, through its Entrepreneurship Educators Strategy Group (EESG 2013), undertook a review of entrepreneurially related learning and teaching in the College of Business. The group identified diverse and innovative approaches at module level, but less coherency in College and Programme level pedagogies underpinning entrepreneurship education. From this analysis it became apparent that knowledge gaps exist in the area of entrepreneurship learning outcomes in business education. It was suggested that this might be addressed through improved course design, support for staff and appropriate assessment criteria. The fellowship objective therefore was to develop shared entrepreneurship learning outcomes that might be achieved in every undergraduate and postgraduate programme in the College of Business.

The initial question addressed therefore is: In teaching entrepreneurship, what are we trying to achieve? Is it students that understand entrepreneurship and business start-up planning? (Module level learning outcome) and/or is it students that will have an entrepreneurial orientation in the broader economic and social contexts? (Institute, College, School and Programme level learning outcome). It will be argued that entrepreneurial module level outcomes are important for undergraduate students in building

fundamental skills and confidence. The more strategically important goal is for all students to develop entrepreneurial mindsets and entrepreneurial capabilities which can lead to entrepreneurial effectiveness (Quality Assurance Agency for Higher Education 2012). Graduates possessing these entrepreneurial attributes, it is further argued, will survive and thrive “in a world characterised by increasingly greater levels of uncertainty and unknowability” (Neck and Greene 2011: 67–68). The output of this project is the development of appropriate learning outcomes which can contribute to the development of entrepreneurial behaviours, skills and attributes (entrepreneurial capital) in all graduates of the College of Business and then in other Colleges within the Institute. A second objective is to develop a guide for programme teams on how to incorporate these learning outcomes into their programmes. (This guide will be developed after the completion of the fellowship.)

Evaluation of the Project

The project was evaluated by firstly reviewing the literature on entrepreneurial education outcomes to identify the current state of thinking in the area. The literature is also utilised to identify possible trends in “best” and “next” practice. This literature review was followed by attendance at the International Council for Small Business (ICSB) World Conference on Entrepreneurship in Dublin, held from the 11th to 14th June (www.icsb2014.org). The author, a member of the local organising committee, participated in sessions on the “Entrepreneurship Education” track and also attended relevant sessions at the pre-conference entrepreneurship policy day and consulted with key informants in the area.

Literature Review

It is important to set the context for the literature review. DIT has developed its graduate attributes for enhanced employability (the 5 Es) which were approved by Academic Council in 2013 (DIT GA Working Group 2013). These are the graduate attributes which DIT ideally would like its graduates to have upon graduation from the Institute. These are graduates who are: ENGAGED, ENTERPRISING, ENQUIRY-BASED, EFFECTIVE and EXPERT. The relevant E for this paper is ENTERPRISING. See Figure 3.1 below.

Graduates who have the skills, knowledge and attributes needed to apply creative ideas and innovations and to find practical solutions.

Creative, motivated self-starters, curiosity, discovery, entrepreneurs, well-organised, self-managers, ethical, excellent communicators, career development skills.

Since 1992 DIT Hothouse entrepreneur development programme has assisted over 250 new firms to create 1,000 jobs and has licensed over 40 new technologies to multi-nationals and Irish SMEs.

Figure 3.1: DIT an enriched educational experience – enhancing employability

The desired graduate attributes for the enterprising graduate raises the question as to what “constructively aligned” curriculum design, learning and teaching methods and assessment strategies might be deployed to deliver an “enterprising” graduate. Using the lens of human capital theory (Mincer 1958; Becker 1964) – similarly used by the DIT “Cross-Institute” group above i.e. knowledge, skills, abilities/attributes (KSAs) – Martin, McNally and Kay (2013) undertook a meta-analytic review of the outcomes of 42 studies (N = 16,657) in the entrepreneurship education and training (EET) outcome domain. The authors were essentially examining the levels of human capital formation in entrepreneurship education. Previous work highlighted the lack of consistent evidence showing that EET helps to create more or better entrepreneurs. This study was the first quantitative review of the literature, and in the context of human capital theory, found that there is support for the value of EET and by extension entrepreneurship learning outcomes. However, it is the nature of the relationship between human capital development and EET that provides most interest for this paper. It was found that the relationship between EET and entrepreneurship outcomes is stronger for academic-focused EET interventions than for training-focused EET interventions. This indicates – once again by extension – the greater potential for deeper entrepreneurship learning outcomes in the academic setting. Whilst large unexplained variation exists and evidence of heterogeneity remains in many of the correlations, the study is significant nonetheless and sets a benchmark in the domain. Finally the Martin et al. study finds that many of the papers reviewed in the meta-analysis had low methodological rigor and that these studies tended to overstate the effects of EET. Only 6 of the 42 studies in the meta-analysis had randomised assignment.

The Martin et al. study, along with that of Unger et al. (2011) put the quality of the empirical evidence from this area in context and demonstrate that much (rigorous) research remains to be done in the area before more definitive conclusions might be drawn on the relative importance of various entrepreneurial learning outcomes. More worrying is the reliance placed by policy makers in Ireland and the UK in the past on the conclusions drawn from methodologically weak empirical studies. Many of these studies are exploratory in nature and therefore are unsuitable for generalising to wider or other populations. However the lack of rigor in the evidence assembled to date has not stopped policy makers and other interested stakeholders in the domain from producing guidelines on how HEIs might teach enterprise and entrepreneurship education. The Quality Assurance Agency for Higher Education (2012) in the UK for instance used a distinguished panel of academics and others representing their partner organisations (and the work of Gibb 2005) to produce “Guidance for UK Higher Education Providers” in enterprise and entrepreneurship education. Figure 3.2 below sets out the key inputs and expected outputs of the entrepreneurship education process.

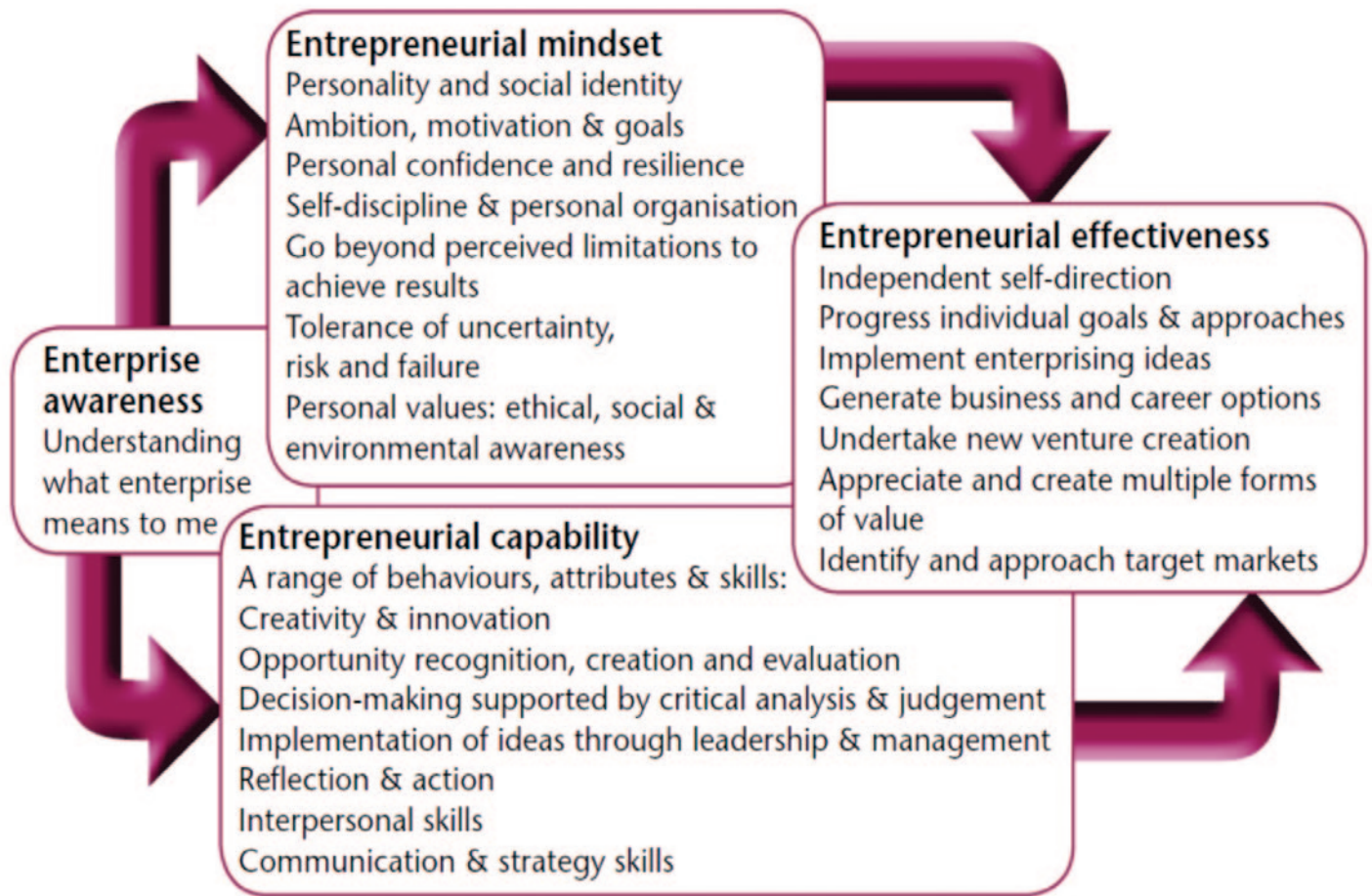


Figure 3.2: Enterprise and entrepreneurship education – Guidance for UK higher education providers

Source: Quality Assurance Agency for Higher Education (2012)

This framework is an interesting conceptualisation of the proposed journey the student will take from initial enterprise awareness through developing her mindset and capabilities and on to entrepreneurial effectiveness. Indeed the desired entrepreneurial effectiveness attributes could be re-configured as desirable learning outcomes. Pittaway and Greene (2006; 2007) undertook a systematic literature review of the evidence in the UK. Their findings supported the view that EE has had an impact on student propensity and intentionality. However, it was unclear the extent to which such education impacts on the level of graduate entrepreneurship or whether it enables graduates to become more effective entrepreneurs. The findings also highlight a lack of consensus on what entrepreneurship education actually is when implemented in practice. Pittaway and Greene further highlight the many pedagogic contradictions in the domain. Their unavoidable conclusion is that there is much research to be done in tracking student careers and employers' demand for "enterprise skills". Indeed further research is also required to begin to understand how different approaches to entrepreneurship education and training achieve different things (European Commission 2008). Martin et al. (2013) broadly come to the similar conclusions in their meta-analysis on the need for more rigorous research into the impact of specific pedagogic approaches and intervening variables.

In Ireland similar analyses/reviews have been undertaken ostensibly to establish the state of play in the entrepreneurship education space (Cooney and Murray 2008; HETAC 2009; Garavan et al. 2010). Key findings of the HETAC report for instance show that:

- Of undergraduate students surveyed 78% expressed an interest in starting their own business at some point in future.
- Entrepreneurship education is not readily available to all students, is fragmented and delivered mainly only in business schools.
- There is a lack of communication about, and visibility of, entrepreneurial supports and policies.
- There is insufficient joined-up thinking between institutions, academics and practitioners.
- Despite some initiatives, industry engagement with the third-level sector is neither widespread nor intensive in Ireland.
- Entrepreneurship education is under-resourced and lacks an articulated strategic policy.
- Higher education institutions need to adopt a framework to embed entrepreneurship education across all disciplines.
- Experiential learning, not theory-based lectures, will most benefit entrepreneurial students.

Garavan et al. (2010: 240–241) outline the characteristics of entrepreneurship education in Ireland to similar effect, highlighting the lack of coherence across the domain. The lack of coherence can be partially explained by the absence of a national entrepreneurship policy and by extension a national entrepreneurship education policy (European Commission 2012). This despite repeated calls for both (Cooney 2014).

HETAC (2009) also suggests in Section 3 a list of the possible learning outcomes as follows.

- Entrepreneurial behaviour, attitudes and skill development
- Creating empathy with the entrepreneurial life world
- Key entrepreneurial values
- Motivation and entrepreneurship career
- Understanding of process of business entry and tasks
- Generic entrepreneurship competences
- Key minimum business how-to
- Managing relationships

This is a generic list of possible outcomes which are further subdivided in the report into areas relating to the headings above. It is not immediately obvious from the listing what should take priority and unlike the Quality Assurance Agency for Higher Education (2012) report above, there appears to be little attempt to link the learning outcomes to the entrepreneurial mindset, capabilities or indeed enterprise awareness. Nevertheless tools and templates are provided to help the educator with the learning outcomes under the eight key themes identified.

Indeed the ICSB conference papers (2014) in the education track also provided some insights on practice from a variety of countries around the world; however, most papers did not focus on entrepreneurial learning outcomes per se with the majority of the empirical papers covering relatively short periods of time. Most papers were also of an exploratory nature reflecting the difficulties researchers have in accessing appropriate longitudinal datasets.

In sum it appears that the development of learning outcomes in the entrepreneurship education and training area appears to have made little progress over recent years other than to provide lists of desirable outcomes (developed intuitively or based on research lacking rigor) but the extant literature offers, in the main, little theoretical or practical guidance on how these outcomes might be achieved through curriculum design and learning and teaching methodologies. Accessing the state of play in the entrepreneurship education domain, Neck and Greene (2011) reverted to first principles and reevaluated how entrepreneurship education is taught at third level and how it might be taught in future given the increasing complex, uncertain and unknowable world inhabited by students. Taking an educator's perspective, the authors state that the responsibilities of entrepreneurship educators is to develop the discovery, reasoning and implementation skills of their students so that they can survive and thrive in uncertain and unknowable environments. Entrepreneurship is about future opportunities but many of the tools and techniques used are not fit for purpose.

Many techniques are more suited for benign and predictable environments as experienced in the past. Entrepreneurship is a multidisciplinary field – it requires knowledge of many areas by the teacher but the end goal in all cases is value creation and capture. Entrepreneurship is therefore a key engine for creating personal, economic and social value in society.

Neck and Greene therefore propose a paradigm but not a new pedagogy for teaching in a new world. It is a conceptual approach to teaching entrepreneurship as a METHOD. This method goes beyond mere understanding, knowing and talking as in previous approaches and embraces using, applying and acting. In a word, practice becomes more important. In developing the new framework Neck and Greene were heavily influenced by effectuation principles (Sarasvathy 2008). This new approach has major implications then for learning outcomes. Table 3.1 contrasts this new approach with more traditional approaches.

	Entrepreneur World	Process World	Cognition World	Method World
World of	Heroes, myths and personality profiling	Planning and prediction	Thinking and doing	Value creation
Focus	Traits, nature v nurture	New venture creation	Decision-making to engage in Entrepreneurial activity	Portfolio of techniques to practice Entrepreneurship
Level of Analysis	Entrepreneur	Firm	Entrepreneur & Team	Entrepreneur, Team & Firm
Primary Pedagogy	Business basics, lectures, exams, assessment	Cases, business plans, business modelling	Cases, simulations, scripting	Serious games, observation, practice, reflection, co-curricular, design
Language	Locus of control, Risk taking, propensity, tolerance for ambiguity, need for achievement	Hockey stick, projections, capital markets, growth, resource allocation, performance	Expert scripts, heuristics & decision- makings, Schema, mental models, knowledge structures	Practice, self-knowledge, fit, action, do-learn, co-creation, create opportunities, expect & embrace failure
Pedagogical Implications	Description	Prediction	Decision	Action

Table 3.1: Known worlds and new frontiers

Source: Neck and Greene (2011)

The method approach applies equally to novice and expert and thus applies across student populations. It is inclusive and therefore success is both idiosyncratic and multidimensional. It requires continuous practice; do–learn and not learn–do as in traditional approaches. Reflective practice thus becomes increasingly important for learning outcomes. The method proposed is therefore suitable for unpredictable environments. The teacher is empowered to experiment with a pedagogical portfolio that emphasises diverse tools and techniques (Table 3.2). These approaches are broken down into four discrete primary pedagogies: Starting businesses (practice – experiencing/feeling); Serious games and simulations (play); Designbased learning (create, co-create) and Reflective practice (deep learning, see Marton 1975) i.e. reflection-on-practice, reflection-in-practice (Schön 1987). Expected learning outcomes then are based on the students’ attempts to create value by experiencing, playing, observing, creating and thinking. Each learning outcome depends on the pedagogical approaches utilised. Learning outcomes can be stated in tangible terms. These learning outcomes can be delivered by improved Programme/Course design, support for staff and appropriate value-based assessment criteria. Table 3.3 shows how this might be applied to an entire Master’s Programme in DIT.

