Cross-institutional development of sharable learning technology tools for flexible accounting education

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Strand: Blended learning

Abstract:
This paper describes a collaboration between three Irish Institutes of Technology to develop a series of sharable, e-learning resources to support students learn introductory aspects of financial accounting. It describes the resources and illustrates pedagogical, instructional design and technical considerations in their development. The collaborative process is discussed, as are evaluation completed to date and plans for further use and development**.**

Findings of this study include the effect of the flipped classroom in transforming student learning and the development of their digital literacies; the positive response to providing a flexible and scaffolded approach for learning, and the positive effects of collaboration between higher education institutions. Challenges associated with introducing and resourcing such initiatives will be discussed.

The paper should be of interest to anyone teaching introductory financial accounting and to anyone with an interest in using an e-learning approach in their teaching practice. It is hoped that the paper will generate discussion on e-learning, and on creation and sharing of e-learning resources via repositories such as the NDLR and Jorum.

Some of the resources can be viewed by following the link below:
https://dspace.ndlr.ie/bitstream/10633/31502/1/FASTER%20Project.pdf

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Introduction

The purpose of this paper is to describe a collaborative process between three Institutes of Technology in the Higher Education (HE) section in Ireland to develop a series of multimedia type e-learning resources for introductory financial accounting students. The resources have been used over the past academic years in the three institutions and their use has been evaluated. This paper should be of use to anyone interested in providing e-learning support for their students or for anyone interested in collaborating with their fellow HE institutions in creating e-learning resources.

The remainder of the paper is structured as follows. The next section discusses the type of resources produced and is followed by a review of the collaborative process. We then discuss the rationale for producing e-learning resources in accounting and follow this by looking at practical applications of the resources in our teaching practice. An evaluation of the use of the resources is made and this is followed by an analysis of the findings. We finish with some concluding remarks.

Resources developed

The FASTER resources are multimedia type resources that combine presentations, videos, problems to work through and quizzes. The topics covered by the resources are common topics covered in introductory accounting courses. The resources cover basic principles of accountancy, which means they will be relevant internationally and useful to a wide range of users. The resources are generated in line with international financial reporting standards.

Each learning resource focuses on a specific introductory accounting area, as follows:

1. Trial Balance
2. Ratio Analysis
3. Bank Reconciliation
4. Cash Flow Statements
5. Double Entry Bookkeeping

Four of the five completed resources can be viewed at the following web address: https://dspace.ndlr.ie/bitstream/10633/31658/4/FASTER%20Project.pdf

The learning resources were created using Articulate Studio and supporting technologies such as Camtasia Studio, Screenr.com and Microsoft Office Suite. The learning resources were published in Articulate Studio as Sharable Content Object Reference Model (SCORM) compliant objects version 1.2. SCORM is a universal standard developed by ADL that allows all training and software created under its guidelines to work seamlessly with each other (Wesche, 2010). One major advantage of having SCORM compliant e-learning resources is that content can be delivered to learners via any SCORM-conformant Virtual Learning Environment (VLE) using the same version of SCORM (ADL, 2011). A second key advantage is that it enables student usage to be tracked in an institutional VLE such as Moodle or Blackboard. This is particularly useful for evaluation purposes.

For the design of the resources, we drew on principles of multimedia design, including the use of worked examples (Clark & Mayer, 2008) and visual design principles from Williams (2004, 2009). Bryant & Hunton (2000) researched the use of educational technology in accounting. Drawing from behavioural and cognitive theory, as well as educational research on the impact of technology on learning, they made a number of recommendations for accounting lecturers to consider when using technology to deliver instruction. These recommendations, as summarised by Theuri, Greer, & Turner (2011), suggest the following for effective use of technology in instructional design:

- Provide opportunity for student interaction
- Present accounting using basic and everyday language in explanations
- Clearly state objectives at the beginning of each topic
- Provide feedback to the student for monitoring self-progress
- Keep it engaging enough to motivate completion

We incorporated all of these recommendations into the design of the FASTER e-learning resources. Each resource introduces learners to the key concept through a short, interactive presentation. Learners are guided through a worked example, with short videos (between 3 – 10 minutes in length) showing the development of the solution. A problem is presented that learners are encouraged to first try and then answer a series of short questions, each question accompanied by a hint in the form of an image taken from a model solution-in-progress. Immediate feedback is provided. Each resource also includes a review quiz, which draws randomly on a small bank of questions so it is different each time it is attempted.

Collaboration Process

This project was possible due to the support of the National Digital Learning Repository (NDLR). We received funding under the 2010 Learning Innovation Community Support (LInCS) Project. LInCs Projects are cross-institutional projects, funded by NDLR, to promote the development and sharing of digital learning resources and associated practices. The FASTER e-learning resources can be found in the NDLR Accounting & Tax repository. https://dspace.ndlr.ie/bitstream/10633/31658/4/FASTER%20Project.pdf

The funding was used to finance equipment, software, training and travel. Unfortunately a condition of the funding was that it could not be used to purchase lecturers' time. Therefore, the resources were produced whilst team members worked their full teaching load, which varied between 18 to 20 teaching hours per week. This was a significant additional demand on team members' time. While institutional support was offered for time to attend meetings and conferences, it was disappointing that there was no reduction in teaching hours offered by any of the three institutions involved.

The project has significantly strengthened ties between the business schools and learning and teaching departments of the three partner institutions of Dundalk, Carlow and Athlone Institutes of Technology. As all of the business lecturers involved in the project teach introductory accounting, they were able to share their teaching resources amongst the group, which has benefited all concerned.

One member of the project team, Damien Raftery of IT Carlow's *Teaching and Learning Centre*, is not a business studies lecturer. Damien contributed very significantly to the project in a support and training role and his influence embedded good instructional design into the resources. Indeed one of the key lessons learned from the project is the importance of having a team member who has an e-learning background and who is not one of the content experts. The fact that Damien was not responsible for producing an individual accounting resource meant he could take an unbiased and holistic view of all the resources.

The rationale for producing e-learning resources

There have been a number of phrases used in the literature to describe the use of technology in HE. Such phrases include blended learning, technology enhanced learning and e-learning. We use the term e-learning in this paper to describe the use of technology in HE. Definitions of e-learning range from it meaning online provision of education, to wider definitions that encompass any use of technology in education. We defer to the definition of Bliuc, Goodyear, & Ellis (2007), who describe blended learning as *"learning activities that involve a systematic combination of co-present (face-to-face) interactions and technologically-mediated interactions between students, teachers and learning resources"* (pg 234). This definition ties in with how we use these multimedia type e-learning resources.

According to Curran (2004) universities' e-learning strategies have three main objectives; to widen access to education opportunity, enhance the quality of learning and reduce the cost of higher education. The objective of enhancing the quality of learning was what drove this collaborative project. Another rationale for producing the resources was to allow flexibility in teaching.