Recommendations to DIT

Based on the secondary and primary research conducted for this project and the authors’ experience of programme management and teaching on entrepreneurial programmes, the following recommendations are made to DIT.

1. The knowledge, skills and aptitudes developed in the student in entrepreneurial education and training (EET) is a fundamental building block of economic growth in the small open state. It is therefore recommended that DIT take a lead as the entrepreneurial institute and make it a requirement that all level 6–9 courses, not only in the College of Business, but across the Institute adopt the METHOD approach to teaching Entrepreneurship at firstly College, School and then Programme level before the approach is adopted at module level.
2. To champion the above approach it is recommended that the Institute appoint a senior Institute manager with domain expertise to work with the Colleges to embed the entrepreneurship education agenda across the Colleges.
3. It is recommended that the Institute first pilot the approach in one school in the College of Business, Arts and Tourism, Engineering and Built Environment, Science and Health so that treatment and control groups can be established to allow rigorous longitudinal research to be undertaken during the embedding phase.
4. It is finally suggested that the output of the above-mentioned research would provide the HEA with clear evidence that DIT/ TU4D is an entrepreneurial university in the making.

Year Of Programme	Primary Pedagogies/Tools/Techniques Do-Learn-Think	Programme design – Curriculum development	Support for Staff – Learning & Teaching methodology	Assessment criteria – Formative, Summative	Learning outcomes
1	Experiencing/practice/feeling businesses/Projects	Starting Business Plan Charity Project Consultancy project	Requires teachers with business planning and consultancy skills	Dragons Den Funds raised Delivering on brief	Value Discovery, Value creation, Value capture, Value evaluation Implementation Failure
1	Playing Playing Serious games and simulations	Not curriculum	on No staff using tool/technique on programme	Competitions Win/loose	Embrace/accept success and failure
1	Observing Field trips/Experiments/field research	Consultancy project Thesis	Requires teachers with consultancy and research KSAs	Quality of research	Evaluation of value Contributing to value creation
1	Design based learning Creating, co-creating	Product Development module	Requires teachers with innovation management, product development KSAs	Innovativeness of new market offering	Value discovery Value creation
1	Reflective practice Thinking	Consultancy project Charity project Thesis	Requires teachers with critical and reflective thinking skills.	Reflective journals Feedback on performance – formative/summative Presentations Thesis grade/Viva	Reflection on practice Reflection in practice

Note: M.Sc(Business & Entrepreneurship) in the School of Marketing, College of Business, DIT is used for illustrative purposes. The elements in the programme which go beyond understanding, knowing and talking and embrace using, applying and acting. It is important to remember that the first semester in particular contains the foundational building blocks which allow for the the more practice orientated modules on the programme.

Table 3.2: Entrepreneurship learning outcome matrix at programme level in Institute/College/School

Future Research

The entrepreneurship education and training domain is an area requiring ongoing rigorous research to allow researchers to investigate the relationship between various pedagogical approaches, learning outcomes and subsequent career entrepreneurial performance. This will require robust methodological approaches, adequate samples, control groups and longitudinal data for tracking student trajectories. This is a fertile research area for student researchers at undergraduate, postgraduate and doctoral levels.

At the ICSB conference held in Dublin on the 11–14 June 2014, Jenny McDonnell, Lecturer in the College of Business and the author identified a tracking index IPE-GEST (developed for the international GEST study) for the entrepreneurial propensity of University students by Ruda et al. (2014) which was presented by one of the authors Dr Rubén Ascúa. This index may allow us to join an international consortium for tracking student entrepreneurial intentions. This would be the first step in tracking students through their career trajectory.

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College of Engineering and the Built Environment

4 Online resources platform for mathematics education

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Abstract

The aim of this project was to develop and explore the use of a Sharable Content Object Reference Model (SCORM) integrating a web-based platform for the study of mathematics as part of an active learning environment. The platform was designed to provide active support to engineering students especially those in their first year of study. Early use of the platform can identify possible areas of weakness and provide the self-learning environment required for students to become more proficient in areas where they are lacking key skills or are finding the concepts difficult to understand.

The platform consists of a set of tests and applications for the study of engineering mathematics. The tests can adapt and change depending on the answers provided by the student, including video feedback for incorrect answers before the student progresses to the next question. Based on the idea that teaching a concept is the best way to learn that concept, the students become actively involved in the platform as they create the videos that provide feedback to the other users of the platform. This active learning, constructivist approach provides an environment of achievement and ownership that allows students of all levels to enjoy the learning experience.

Keywords: *active learning, graphic tablets, mathematics education, online quiz, videos*

"Tell me and I forget, teach me and I may remember, involve me and I learn."

Benjamin Franklin

Outline of the Fellowship Project

Introduction

The role of mathematics in the education of engineers and other STEM (Science, Technology, Engineering and Mathematics) related disciplines is widely accepted. Students who possess weak mathematical skills generally struggle to reach the learning outcomes of technical modules, display poor engagement in module content and have issues with retention (Russell 2005; Carr, Bowe and Ni Fhloinn 2010; Sheridan 2013). The use of a standard maths diagnostic test (MDT) to evaluate core competencies has revealed that many students entering higher education do not possess the full suite of mathematical skills required to succeed in technical programmes (Carr et al. 2013; Marjoram et al. 2013).

Using technology as an aid to teaching and learning is widely discussed in research literature (Pinder-Grover, Green and Millunchick 2011; Yoon and Sneddon 2011; Carrillo et al. 2013). In the highly technological world of today communication methods and styles can be quite diverse. Having grown up in this environment the student of today is quicker to embrace technology and adapt to changes as they are introduced. This flexibility presents many opportunities to exploit the diversity of learning and communication styles, and so, in order to engage the student, the educator needs to communicate with a similar set of tools.

In the traditional approach to learning outlined by Bovill, Cook-Sather and Felten (2011), the "expert tutor" is placed in front of "subordinate learners". With the changing needs and expectations of the student a pedagogical shift from a "passive" learning environment to one that embraces "active" learning is required in order to stimulate a deeper learning experience. This approach is supported by a rising interest in research literature which points to students becoming more engaged and empowered when they are employed as agents of their own learning (Kay, Dunne and Hutchinson 2010; Dunne and Zandstra 2011; Greene and Crespi 2012). In an active learning environment the focus shifts from content delivery by the lecturer to active engagement with the material by the student. The role played by active learning in higher education is discussed by Chickering and Gamson (1987) and Chickering and Ehrmann (1996) within the context of their seven principles of good practice in undergraduate education. Cromack (2008) also makes the assertion that where a "symbiotic relationship exists between technology and learner-centred education" an improvement in student learning is observed.

Within a European context, the need for a different approach to traditional teaching is supported by the Bologna Process² one of the primary objectives of which is the transformation from a teaching focused to a learning focused education system. This involves the adoption of new teaching methodologies which encourage the implementation of active teaching methodologies aimed at improving the student's core competencies and skills. From a national perspective, "The National Strategy for Higher Education to 2030" (Department of Education and Skills 2011) emphasises the need for teachers in higher education to "stimulate active, not passive learning". It points

² <http://www.eurireland.ie/programmes/bologna-process.128.html>

to the need to “create a process of active learning by posing problems, challenging student answers, and encouraging (students) to apply the information and concepts”. From a DIT perspective, the response of the College of Engineering and Built Environment (Conlon 2013) to the DIT strategy on student engagement (DIT 2011) highlights, among other things, the use of modern technology to support student learning as well as increasing the diversity of the learning experience.

Participants

The students who participated in this study are drawn from a first year level 7 general entry engineering programme (DT097). A comparison of CAO entry points for DT097 with two other denominated level 7 programmes (DT004: Civil Engineering; DT006: Mechanical Engineering) as well as a first year common entry level 8 Engineering programme (DT025) is provided in Table 4.1. The figure in brackets represents the mid-point entry CAO points. Based on CAO entry points, students from the level 7 DT097 programme compare favourably in their academic achievements with those on the level 8 programme (DT025).

Academic Year	Level 7			Level 8
	DT097	DT004	DT006	DT025
2010-11	---	220 (365)	230 (385)	340 (390)
2011-12	320 (430)	220 (360)	230 (365)	365 (430)
2012-13	360 (460)	240 (335)	300 (385)	350 (415)

Table 4.1: Selected programme CAO entry points

Of the 37 students enrolled on DT097 only 7 (16%) took the higher level mathematics paper in the Leaving Certificate. Nationally, 25.6% took the higher level paper in 2012–13. The distribution of grades among the participants in this study who took the ordinary level mathematics paper is: A (85–100%) = 2; B (70–84%) = 14; C (55–69%) = 4; and D (40–54%) = 10.

Approach taken to study

Figure 4.1 illustrates the approach employed for this study. It follows the design-based approach described by Reeves, Herrington and Oliver (2004), the foundations of which lie in developmental research (Van den Akker 1999).

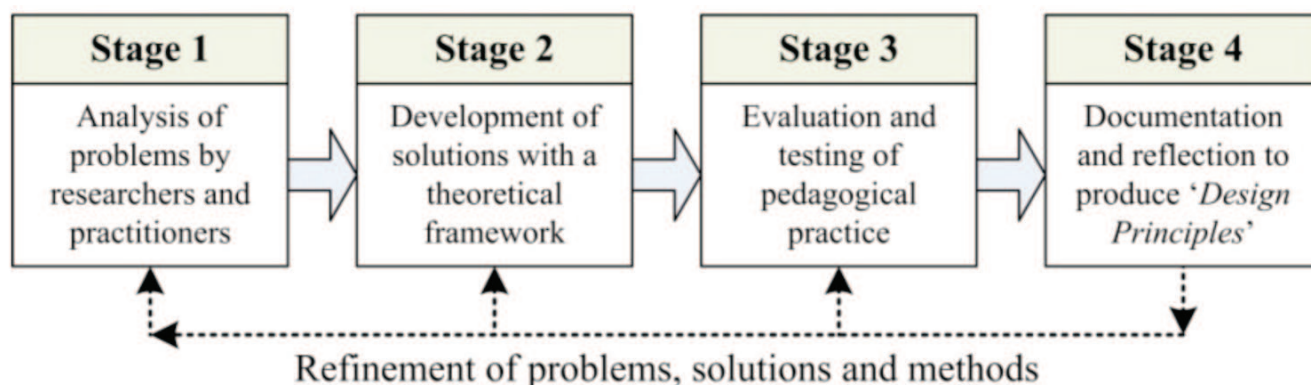


Figure 4.1: Design based research stages

Design based research stages

The four stages illustrated in Figure 4.1 comprise an interactive cycle with an iterative sequence of analysis, design, evaluation and revision. A cycle of successive approximations continues until a balance between the initial ideals and the actual realisation of the study are achieved. This approach is particularly beneficial to research aimed at “exploring and exploiting the potential of information and communication technologies in education” (Reeves et al. 2004).

The four stages are broken down as follows:

- Stage 1: The focus is on core mathematical concepts which are proving difficult to understand. These are initially identified using either a standard maths diagnostic test (MDT) or through a student survey.
- Stage 2: A set of online resources consisting of quizzes created by the lecturer, and feedback videos created by the student are developed. The feedback videos allow students to synthesise and disseminate knowledge from various sources on a given mathematical topic.

- Stage 3: Evaluation of student performance is carried out using the online quizzes. Students are encouraged to give feedback at regular intervals and demonstrate active performance.
- Stage 4: Outputs are in the form of knowledge (student learning) and products (quizzes and videos). Feedback is obtained from students through surveys and focus groups. Usage data and scores from the online quizzes are analysed.

The Learning Management System (LMS) used by DIT is webcourses (Blackboard). The online quizzes are created using Wondershare QuizCreator³ which can be integrated as a SCORM (Shareable Content Object Reference Model) quiz package into webcourses.

Phase 1: Students as co-creators

Solutions to mathematical problems are created by the student using graphic tablet technology (Wacom® Intuos Pen and Touch Medium4) and video creation software (HyperCam 25). Students work collaboratively in groups of two/three to create a solution. Once a solution is obtained, a script for the video (see Figure 4.2) is prepared and the graphic tablets are used to create the video with accompanying commentary (see Figure 4.3). As part of the development of the solution the students gather knowledge from various sources and engage with the concepts at a deeper level as they are required to explain the process, concepts and theory behind it. This helps to promote a deeper learning experience rather than the more shallow approach characterised by rote learning.

Phase 2: Online content for self-study

The SCORM run-time environment (RTE) is illustrated in Figure 4.4 (adapted from "ADL SCORM Run-Time Environment – Overview"⁶). Reusability and interoperability of learning resources across different LMS is achieved through a common means of "launching" resources. These resources communicate with the LMS through an Application Programming Interface (API) using a language such as JavaScript to implement RTE API function calls to the LMS.

The SCORM objects (SCOs) are made up of quiz questions and feedback videos which are assembled into packages with delivery instructions. The LMS loads the SCOs and delivers them according to the instructions which detail the order and number of questions to be answered. This can be tailored to manage the different paths that can be taken depending on the answers provided by the student. Quiz questions are accessed in ascending order of difficulty as illustrated in Figure 4.5.

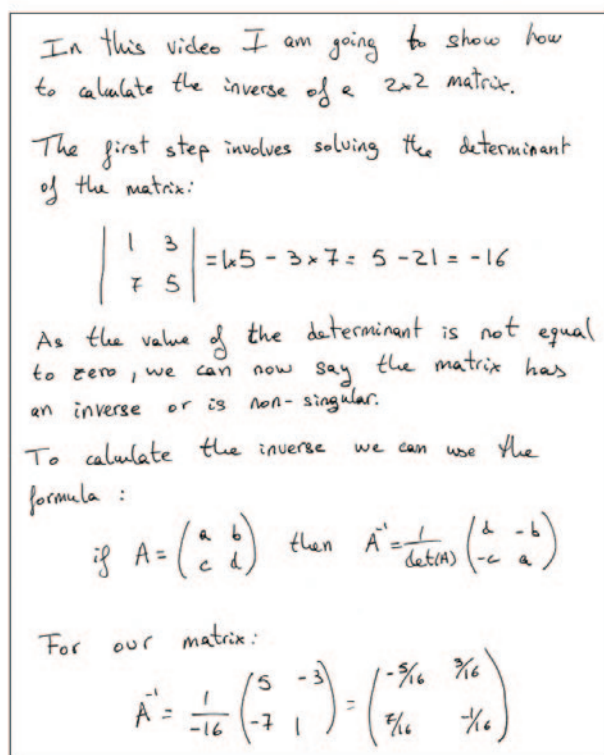


Figure 4.2: Extract from a typical student-created script



Figure 4.3: Students use a graphics tablet to write the solution which is captured as video

3 <http://www.wondershare.com/pro/quizcreator.html>

4 <http://www.wacom.com/en/gb>

5 <http://www.hyperionics.com/hc>

6 <http://www.cen-ltso.net/main.aspx?put=242>

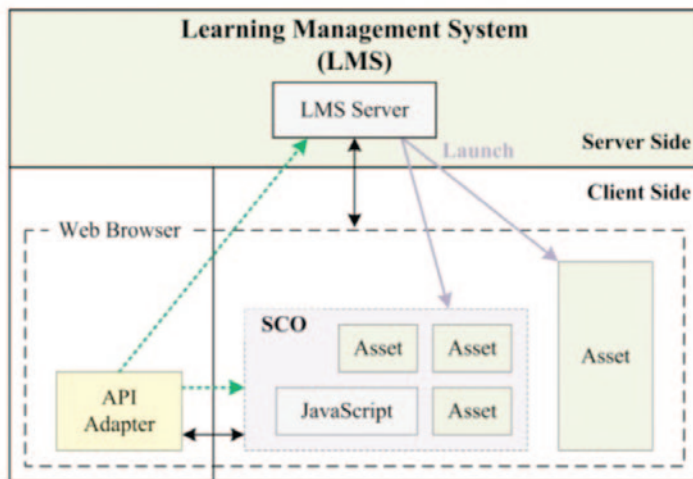


Figure 4.4: The SCORM run time environment

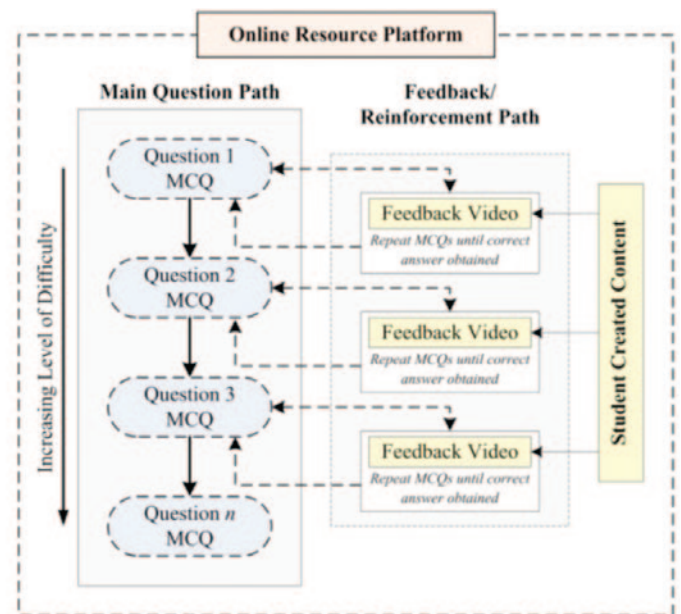


Figure 4.5: Main question and feedback/reinforcement paths

An incorrect answer will cause the student to be re-directed from the main question path (MQP) to the feedback/reinforcement path (FRP). From here the student may view videos created by their peers to help reinforce the concept being examined by the quiz question. On successful completion of a question the student is re-directed back to the MQP where they can proceed to the next question. A typical question from the MQP and its associated feedback path are illustrated in Figures 4.6 and 4.7 respectively.

Question (Main Question Path)
Which of the following matrices is singular? $A = \begin{pmatrix} 1 & 8 \\ 2 & 16 \end{pmatrix} \quad B = \begin{pmatrix} 3 & 8 \\ 2 & 6 \end{pmatrix}$
Possible Solutions
<p>(a) A is singular because its inverse doesn't exist.</p> <p>(b) B is singular because its inverse exists.</p> <p>(c) Both A and B are singular because their values are not equal to zero.</p> <p>(d) None of the two matrices are singular.</p>

Figure 4.6: Sample quiz question from MQP

Question (Feedback/Reinforcement Path)
Find the inverse of... $A = \begin{pmatrix} 5 & 2 \\ 2 & 6 \end{pmatrix}$
Possible Solutions
<p>(a) A has no inverse</p> <p>(b) $A^{-1} = \begin{pmatrix} 6 & 2 \\ 2 & 5 \end{pmatrix}$</p> <p>(c) $A^{-1} = \begin{pmatrix} 6 & -2 \\ -2 & 5 \end{pmatrix}$</p> <p>(d) $A^{-1} = \begin{pmatrix} 6/26 & -2/26 \\ -2/26 & 5/26 \end{pmatrix}$</p>

Figure 4.7: Sample quiz question from FRP

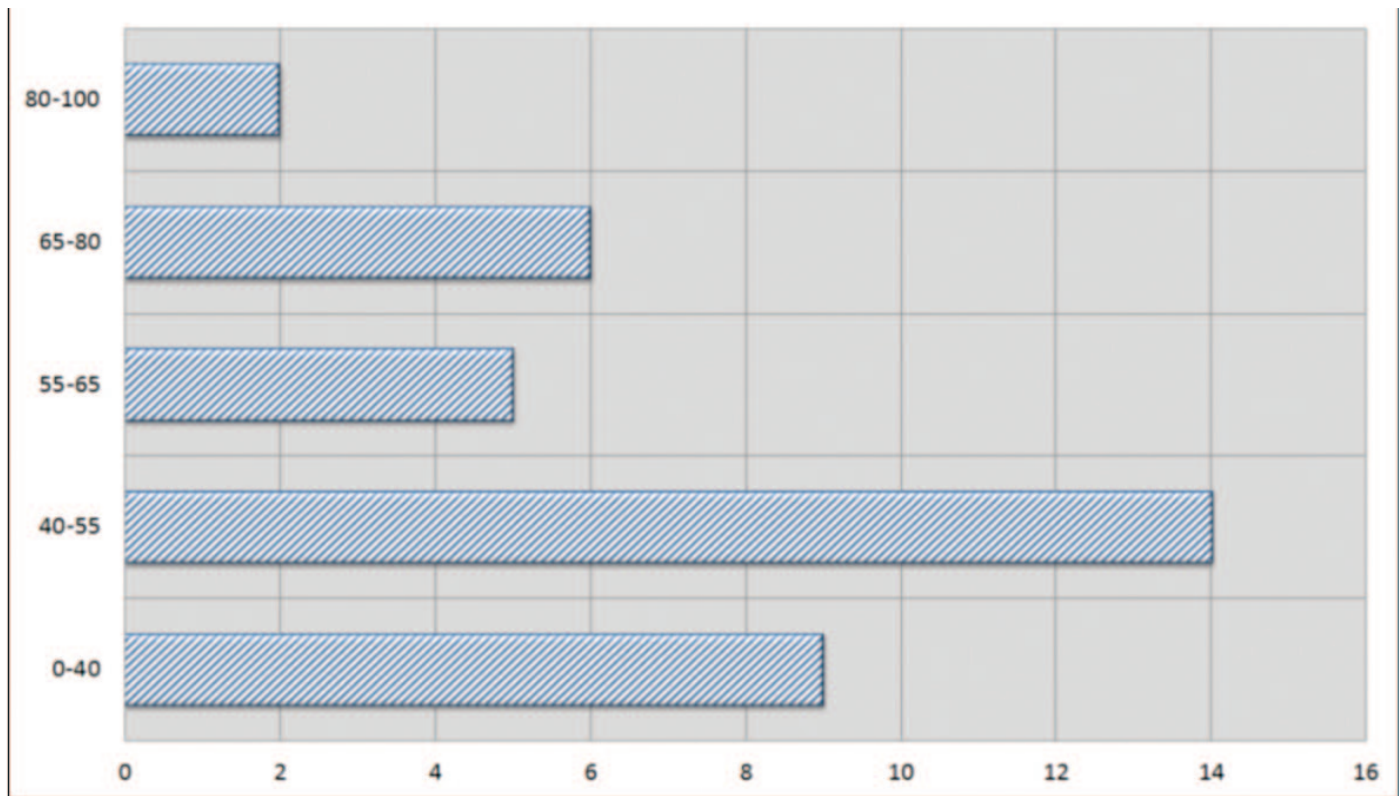


Figure 4.8: Results from the maths diagnostic test

Following the MDT, two sub-groups were identified based on performance, i.e. students with a score $\geq 50\%$ and students with scores $< 50\%$.

Student survey

A survey was conducted amongst those students who participated with responses based on a five-point Likert scale (1- Strongly Disagree, 2-Disagree, 3-Neither Agree/Disagree, 4-Agree, 5-Strongly Agree). Average responses are listed in Table 4.2 (n = 21). The responses received from the survey are illustrated in Figures 4.9 to 4.13.

			Average Response
Statements	1.	Creating the videos was a very useful tool for learning.	3.90
	2.	Recording the videos allowed me to practice what I learned in the lecture and reinforce the core concepts outlined.	4.24
	3.	I am planning to use all the on-line resources (quizzes and videos) for revision in preparation for my module exam.	3.74
	4.	I would recommend creating videos for other subjects.	3.86
	5.	If you could rewrite the maths module, you would remove the video component.	1.90

Table 4.2: Selected student survey responses

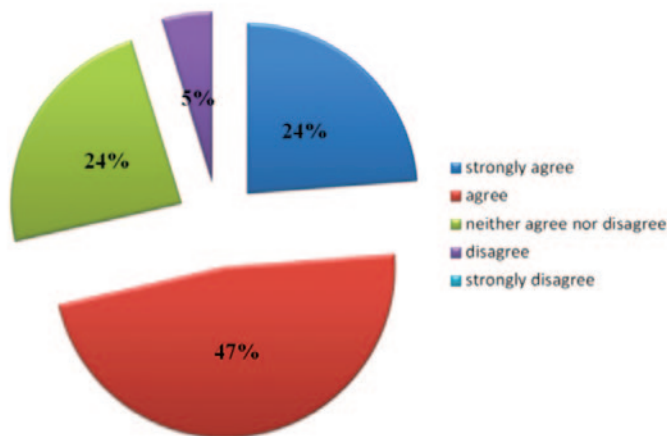


Figure 4.9: Statement 1 responses

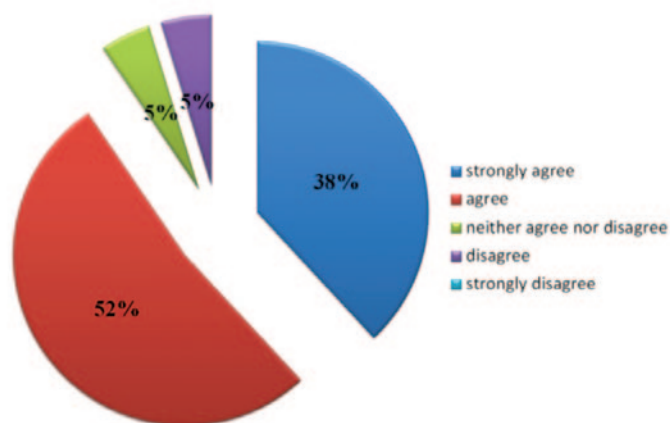


Figure 4.10: Statement 2 responses

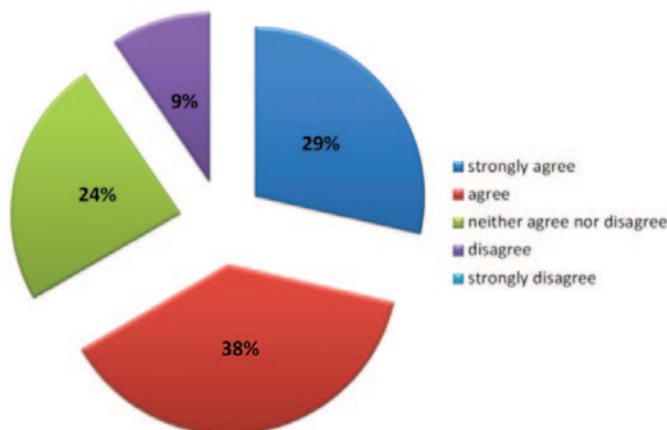


Figure 4.11: Statement 3 responses

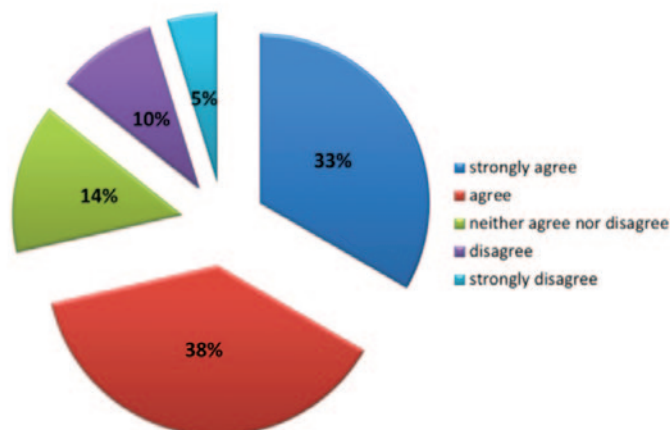


Figure 4.12: Statement 4 responses

A question was also posed about student preference for the amount of time spent on tutorial sessions where videos were created as part of an active learning environment to those which took the form of a traditional tutorial session. Figure 4.14 shows the responses broken down into two categories, i.e. those who obtained $\geq 50\%$ in the MDT and those who achieved $< 50\%$.

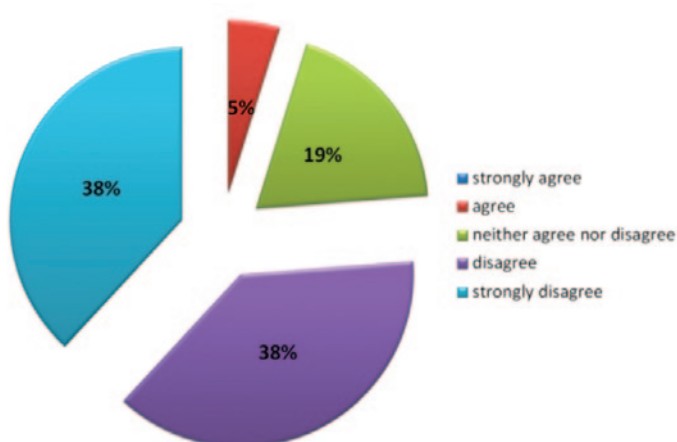


Figure 4.13: Statement 5 responses

When the results are divided into the responses of the two sub-groups, the lower scoring sub-group prefers a higher percentage of tutorials creating videos than the sub-group with higher scores. This result is also evident where the students were asked if they would re-write the module to eliminate the video tutorial sessions and replace them with traditional tutorials. The students with a MDT score $< 50\%$ who either disagree or strongly disagree with eliminating the video tutorials are 80%, with 20% neither agreeing nor disagreeing. Comparison between Figure 4.13 and Figure 4.15 confirms the trend evidenced in Figure 4.14 in that students with lower MDT scores $< 50\%$ prefer that the module includes the creation of videos.

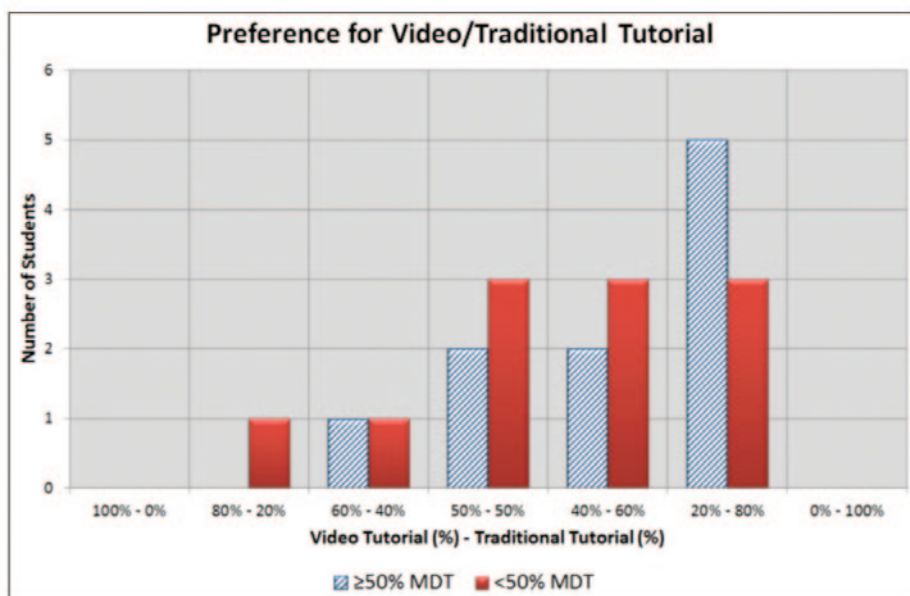


Figure 4.14: Student preference for video/traditional tutorials

The students' responses show a general preference for a mix of traditional and video tutorial sessions. A point to note is that no student showed a preference for a 100% session using one or the other method. This study stems from an initial pilot study carried out by Llorens (2013) into the use of online videos for mathematics peer instruction. Results from that study showed that the active learner approach to online videos, where the students solve a problem and disseminate that solution to their peers via online videos, increases student engagement, encourages deeper thought, increases motivation and provides confidence for weaker students.

For this study the pedagogical potential of using graphic tablet technology as an effective learning tool in an active learning constructivist environment was explored. The online platform which consists of the student-created videos and the lecturer-created quizzes is intended to reinforce core concepts and provide students with a multimedia tool created mainly by students for the benefit of other students. As well as strengthening their core competencies in mathematics, they have developed a set of transferrable skills that will benefit them beyond the confines of their studies: teamwork; communication; planning; and technical literacy.

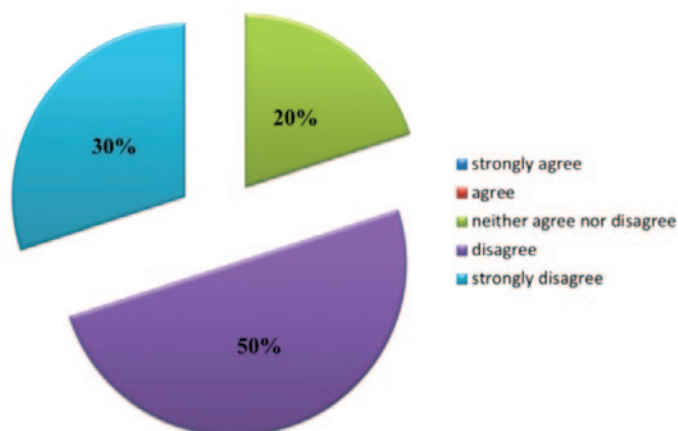


Figure 4.15: Statement – "If you could rewrite the maths module, you would remove the video component."

The general perception amongst the students was that the videos were a useful and enjoyable way of learning. However, the preferred method for tutorial sessions was a mix between traditional sessions and video sessions. Of the students surveyed no one preferred 100% traditional or 100% video sessions. The results show a preference amongst weaker students (based on MDT scores) for non-traditional tutorials and online content.

Recommendations to DIT

As a result of the work done on this project, the following recommendations can be made:

- Increase the use of technology in first year to complement and enhance the first year learning experience.
- In line with the DIT strategic plan, encourage and develop active learning approaches that put the student at the centre of the learning process.
- The use of graphic tablets that allow students to create and share solutions to problems should be explored further in other technical disciplines.

- Extend the online platform to other modules in first year to create a suite of resources to support weaker students or those who take non-traditional entry routes.
- Extend the project to other level 7 first year mathematics modules.

Proposed Future Work

In this paper, we have outlined the development and evaluation of an online resource platform consisting of quizzes and students' videos. The results obtained show that students engage actively with technology. Their experience is enriched by the active learning environment and this is reflected in their perceptions and attitudes towards the discipline. This active learning and constructivist approach provides an environment of achievement and ownership that empowers students of all levels allowing them to benefit more from the learning experience.

This project represents the first stage of a longitudinal study which will work towards expanding the bank of quiz questions and feedback videos. The platform will grow as new and improved resources are added and will be extended to provide similar online resources in other technical modules.

Acknowledgements

The authors would like to express their thanks to Dr Brian Bowe, Head of Learning Development, College of Engineering and the Built Environment, DIT, Bolton Street. The support of the Learning Teaching and Technology Centre (LTTTC) during the course of our fellowship is also acknowledged. Finally, we would like to thank all the students who participated so enthusiastically in this project.

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College of Sciences and Health

5 Web-based peer tutoring in science education

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Abstract

Peer-instruction has been shown to have a very positive effect on students' engagement and learning. PeerWise is a web-tool designed to allow peer-tutoring between students within a large class group. Students can write, answer and discuss Multiple Choice Questions (MCQs) based on their work in-class. It is low-cost and low-maintenance software which has become increasingly popular across many subject disciplines as a method to introduce a peer-tutoring aspect to course work.

In this study we introduce PeerWise as a form of continuous assessment to a wide and varied cohort of science students (N=509) across disciplines, undergraduate years, levels (certificate to honours degree) and institutes. Correlations between engagement with PeerWise and an increase in end of module exam results are investigated and found to be strongly correlated in one of the modules investigated. Students' attitudes to PeerWise are probed with a number of Likert style questions. It is found that the students agree that the tool benefits their understanding through the peer-activities of authoring and answering questions and to a lesser degree by discussion of questions with classmates. Some differences exist between class groups but overall the engagement levels across all groups are much higher than the minimum requirement set by the assessments.

Keywords: *peer instruction, science education, web tool*

Introduction

Problem-solving is a highly important graduate attribute which is of particular importance within the scientific community. Students prepare for this by solving many "end-of-chapter" type questions. However, it has been argued that a much deeper understanding of the concepts can be gained by students if they are required to create their own questions (Draper 2009).

PeerWise creates a student-centred, predominantly student-regulated learning community based on web tools which the students are familiar with (Denny n.d.). Students are asked to create questions, provide answers and outline short explanations for their questions. All these tasks further raise their cognitive efforts and create deeper understanding. The students create a shared study tool which is focused on the module and its assessment related content.

Feedback is of the utmost importance to students but is highly demanding on staff workload. PeerWise has also been shown to be a very effective tool in facilitating peer-feedback (Hooper, Park and Gerondis 2011) which studies have indicated can have significant advantages to student learning and development (Nicol 2011). Active learning is promoted throughout not only by the actions of creating and answering questions but by the more subtle mechanisms of assessing their own work in the context of others.

PeerWise has shown promising first results when implemented in science education (Bates, Galloway and McBride 2011; Fitzgerald, Johnston and McClelland 2011; Ryan 2013). We propose to evaluate this very promising piece of technology in the development of students across a range of science courses in DIT and the University of Glasgow. We will measure staff and student attitudes to PeerWise and any gains in student's conceptual understanding.

Implementation of Project

We employed PeerWise across a wide and varied student cohort. It was implemented in a similar fashion in a number of different physics and chemistry classes across two institutes, Dublin Institute of Technology and the University of Glasgow, across different junior undergraduate years with a mixture of different qualifications' levels from advanced certificate (level 6) to honours degree (level 8). In total we introduced PeerWise into five modules as shown in Table 5.1. All lecturers agreed to implement PeerWise in a similar fashion. In our scaffolding material we followed an approach similar to that laid out in a 46 DIT Teaching Fellowship Reports 2013–2014

previous study (Casey et al. 2014). An introductory presentation and exercises focused on the pedagogy and rationale of the use of PeerWise rather than the mechanics of the software. Exercises highlighted methods of writing good MCQs in addition to incorporating distractors and common student mistakes into the possible answers. Examples of previous good PeerWise questions illustrated the potential to be creative, have fun and to use the authoring of questions as a learning exercise. We highlighted the anonymity and the fact that this was the students' learning space. This was to encourage students to be creative and to allow themselves and others to be comfortable in making mistakes. Examples of the scaffolding material can be found online (Denny 2014) with further details reported by the previous study (Casey et al. 2014).

Group #	Institute/school	Year/level	Module description	Active students
1	DIT/School of Physics	1/8	Introductory physics for non-physics degree courses	104
2	DIT/School of Physics	1/8	Introductory physics for physics degree courses	47
3	DIT/School of Food Science and the Environmental Health	1/8 and 6	Organic chemistry	141
4	DIT/School of Physics	1/7	Fundamental physics	78
5	UG/School of Physics and Astronomy	2/8	2nd year general physics	139

Table 5.1: Listings of the different class groups involved in study

Over the different modules the marks associated with PeerWise were in the region of 2–6%. Students are required to author, answer and comment on four questions each. Students gain a PeerWise score by engaging with PeerWise and this was incorporated into the marking scheme as shown in Table 5.2.

Description	Score (%)
Write, comment on and answer less than 2 questions	0
Write, comment on and answer more than 2 questions but less than 4	20
Write, comment on and answer 4 questions and get a PeerWise score less than the class average	40
Write, comment on and answer 4 questions and get a PeerWise score greater than the class average	70
Write, comment on and answer 4 questions and get a PeerWise score in the top ten students	100

Table 5.2: Scoring system in use for this implementation of PeerWise

This scoring system was decided upon to allow students to pass based on modest engagement and to encourage competition within the class for the engaged students. Previous efforts to grade students on a curve based on their PeerWise score were met with resistance from students (Casey et al. 2014).

Evaluation and Discussion

Pre and post exams

Previous studies have used quartile tests to show a correlation between student engagement and an increase in end of module exam results (Bates 2011; Hardy et al. 2014). Students sit a class test before the introduction of PeerWise and based on the results of this test are divided into quartiles. After this test PeerWise is introduced to the class and the assessment runs over typically a half semester timeframe. The PeerWise assessment date closes and sometime after that the students sit the end of module exam. The quartiles are then further subdivided into students with high PeerWise Activity (HPA) and Low PeerWise Activity (LPA). The average end of modules exams are plotted for each of the LPA and HPA groups for each quartile, results are shown in Figures 5.1 to 5.3. Error bars on these plots are the standard error.

Correlation as seen by previous studies (Bates 2011; Hardy et al. 2014) is not clearly shown in Figures 5.1 to 5.2; any gains or losses are within the error. In Figure 5.3 (Group 3), the Organic chemistry module, large gains can be seen across all quartiles. It is unclear why the difference in the different modules, and could be due to a number of reasons e.g. different lecturer engagement. A possible explanation could be the alignment of assessment in Group 3 as outlined in the report (Ryan 2013).

PeerWise usage data

As reported by many previous studies (Bates 2011; Ryan 2013; Casey et al. 2014; Hardy et al. 2014) the students engaged highly with PeerWise and contributed far more than was expected. For 509 students the minimum requirement would be 2,036 questions authored, answered and commented on. In total, students contributed almost double of the minimum required questions, over 24 times the minimum answer requirements and six times the minimum comment requirements. However this simple analysis does not account for the different student behaviour. From the data it is evident that a small portion of the students, approximately 25%, account for approximate 60% of the contributions to PeerWise. The majority of students do closer to the minimum requirement, authoring typically four questions and answering 4–10 questions. A low percentage, approximately 15% do not engage well and do less than the minimum requirement.

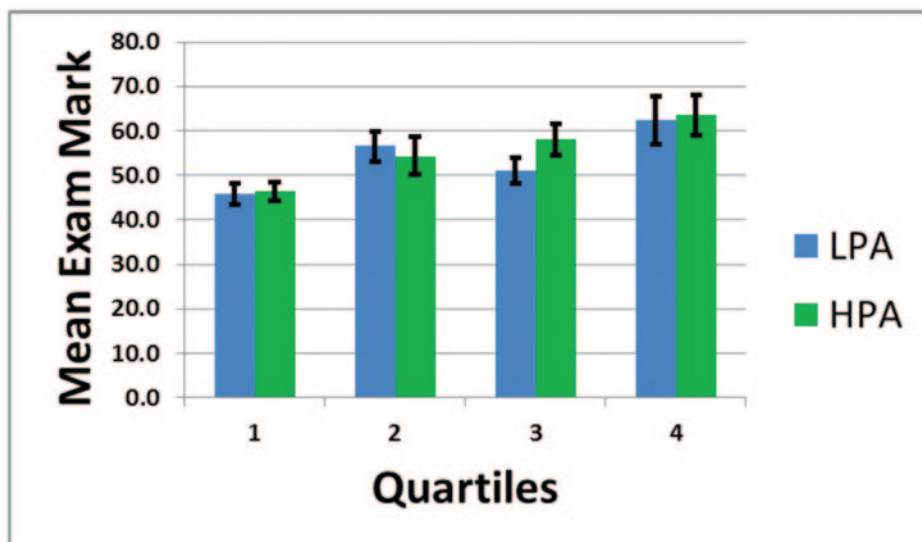


Figure 5.1: Quartile test for Group 1, Introductory physics for non-physics degree courses

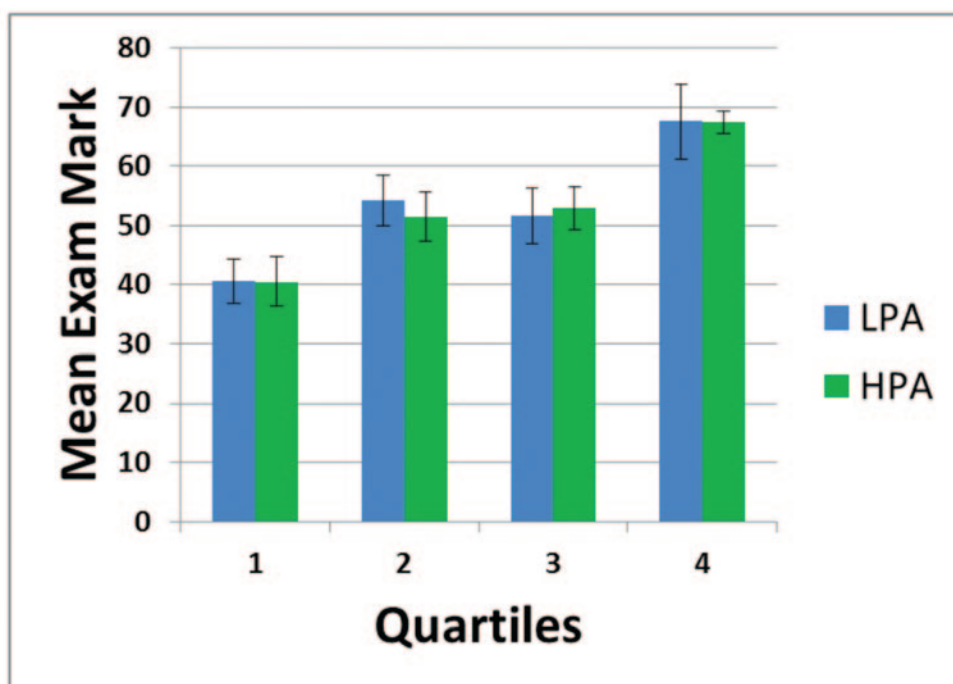


Figure 5.2: Quartile test for Group 4, Fundamental physics

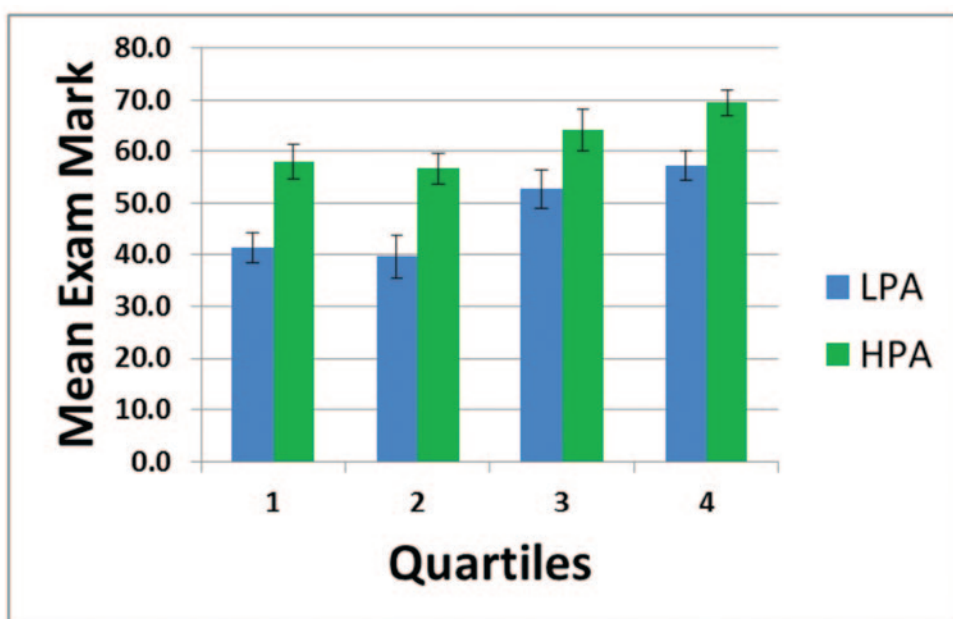


Figure 5.3: Quartile test for Group 3, Organic chemistry

Questionnaire

A questionnaire was designed to provide insight into the students' use of PeerWise and to probe their attitudes towards the software. The full questionnaire is included in Appendix C. It contained eight Likert-scale type questions and four free-text questions. Thematic analysis on the free-text responses is ongoing; here we report the results of the Likert type questions shown in Table 5.3.

Question #	Questions	Average student feedback
1	Developing original questions on course topics improved my understanding of those topics	Agree
2	Answering questions written by other students improved my understanding of those course topics	Agree
3	Engaging in discussions (writing and reading comments) improved my understanding of these topics	Neutral/agree
4	Of the questions I authored, I created them from scratch ("strongly disagree" here means you copied and pasted questions from other sources whereas "strongly agree" means you developed the question entirely on your own)	Agree
5	I did (or would) use PeerWise for exam preparation and/or revision	Agree/Strongly agree
6	I accessed PeerWise primarily from my mobile device (e.g. smartphone, tablet)	Strongly disagree
7	I would like to see PeerWise introduced for assessment in my other modules	Agree
8	Time taken for me to create a typical PeerWise question	10–30mins/0–10mins

Table 5.3: Questions with average student responses to Likert-scale questions

The students appeared to find writing and answering questions more useful than engaging in discussion. The spread of the answers across the different class groups were quite similar. When asked the question on plagiarism, the fourth question, differences appeared in the different class groups as shown in Figure 5.4. Here we attempted to probe the amount of plagiarism that was occurring. Class Groups 3 and 4 have a higher amount of plagiarism occurring with many more students' answers agree/strongly agree. Group 5 has the least amount of plagiarism. These groupings, Groups 3 and 4 on one side and Group 5 on the other form the outside poles in these answers; they also form the opposite poles in terms of academic level. Group 3 contained first year level 6 and level 8 students and Group 4 contained first year level 7 students. As opposed to this Group 5 had second year level 8 students. The other groups sit between these groups both academically and in their responses to the question.

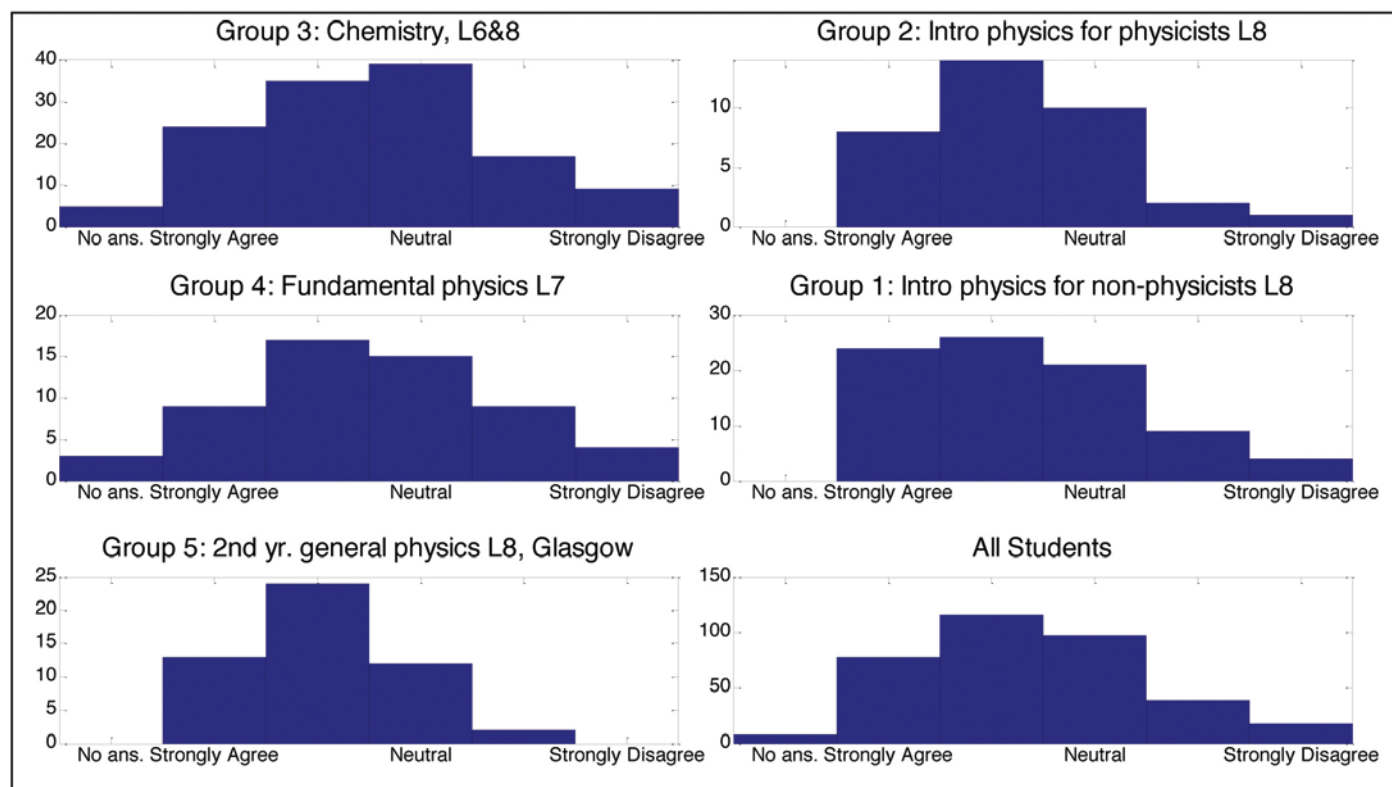


Figure 5.4: Student responses to the question on plagiarism, Question 4

Students agreed that they did or would use PeerWise for revision. In modules where exams occurred during the PeerWise assessment period, peaks in activity can be seen which coincide with exam dates. However after the PeerWise assessment date but before end of module exams very little, if any, activity was registered on PeerWise across all modules. However, when students sat exams throughout the PeerWise assessment dates peaks could be seen in the activity levels on PeerWise which corresponded to the exam dates. This is illustrated for Group 3 in Figure 5.5.

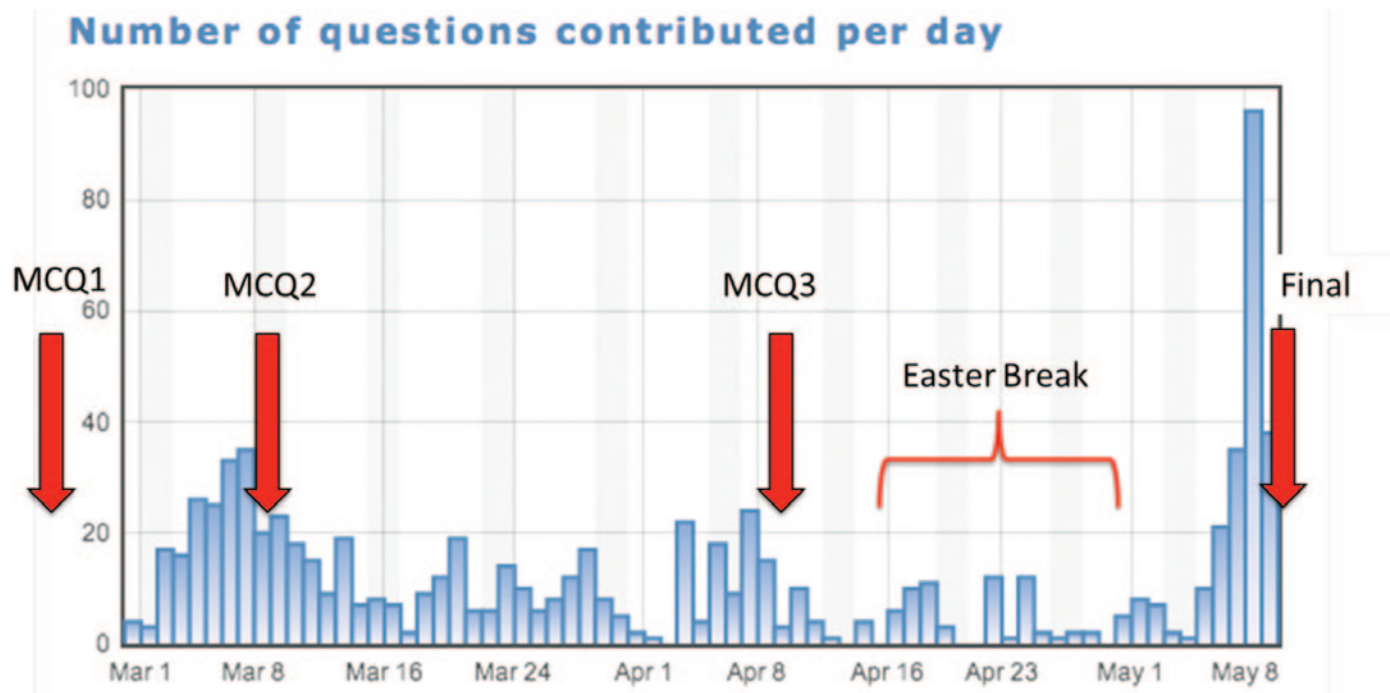


Figure 5.5: PeerWise activity showing the peaks in questions contributed coinciding with MCQ dates

On the whole students did not seem to access PeerWise primarily on their mobile device, although a large number still did, approximately 80 students, shown in Figure 5.6. Some students mentioned in the free text responses that the site is not mobile friendly and would recommend a mobile site to accompany the main site.

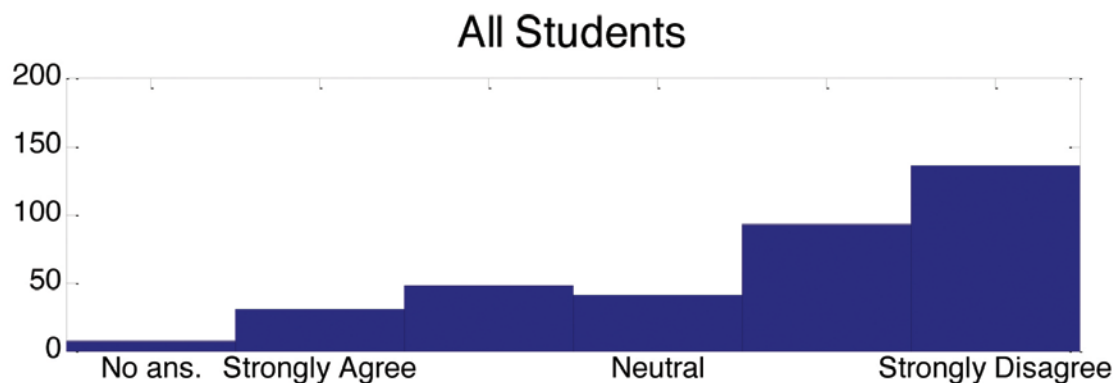


Figure 5.7: Student responses to Question 7

When asked if the students would like to see PeerWise introduced in other modules the spread of answers for the different class groups varied as shown in Figure 5.7. The classes with lower level students, Groups 3 and 4 (Table 5.1) agreed/strongly agreed while the higher academic level students, the second year level 8 students, Group 5 disagreed/strongly disagreed. The first year level 8 student groups which sit, in academic levels, between the two opposing groups responded neutral. This is reflected in the PeerWise activity data where the groups that would like to see PeerWise introduced in other modules were also one of the most active groups amongst the study.

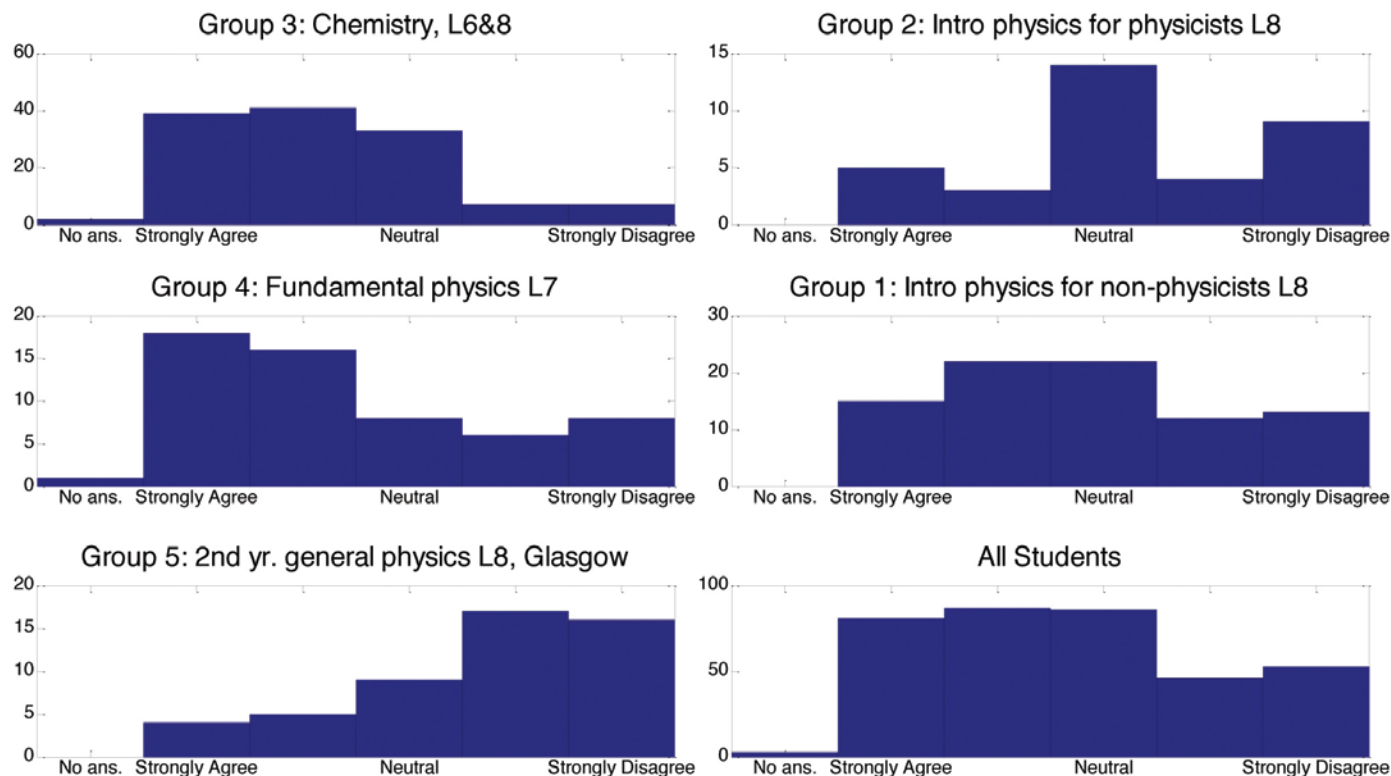


Figure 5.7: Student responses to Question 7

Conclusions and Future Work

Results from the questionnaire suggest that all the students find PeerWise useful and recognise the benefit of authoring and answering questions set by their peers. The students agree most strongly that they would or did use PeerWise for revision purposes.

Unfortunately a correlation between PeerWise activity and an increase in exam mark is not shown for all modules but does appear strongly in the chemistry module.

Recommendations to DIT

Recommendations are also based on ongoing thematic analysis which is not reported here but, it is hoped, will be published soon. It is recommended that:

- PeerWise be introduced as a method of including peer-instruction in large class groups.
- Lecturers check in the software for flags that students have placed on questions for their attention.
- Lecturers may find it useful to examine PeerWise for questions that students are answering incorrectly and address these issues in class.
- Lecturers may show examples of good questions in class when reminding students that PeerWise is a continual assessment with a sometimes distant deadline. This will help engage the students.
- Care should be taken not to be seen to be too involved with PeerWise as many of the foreseen advantages and student-reported advantages are that this is their own space.
- Lecturers stress the importance of self-regulating the system. If there are mistakes on the system, it is the student's responsibility to correct their classmates. In addition, if they see issues arise with bad behaviour (childish questions, bullying, plagiarism, etc.) then they should flag this.
- Care should be taken when PeerWise is implemented in multiple modules simultaneously. No study was carried out on this aspect and it is unknown if this would have an effect.

Proposed Future Work

This is part of an ongoing study where we shall continue to assess the effect of PeerWise on our students. Results on gains in conceptual understanding linked to PeerWise are being reviewed with the use of concept tests in some of the physics modules. A further, more detailed study on the free text answers provides great insight into the students' attitudes to PeerWise. This report is currently in preparation for publication.

Differences in class grouping in this report suggest a different engagement from students with different academic credentials. Further studies to probe this hypothesis are underway.

Acknowledgements

I would like to thank the LTTC in DIT, in particular Claire McDonnell for assistance with getting the project started, Claire McAvinia for assistance with the data analysis and Jen Harvey for her assistance with project dissemination.

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6 The development, implementation and initial evaluation of tailorable resource packs for multimedia based “assessments for learning”

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Abstract

In this project a suite of tailorable teaching and learning resources were created, implemented and evaluated. These resources focused on the assessment for learning model, adopting the constructivist approach to learning. Here, the student builds their knowledge, and deepens their understanding, as they complete their assessment. The resources were designed to aid academic adoption, and student implementation, of this model of assessment. The assessment outputs created using these resources were digital videos and network concept maps. The tailorable resources provided a structured and scaffolded environment for both the academic and student to explore this learning space. Both students and academic staff, as part of an explorative case study, evaluated the resources. In terms of the resources created for video-based assessment, students were happiest at times that correlated with the use of the resource pack and commented that the resources assisted them in creating their assessment for learning product. Finally, recommendations for practice are offered and suggestions are made on how to holistically integrate this approach on an Institute-wide scale.

Keywords: *assessment for learning, digital learning, emotions of learning, student as producer*

Introduction

Background context and rationale

Assessment is an inescapable aspect of many educational environments and is known to be one of the key drivers of learning (Hubbard 1997). Assessment can be viewed as a hurdle over which a student must prove they can jump to demonstrate their learning. Alternatively, assessment can be viewed as a rung of a ladder whereby students can use their assessment as a means of deepening their understanding; subsequently exhibiting their learning and climbing the ladder of subject mastery (Ryan 2013a). In the latter approach, assessments are for learning, not of learning. Coupling assessment for learning with real-life, authentic scenarios and specific peer and academic feedback and -feedforward greatly enhances the student learning experience (Shepard 2000; Nicol and Macfarlane-Dick 2006). Additional inclusion of technology into the assessment melting pot offers further possibilities such as adapting to the specific learner's style, pace and learning needs (Cope et al. 2011). Use of multimedia allows for the development of rich, portfolio-based assessments and reaches out to the digital natives and migrants that occupy the lecture halls of every educational institute (Prensky 2001). To effectively complete a multimedia-based assignment students must analyse and synthesise several multimodal sources of subject content. The student must then brainstorm, storyboard and create. This process is repeated several times and each time the student refines, not only their product, but also their understanding of the content. This ultimately leads to increased student engagement and deeper learning.

Project objectives

The aim of this Teaching Fellowship was to develop a suite of resources to encourage and enhance the use of multimedia in student-centred assessment for learning. The resource pack is downloadable as a tailorable solution that can be adapted by the academic to suit the relevant subject area. Additionally, information on the alternative uses for these resources can be found in the case studies and brief review of the literature that supplements the hands-on resources.

Pedagogical and personal benefits: students and academics

The use of the resource pack facilitates both students and academics in the creation, application and assessment of student-centred creative and engaging continual assignments. Integrating multimedia into the learning journey will help the student to develop tangible life-long skills and key employability traits such as collaboration, meaningful student interaction, enhanced communication proficiency, project management skills, peer co-operation and autonomy (Robin 2008). Furthermore, embedding multimedia in this way promotes assignment evolution towards an assessment for learning and thus process becomes a student-orientated, social constructivist activity where the student(s) take ownership of their project and become responsible for the product and, subsequently, their learning (Harel and Papert 1991).

The project was divided into two main sections; production of the resource packs and their evaluation. Two themes were chosen to form the basis of the multimedia-based assessments for learning – video and networked concept maps. Resources were created for each theme and were a mixture of interactive, online resources, downloadable files and worksheets. These included narrated screencasts detailing the use of appropriate technologies, editable Word documents, grading rubrics and suggested timelines for implementation. Tables 6.1 and 6.2 detail the resources created, split into resources for the academic and resources for the student.

The second part of the project was the evaluation of the resource packs created. The modules chosen for the evaluative case studies were Introductory Biochemistry (TFCH2001; second year honours degree) for the video assessment resources and Advanced Topics in Nutra- and Pharma-ceuticals (TFEL4001, final year honours degree) for the network concept map resources. For the sake of brevity, only the student evaluation of the video assessment resources is detailed here. Evaluation followed best ethical practices and conformed to the Institute's Research Ethics Guidelines. Data were collected in several forms: anonymous multiple-choice questionnaires, independent academic facilitated discussion fora before and after the use of the resources, anonymous standard institute module review forms, and a personal researcher reflective diary. Qualitative data were coded into several key themes and sub-themes based on researcher interpretation influenced by Strauss and Corbin's (1990) Method of Constant Comparison. Quantitative data were analysed using relevant statistical functions within Excel. Furthermore, discussions with stake holders following dissemination both nationally and internationally, critical reflection with a "critical friend" and other academic staff members provided a broader, balanced and rounded evaluation of the resources.

<i>Academic resources</i>	
1	How to prepare students for a video assessment
2	How to align an assessment <i>for</i> learning to a traditional lecture course
3	How to provide feedback/feedforward for students during the assessment
4	How to grade a student-produced video resource
5	How to prepare and conduct pedagogical research based on the use of video
<i>Student resources</i>	
1	How to effectively brainstorm
2	How to storyboard collaboratively
3	How to plan a video shot
4	How to simply edit video content
5	How to privately upload video to a social media site
6	How to write reflectively after a leaning experience

Table 6.1: Resources developed, divided into academic- and student-appropriate categories, for video-based assessment for learning

<i>Academic resources</i>	
1	How to prepare students for a network-map-based assessment
2	How to prepare students for a network-map-based assessment
3	How to provide feedback/feedforward for students during the assessment
4	How to encourage peer interaction and feedback
5	How to grade a student-produced network map (final product and process)
<i>Student resources</i>	
1	How to effectively brainstorm as an individual within a group
2	How to network-map collaboratively and individually
3	How to use technology to enhance a network map
4	How to write reflectively after a learning experience

Table 6.2: Resources developed for networked concept maps implementing the assessment for learning approach. The resources are divided into academic- and student-appropriate categories

An explorative case study was conducted to investigate the perceived benefits of the use of video-based assessment in a second year introductory biochemistry module (TFCH2001) and the use of networked concept mapping in an advanced final year optional module (TFEL4001). As part of this explorative study the students perceived use of the resources, along with the academics' personal reflective writings during their use, informed whether the project outputs were successful in achieving their goals at a local level.

The use of video as an assessment for learning was, in general, appreciated by the students. However, the preconception that students are digital natives, or even digital migrants is questionable. It may appear from the outside looking in that students exist in a social-media-driven, technology-enhanced world and are well versed in the pervasive technologies. This study aimed to align the instant gratification, always-on technology-driven student with the slower paced world of scholarly activity and deep understanding (Welton 2011). In previous attempts to achieve this in similar modules, students struggled with the technological aspects of the assessment. Before commencing this assessment (the creation of a short video on a biochemical topic of choice) over three quarters of the students surveyed (n=100) commented that they were not "confident with technology". These students noted that they could use common software (e.g. MS Office) and social-mediabased technologies (e.g. Facebook and Twitter being the most cited); however, they struggled when asked to apply their technological knowledge to a new task (e.g. video editing software) and this resulted in fear and anxiety.

This led to a secondary research topic, the emotions of learning. In an aligned study (Ryan 2013b) it was noted that students' emotions oscillated from happy to unhappy depending on what aspect of the video-creating assessment they were carrying out. In general, students were least happy when they were carrying out the technological aspects of the project. The resources created as part of this Teaching Fellowship aimed to address these difficulties. This additional technical support was provided to the students, particularly in relation to the editing of digital video, as a "just in time" resource; i.e. access was provided when the students needed assistance (based on their project timeline). The resources took the form of screencasts of selected free-to-use software demonstrating the basic functions and methods permitting the students to asynchronously learn and use the editing software. Students could then explore the capabilities of each editing software tool at their own pace, but every student could be confident in carrying out basic editing. In comparison to the aligned study, the use of these resources dramatically reduced the negative emotions noted at technology heavy points of the project. Anonymous student evaluation, conducted through online survey, noted improved student happiness at the most technologically challenging time point of the project (weeks 6–9). This time frame coincided with the video-editing tasks and uploading the final product to the hosting website. In the aligned study these aspects were cited as the most challenging to the student technical skills and hence, the Teaching Fellowship Student resources focused on these tasks. In the student discussion fora students commented that they watched and re-watched the resources several times before and during the

relevant tasks. They noted the benefit of being able to pause, rewind and re-watch the more technically challenging aspects and the scaffolded and timely release of each resource allowed them to concentrate on one aspect at a time. Despite the positive reflections from the students on the use of the resources, some noted that those with more experience in computerbased technologies found it easier to adapt to the new technologies experienced in this project. Overall the students did note the benefit of being exposed to new and alternative technologies that may not be directly linked to their perceived future careers. In general, students reflected that this exposure helped to remove their personal fear of using new technologies and made them more willing to try something they are not familiar with.

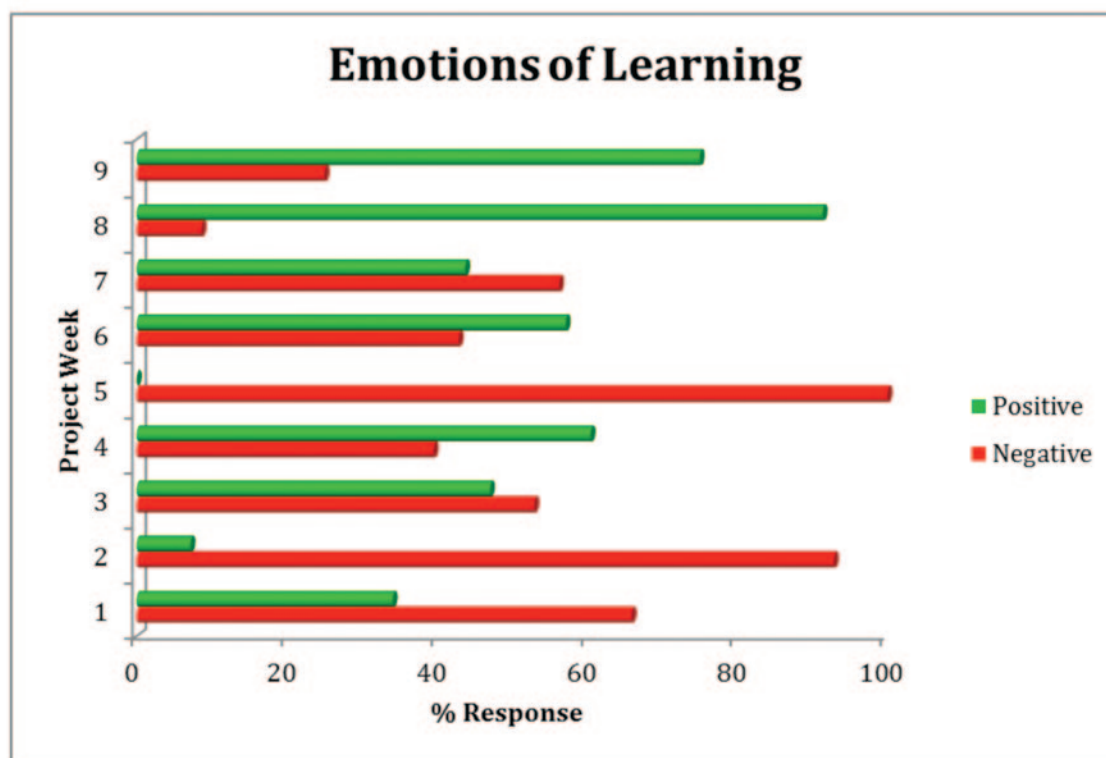


Figure 6.1: TFBC2001 evaluation of the emotions of learning

Note: Students were surveyed anonymously via SurveyMonkey, based on Walker's (2013) Emotional States Assessment Technique. Participation was voluntary and Week 5 is noted as an anomaly as only one student responded. On average 11 students responded per week. Video editing began in Project Week 6 and progressed until Project Week 9.

Recommendations to DIT

This project aligned to many of the Institutional policies as highlighted in the DIT Teaching, Learning and Assessment Strategy 2011–2014 and, as such, there are several Institute-wide recommendations detailed under the Strategy headings.

- **Curriculum**
Curriculum development was central to this project and the outputs can directly assist both academics and students in following formative and summative assessment strategies both for learning, and of learning. These outputs can be used to offer an alternative approach to assessment, which centralises the student and promotes deep learning.
- **Teaching excellence**
All aspects of the project (resource development, implementation and evaluation) were based on best pedagogical practice grounded in research and peer reviewed literature. This will enhance the best teaching and learning practice and may form a springboard for future collaboration and development within the Institute.
- **Development of key skills and competencies**
Central to this project was the development of key "soft skills" by students during the use of the project resources. These key skills, such as project management, communication, negotiation, are highly sought after by employers. By using the scaffolded student resources (or the model of scaffolding student learning through assessments for learning), students can become autonomous learners capable of working both alone and within a group dynamic.
- **Diversity of learning opportunities**
Multimedia-based assessment for learning potentially offers a wider range of learning experiences and encourages participation from a diverse learner background. This will also allow students to diversify how they learn and encourage the student to take responsibility for their own learning.

- **External and internal engagement**
The digital videos produced by students were showcased to Leaving Cert Biology students from a local secondary school (Larkin College) through a Students Learning With Communities initiative. These digital videos were used as reusable learning objects to enhance the scientific understanding of the secondary school students, to increase their awareness of the sciences in general and to view DIT as a potential avenue to further their education. Creating a real-life, authentic assessment for learning that had a real-life target market gave gravitas to the project for the students. They felt very proud of their products and volunteered to showcase their work to the Leaving Cert students. This fostered an ad-hoc community of practice, "students of biology", as the DIT students were studying fundamental biochemistry that aligned to, and built on, many aspects of the Leaving Cert Biology course.
- **Feedback and feedforward**
A key aim of this project was to improve the culture of feedback and feedforward. Due to the nature of the learning approach, assessment for learning, the project developed the student's ability to critically evaluate their own, and their peer's, work. The ability to be consciously self-critical and evaluative is a skill that is crucial for lifelong learning. Multiple feedback mechanisms were integrated into the assessment to allow student evaluation of, and improvement in, learning. The resource pack contains scaffolding activities to assist both the academic and student in the feedback and feedforward process that are adaptable to any discipline.
- **Evaluation and review**
The second part of this project was the evaluation of the resource packs. These project outputs were evaluated and reviewed not only from the student perspective, but also from an academic viewpoint. A cyclical approach to iterative improvements has been adopted and recommendations from the student and staff evaluation will be implemented in subsequent resource development and enhancement. Continual development and optimisation of teaching and learning resources is required to maintain relevance and also to appeal to the varying learners year on year.

Proposed Future Work

The project currently focuses on multimedia-based assessment for learning in two individual modules; however, it is self-sustaining and cost neutral as it can be rolled out across all years and practically all modules without further resource requirements. It will be particularly effective if there is a critical mass of staff engaging and it is here that the future work will be directed. The outputs of this project have been disseminated at both national (Computers in Education Society of Ireland Conference, Galway-Mayo Institute of Technology, Ireland) and international (Higher Education Academy, Science Technology Engineering and Maths Conference, University of Edinburgh, Scotland) level. Furthermore, informal and formal discussion with local academics has raised interest in the use of the resources and also this model of assessment. Collaboration will be fostered with colleagues interested in applying this model to their modules. Assistance will be provided, where necessary, to assist in the adaption of the tailorable resource pack to suit the implementation requirements of other academics/modules. This type of collaboration will allow the project to be further developed. Continuing collaboration within DIT is important to ensure the enhancement of teaching, the economical delivery of the curricula whilst maintaining a diverse, and tailorable, assessment strategy across the Institute.

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7 SELF-CHEM: student engagement in learning through flipped chemistry lectures

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Abstract

This project introduces the idea of “flipped lecturing” to a group of second year students. The aim of flipped lecturing is to provide much of the “content delivery” of lecture in advance, so that the lecture hour can be devoted to more in-depth discussion, problem solving, etc. As well as development of the material, a formal evaluation is being conducted.

Fifty-one students from year 2 Chemical Thermodynamics module took part in this study. Students were provided with online lectures in advance of their lectures. Along with each online lecture, students were given a handout to work through as they watched the video. Each week, a quiz was completed before each lecture, which allowed students to check their understanding and provided a grade for their continuous assessment mark.

The evaluation is examining both the students’ usage of materials and their engagement in lectures. This involves analysis of access statistics along with an in-class cognitive engagement instrument. The latter is measured by “interrupting” students as they work through a problem and asking four short questions which are drawn from another study (Rotgans and Schmidt 2011), which aimed to examine how students were engaging with the materials in that moment. Results from this study, along with access data, quiz scores, and student comments, aim to build up a profile of how the flipped lecture works for middle stage undergraduate students.

Keywords: *cognitive load, flipped lectures, online learning*

Introduction

Flipped lectures at university level began to be touted a few years ago and quickly became a popular choice among early-adopter innovators to replace the traditional lecture. The concept of providing material in advance of the class so that more time could be spent on active learning during class is appealing to educators, and the flipped model provides a useful design framework for how one might integrate in-class and online materials. However, despite a lot of attention in the “popular press” of blogs, online journals, and social media, there is scant detail on the effect of flipped lectures on student learning

in the education literature. The study most often referred to is an article published in 2000 in the Journal of Economics Education (Lage, Platt and Treglia 2000). That article describes the implementation of the inverted lecture, along with some evaluation based on student opinions. More recently an article in Chemistry Education Research and Practice describes the implementation in the context of a General Chemistry module, with the implementation consisting of a student survey (Smith 2013).

Recent work by the author reported the effect of providing some material to students in advance of a lecture (Seery and Donnelly 2012). These pre-lecture activities aimed to introduce some core terminology and ideas prior to a lecture with the aim of reducing the in-lecture cognitive load. That research found that introducing some terminology and structure in advance of the lecture improved grades for all students, regardless of the extent of their prior knowledge, and in addition narrowed the gap in these grades to a non-significant difference. While pre-lecture activities differ from flipped lectures in terms of the amount of information provided in advance and the nature of the subsequent lecture hour (Seery 2012), they have similarity in their underlying rationale: providing students with material in advance of the formal teaching time may help reduce the cognitive load as students will have some familiarity with the material when it is being discussed in class.

On the basis of this rationale, the current study aimed to examine the implementation of a flipped classroom model of delivery in place of a more traditional lecture model. The study aimed to address the following questions:

1. Would students engage with the materials in advance of the class?
2. Would students attend lectures for material that had “been delivered”?
3. Would students engage with the more active approaches being taken in lectures?

Details of Implementation

Undergraduate chemistry degrees in Ireland typically consist of four years (stages) with 60 ECTS credits (European Credit Transfer and Accumulation System) per year. After a common science first year, students take modules in chemistry for the remainder of their degree. This module in Physical Chemistry was delivered to 51 students during their second stage (Year 2) in the first semester.

The content consisted of introductory thermodynamics (First Law, Second Law, Solution Chemistry) and made up half of the module (2.5 ECTS). The other half of the module was delivered by another lecturer in the traditional manner. In total in Year 2, students take two modules (2 x 5 ECTS) in Physical Chemistry. The hours of delivery were 9 am and 3 pm on Wednesdays for six weeks over the second half of semester (the final week consists of tutorials). The modular exam for the Semester 1 module is held in January and consists of 50% of the mark. The remainder of the assessment is derived from laboratory (30%) and continuous assessment (20%). Some 10% of the continuous assessment mark is derived from the Thermodynamics half of the module, and is referred to below.

The 12 hours traditionally delivered to students were re-configured into five weekly screencasts, prepared especially for this purpose. Details on design considerations for these screencasts are available (Seery 2010). Students were asked to watch the screencast before Wednesday of each week. Screencasts were typically 10–15 minutes long. While watching the screencast, students completed worksheets where they had to write out explanations and try questions.⁷ In addition, they were referred to the textbook at various points and asked to work through worked examples and other questions to check their understanding in their own time. Once they had completed the screencast and worked on their questions, they completed a pre-lecture quiz. The questions in the quiz were devised by the author such that they followed on from the worked examples students were asked to work through. Each student completed similar questions, although the values in each question were different. The quiz had to be completed prior to the lecture, and after this time, students could review their answers and the correct answers. The sum of the pre-lecture quiz marks was used to compute the continuous assessment mark (10%) that was drawn from this component of the module. On the whole, the entire pre-class work required approximately 45 minutes to one hour of work from students.

The cognitive load considerations underlying the approach were used to design the lecture hour. As there were two lectures per day following on from an associated screencast, it was decided to use these two hours to progressively develop students' understanding and problem solving as related to the material under consideration. Therefore, the first hour consisted of revisiting some core concepts in the introductory 10 minutes of the lecture, followed by a series of problem sets, the design of which followed directly from the pre-lecture quiz. Students worked on these in small groups, typically groups of three. The purpose of this first hour was to get students talking about the topics under consideration and working on algorithmic style problems. This was to ensure that they had the knowledge and confidence to use the core equations and approaches in each of the topics. In the second lecture hour, the students were given more advanced problems to work through, again in groups. These often had missing data or data that need to be estimated, and/or brought together related topics. The aim here was that students would be able to move on to applying the core knowledge in each topic to a thermodynamics problem. The author circulated the lecture hall dealing with queries and prompting questions. Finally, after the lecture, some worked example videos were placed on the virtual learning environment, which covered the approach to some of the main problems if students wished to revisit them at their own pace.

Observations from Implementation

As mentioned in the introduction, this pilot study was interested in three main questions. These are considered in turn below.

Would students engage with the materials in advance of the class?

Screencasts and pre-lecture quizzes were made available for the week preceding each lecture, giving students seven days to complete the work required in advance of the lecture. As these students are quite busy with course work (four chemistry practical reports per week to prepare, continuous assessment from other modules), there was a concern that even though intentions might be good, students would not engage with the preparatory material.

Analysis of the access data for each screencast shows that overall, 92% of students watched the screencast at least once each week (Figure 7.1). These included three students who never logged in to watch videos or who never came to lectures, and in Weeks 1, 3, and 5, an additional three students. When the latter group of students were asked why they did not watch the video, the typical answer was that they had forgotten. Students who did not watch a video were automatically sent an email reminding them to do so the following week, which may explain the periodic nature of the data.

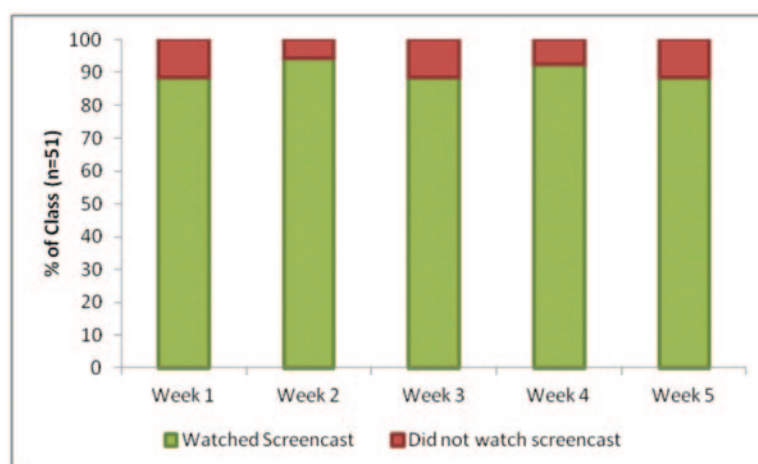


Figure 7.1: Proportion of students who watched and did not watch weekly screencast

⁷ Permission was obtained from the textbook publisher to reuse images in the screencasts and handouts.

The day that students watched was also recorded, and it was found that most students watched on the day before the lecture, in the evening time (Figure 7.2). There are some indications that as the weeks went by, the time of day moved to earlier in the evening, which suggests students began to build it into their regime on a Tuesday evening.

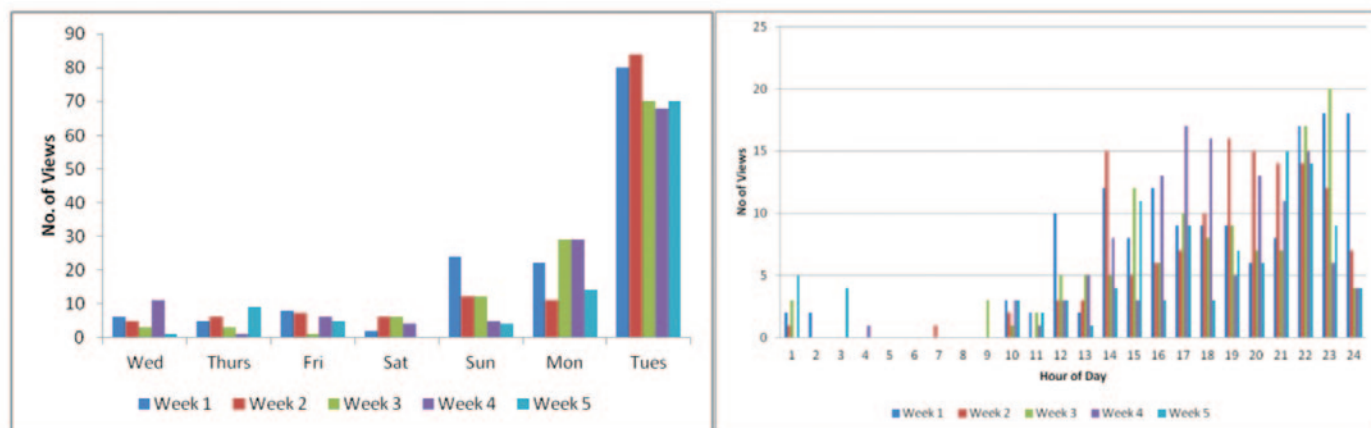


Figure 7.2: Access data showing days of the week (left) and time of the day (right)

In addition to watching the screencasts, students were required to complete a pre-lecture quiz. All students who watched the screencast completed the quiz. Those that did not also did not complete the quiz, which helps to verify “forgetfulness” as the reason for non-viewing. The overall average on the quiz for all quizzes was 69%, excluding those that did not attempt (DNA) (Figure 7.3).

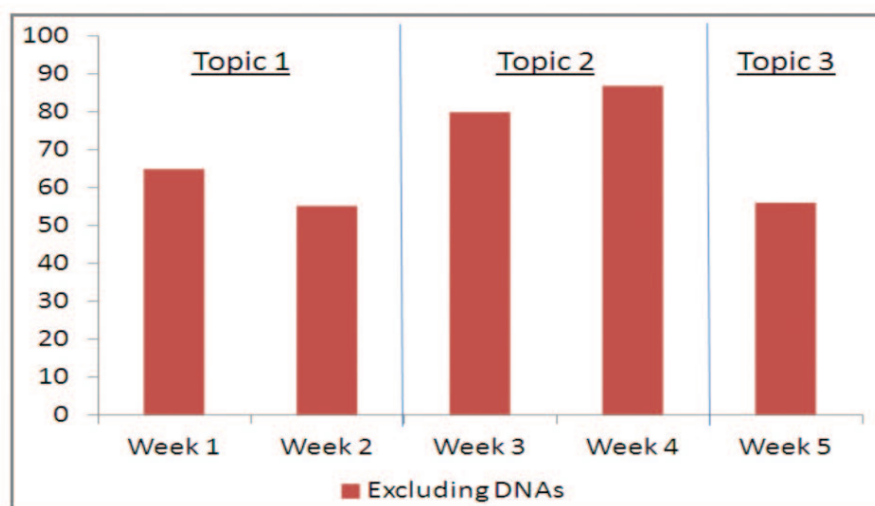


Figure 7.3: Scores achieved in weekly quizzes

Note: Topic 1: 1st Law, Topic 2: 2nd Law, Topic 3: Solution Thermodynamics

Would students attend lectures for material that had “been delivered”?

Having completed the online work in advance of the lecture, the next concern was that students might feel that they had “covered” the content, and therefore had no need to attend the lectures. As with the concerns about watching the screencasts, these fears were mostly without basis. The attendance at each lecture was logged and overall, the attendance was good. Attendance for the first four weeks was above 70% for morning lectures and 80% for afternoon lectures. Attendance in Weeks 4 and 5 were lower, and this is probably due to a combination of it being close to the end of semester, as well as an increasing amount of coursework being due. Nevertheless, attendance for this module was above the average attendance for other lecturers who recorded attendance that semester.

Would students engage with the more active approaches being taken in lectures?

One of the core aims of considering flipped lectures is that students engage with material during the lecture in a more meaningful way. As well as the traditional means of considering engagement as shown above, it was decided to use an instrument to measure students’ cognitive engagement as they were working through some material in a lecture. This was achieved by using the survey developed by Rotgans and Schmidt (2011)8. This survey asks students to consider, in a particular moment, four aspects of engagement: (i) whether they were engaged with the task at hand, (ii) whether they are putting in effort, (iii) whether they wished to continue working, and (iv) how deeply involved they were in the activity.

Mid-way through one of the afternoon lectures, students were interrupted while they were working on a problem during class time. They were handed out a sheet of paper which contained a table listing "Statement 1" through "Statement 4" in the left hand column and a five-scale Likert response across the top, running from "Not true at all for me" on the left to "Very true for me" on the right (Table 7.1). Students were then shown each of the four statements in turn and asked to rate whether that statement was true or not for them (i.e. students did not see the statement until it was displayed on the screen). Then the sheets were collected and the students resumed work. The entire exercise took approximately five minutes.

	Not true at all for me	Not true for me	Neutral	True for me	Very true for me
Statement 1: I was engaged with task at hand					
Statement 2: I put in a lot of effort					
Statement 3: I wish we could continue with the work for a while					
Statement 4: I was so involved I forgot everything around me					

Table 7.1: Cognitive engagement instrument based on Rotgans and Schmidt (2011)⁸

Note: The text of the statement was not on the student form.

In order to explore the students responses to the four statements, the difference between each student's response and the "neutral" response was calculated, where each of the five statements were scored 1–5 with neutral being 3. The results of this analysis are shown in Figure 7.4.

The analysis shows that students agreed, to decreasing extents, with statements 1–3. This suggests that the students were actively engaged with the work to hand (Statement 1), were applying mental effort while doing so (Statement 2), and at least did not mind continuing to work on the problem (Statement 3). Strong disagreement with Statement 4 ("I was so involved I forgot everything around me") is probably to be expected given that students were actively encouraged to discuss and work through problems with their neighbours.

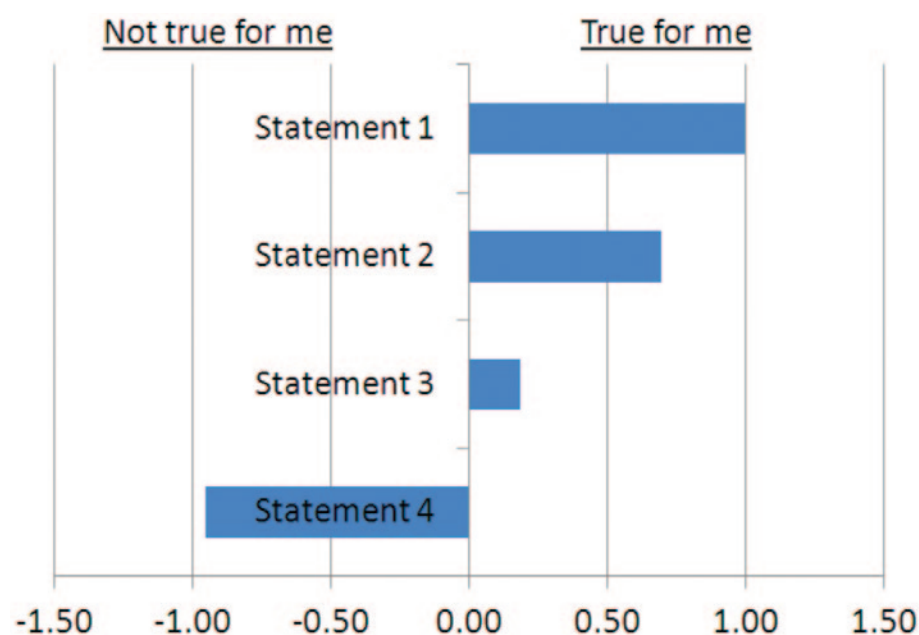


Figure 7.4: Responses to cognitive engagement instrument for each of the four statements

⁸ Permission was obtained from the textbook publisher to reuse images in the screencasts and handouts.

Discussion

The implementation of the flipped lecture method was approached with some trepidation. Fears that students would, in the context of a busy academic week, not have time to prioritise the work required to engage in the material prior to lectures, or not attend lectures themselves resulted in this pilot study monitoring pre-lecture work, attendance, and in-class activity. As can be seen from the data, the students taking the module embraced the flipped model whole-heartedly. They engaged with the material prior to the lecture, attended the lectures, and worked well on assigned tasks during the lecture. In this regard, the implementation was considered to be successful.

Conclusions

The implementation of a flipped lecture model in a mid-stage undergraduate chemistry module was piloted over the duration of half a semester. The design of the implementation was grounded in cognitive load theory. Students engaged with the module and its online materials, and worked well in class on active learning components there. The implementation has thrown some light on some issues surrounding flipped lectures, as well as some thoughts that may be useful in the delivery of online material in the future.

Recommendations to DIT

1. Flipped lectures are a potentially beneficial way to help students structure their approach to a module.
2. The module requires some preparative work, especially in the development of screencasts and other learning materials. A media suite (sound room, screencasting software, etc.) available on each campus would be hugely beneficial in producing these. Group offices are too noisy.
3. Students like the regular use of quizzes as a means of checking their understanding and targeting where they need to study. This should be promoted for appropriate modules.

Proposed Future Work

The project will be re-run in the following academic year, with a further analysis of what students do in the lecture and how discussions there inform their understanding.

Acknowledgments

The author thanks the College of Sciences and Health and the Learning Teaching and Technology Centre, Dublin Institute of Technology for their support of this project. In addition, the author acknowledges Dr Roisín Donnelly and Dr Claire McDonnell for useful discussions and their input into this work.

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Teaching Fellowship 2013–2014

Dissemination Outputs

See also <http://www.dit.ie/lttc/projects/institutionalprojects/teachingfellowships/>

Peter McDermott: Conservatory of Music and Drama

As part of the DIT Fellowship programme, an overview of the project was provided at the Teaching Fellowships Launch on 5 December 2013 at DIT Bolton Street. Updates of work in progress were also given through the LTTC website, at the DIT Annual Showcase of Teaching and Learning Innovations in DIT Kevin Street on 15 January 2014, and at a College presentation on 23 May 2014.

Kevin Griffin: School of Hospitality Management and Tourism

As part of the DIT Fellowship programme, an overview of the project was provided at the Teaching Fellowships Launch on 5 December 2013 at DIT Bolton Street. Updates of work in progress were also given through the LTTC website, and at the DIT Annual Showcase of Teaching and Learning Innovations in DIT Kevin Street on 15 January 2014.

Tony Buckley: School of Marketing

As part of the DIT Fellowship programme, an overview of the project was provided at the Teaching Fellowships Launch on 5 December 2013 at DIT Bolton Street. Updates of work in progress were also given through the LTTC website, at the DIT Annual Showcase of Teaching and Learning Innovations in DIT Kevin Street on 15 January 2014, and at a College presentation on 13 February 2014.

Marisa Llorens-Salvador, Eileen Mageean, Edmund Nevin: College of Engineering and the Built Environment

As part of the DIT Teaching Fellowship programme, an overview of the project was provided at the Teaching Fellowships Launch/Celebration Event on 5 December 2013 at DIT Bolton Street. A presentation was also made on 15 January 2014 at the DIT Annual Showcase of Teaching and Learning Innovations at DIT Kevin Street. An update of work in progress was given on 20 March 2014 in DIT Bolton Street. A special college presentation was given on 27 May 2015 at DIT Bolton Street as part of the STEM Education Research Workshop.

- **Publications (Presented)**

Llorens, M., Nevin, E. and Mageean, E. (2014) "Work in progress: online resource platform for mathematics education", *Proceedings 9th Iberian Conference on Information Systems and Technologies (CISTI'2014)*, Vol. 2: 353–356, 17–21 June 2014, Barcelona, Spain.

- **Publications (In-print)**

Llorens, M., Nevin, E. and Mageean, E. (2014) "Online resource platform for mathematics education", *FIE 2014 – 2014 Frontiers in Education Conference*, 22–25 October 2014, Madrid, Spain.

- **Publications (Submitted)**

Nevin, E., Mageean, E. and Llorens, M. (2014) "The development of an online resource platform for mathematics education as a means to increase student engagement and retention", *International Symposium for Engineering Education (ISEE)*, 11–12 September 2014, Manchester, England.

Aaron Mac Raighne: School of Physics

As part of the DIT Fellowship programme, an overview of the project was provided at the Teaching Fellowships Launch on 5 December 2013 at DIT Bolton Street. Updates of work in progress were also given through the LTTC website, at the DIT Annual Showcase of Teaching and Learning Innovations in DIT Kevin Street on 15 January 2014, and at a College presentation on 30 January 2014. A half-day workshop based on the results of the study was provided at the National forum for the enhancement of teaching and learning in higher education; "Technology Enhanced Assessment for Large Student Groups". A paper is also in the final preparatory stage for submission for publication and a further paper is hoped to be prepared soon. A poster on the study has also been placed in Kevin Street for the attention of staff and students.

Barry Ryan: School of Food Science and Environmental Health

As part of the DIT Fellowship programme, an overview of the project was provided at the Teaching Fellowships Launch on 5 December 2013 at DIT Bolton Street. Updates of work in progress were also given through the LTTC website, at the DIT Annual Showcase of Teaching and Learning Innovations in DIT Kevin Street on 15 January 2014, and at a College presentation on 30 January 2014. Other outputs include:

- Resources website: <https://sites.google.com/site/ditteachingfellowship>
- Ryan, B.J. (2013) "Making connections: networked mindmaps as a student centred assessment for learning", *Journal of Perspectives in Applied Academic Practice*, 2: 30–39.
- Ryan, B.J. (2013) "A walk down the red carpet: students as producers of digital video-based knowledge", *International Journal of Technology Enhanced Learning*, 5: 24–41.

Michael Seery: School of Chemical and Pharmaceutical Sciences

As part of the DIT Fellowship programme, an overview of the project was provided at the Teaching Fellowships Launch on 5 December 2013 at DIT Bolton Street. Updates of work in progress were also given through the LTTC website, at the DIT Annual Showcase of Teaching and Learning Innovations in DIT Kevin Street on 15 January 2014, and at a College presentation on 30 January 2014. Other outputs include:

- An online conference presentation for the American Chemical Society ConfChem Series: M.K. Seery (2014) "Student engagement with flipped chemistry lectures" (Invited contribution), *ACS ConfChem*, Proceedings at <http://bit.ly/FlipChem>.
- Opening Keynote: "The digital future", Dublin E-learning Summer School, June 2014.
- Invited presentation: "Teaching with technology", University of Edinburgh, August 2014.
- Conference Presentation: "*Student engagement with flipped chemistry lectures*", International Conference on Chemistry Education, Toronto, July 2014.
- Article "Implementing the flipped classroom" for Education in Chemistry website: <http://www.rsc.org/blogs/eic/2014/01/implementing-flipped-classroom>.

Appendices

Fellowship Projects 2013/14

Drawing upon and contributing to the findings from the DIT's own data and national and international data and best practice as appropriate

	First Year Curriculum	Assessment	Student Engagement and Retention	Curriculum Development
Modularisation	Projects in this cell would focus on curriculum reform – facilitated by our modular structure – to assist commencing students change their learning strategies to meet the expectations of HE.	Projects in this cell would consider the impact and potential of modularisation on assessment with particular attention to the pedagogical potential of formative assessment as a way to limit the overall summative assessment load.	Projects in this cell would address the way in which the DIT modular structure could be used to redesign delivery of programmes and/or curriculum design in a way that would be responsive to those factors contributing to retention.	Projects in this cell would use the modular structure to design programmes and to use teaching and assessment methods that would encourage student participation and engagement in their learning.
Diversity	Projects in this cell would explore and compare different strategies to support learner engagement within the first year of undergraduate programmes.	Projects in this cell would focus upon the use of "non-traditional" assessments as a way to provide feedback to students on their learning.	Projects in this cell would focus upon the use of strategies to include, engage and retain non-traditional students within existing programmes.	Projects in this cell would develop creative ways to use the DIT modular structure to address the needs of non-traditional students.
E-learning	Projects in this cell would make use of online resources to encourage active learning and information literacy among first year students.	Projects in this cell would leverage technology to support innovative assessment practices.	Projects in this cell would aim to improve student retention through the use of e-learning technologies.	Projects in this cell would focus on the use of e-learning technologies to engage students and motivate them to more active learning.

Teaching Fellowships Evaluation and Feedback

- 1. How did you first become aware that DIT had established College Teaching Fellowships, e.g. did you see them advertised, heard by word of mouth etc.?**
 - Advertised by LTTC
 - Director of Research - College of Business
 - LTTC website
 - Word of mouth and Linda's email
- 2. How did you become a Teaching Fellow for your College, e.g. were you nominated to apply, did you submit the application form when you saw the call etc.? Please briefly outline the process below.**
 - I was nominated
 - Submitted an application form when I saw the call.
 - Submitted application form when I saw the call.
 - Submitted the application form.
- 3. How did you feel this application process worked for you? How might it be improved if there is another call for College Teaching Fellowships next year?**
 - It could be promoted more heavily.
 - It worked fine - guidelines were clear and HoLD was available to assist with any queries.
 - It worked very well but the start date was later than I would have liked and doesn't give you enough time to prepare for the upcoming academic year and project.
 - Notification of successful application was in mid-semester which delayed the project start. Notification in early late August/early September would be better.
- 4. How important was the money in you being able to undertake your fellowship research?**
 - 1 Very important
 - 3 Quite important
 - 0 Not important but it helped
 - 0 Didn't make any difference
 - 0 Don't know
- 5. Which of the following best describes how you used your Fellowship money?**
 - 1 Buy out of hours
 - 1 Buy equipment/resources for the project etc.
 - 3 Disseminate findings at a conference
 - 2 Other (please specify)
 - It would be useful to buy out hours but that wasn't an option. The money identified the Fellowship as something that had to be done; without it other work would take over any good intentions.
 - Travel for meetings with collaborators.
- 6. A Teaching Fellowship launch, the DIT Showcase event and a series of four lunchtime College sessions have been organised as a way to support and promote your Fellowship work within the DIT. Have you attended these sessions?**

Yes: 4 No: 0
- 7. If yes which ones?**
 - A Teaching Fellowship launch, the DIT Showcase event and some (one) lunchtime events.
 - Fellowship launch and DIT Showcase.
 - Launch, showcase and I think my College Lunchtime session.
 - Workshop and presentation of WIP.

8. How useful have these sessions been to you and how might they be improved?

- Difficult to attend other fellows lunchtime sessions due to work constraints. Difficult to persuade colleagues to attend. Would suggest holding them all together possibly as an evening event so that experiences can be shared.
- Generally good; interesting to see what others are doing and discuss informally. Time-keeping should be strictly enforced as they are usually held at busy times of the year.
- Very useful.
- Very useful, especially when people kept to time.

9. Have any additional seminars, workshops, presentations been organised in your department as a way to also promote the work?

Yes: 2 No: 2

10. If yes please outline here:

- PeerWise half day event
- The paper will be used in the TU4D deliberations on the Entrepreneurial University.

11. Support from the LTTC staff has been made available to help you plan/implement your Fellowship project. What kind of support have you found most useful so far and what kind of additional support would you like for the next stage of your work?

- Just having someone that you could ring/email to help with specific educational research questions.
- LTTC staff attendance/comments at workshop and presentation of WIP.
- Most useful support was casual - just being able to have a talk about project and where it was going at different stages. LTTC staff were (as always!) very helpful and informative in that regard.
- The attendance of LTTC staff at the lunchtime session was gratefully appreciated. Additional workshops during the course of the fellowship such as research tips, statistical analysis and report writing might be helpful. Guidance on suitable conferences to attend and/or journals to publish in would be helpful.

12. Has being a teaching fellow for your College been as you expected?

Yes: 4 No: 0

13. If no, in what way has it been different?

- N.A.

14. External funding currently used to support the Fellowships has now ceased. Do you feel that the DIT should continue to support Fellowships into the future?

Yes: 4 No: 0

15. Any other comments you would like to make about the continuation of the Fellowships, or the Fellowships more generally?

- Continued funding to identify the projects would be good, even if it was just one Fellowship per college. Habitual applicants like myself should be dissuaded from applying or encouraged to bring someone on board or mentor someone that hasn't engaged with any of the LTTC funded schemes in the past. Many of my colleagues feel that it is something they could attempt, but are not quite sure what it is required.
- Great idea!
- The fellowship is a great way to entice members of staff into the realm of educational research and to allow them to have some exposure to current ideas and developments.
- The whole fellowship experience was empowering and in my opinion I feel that many of my colleagues would benefit from participating.

Aaron Mac Raighne

0264226394

PeerWise Feedback Questionnaire Session 2013- 2014

Class/Module: _____

Thinking about the PeerWise system...	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
1. Developing original questions on course topics improved my understanding of those topics.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
2. Answering questions written by other students improved my understanding of those course topics.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
3. Engaging in discussions (writing and reading comments) improved my understanding of these topics.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
4. Of the questions I authored, I created them from scratch ("strongly disagree" here means you copied and pasted questions from other sources whereas "strongly agree" means you developed the question entirely on your own).	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
5. I did (or would) use PeerWise for exam preparation and/or revision.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
6. I accessed PeerWise primarily from my mobile device (e.g. smartphone, tablet)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
7. I would like to see PeerWise introduced for assessment in my other modules.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
8. Time taken for me to create a typical PeerWise question.					
<input type="radio"/> 0 - 10 mins <input type="radio"/> 10- 30 mins <input type="radio"/> 30 mins to 1 hour <input type="radio"/> 1 - 2 hours <input type="radio"/> > 2 hours					

9. What do you believe is the biggest benefit of using PeerWise? What aspects of using PeerWise did you find most useful/interesting/enjoyable? (Optional)

10. What do you believe is the biggest problem with PeerWise? Can you recommend something that would make PeerWise more valuable or effective for learning in this class? (Optional)

11. If you contributed more than the minimum requirement (either by developing more questions or by answering more questions than you were required to), why did you choose to do so? (Optional)

12. Was the introductory activity sufficient? How would you improve it? (Optional)

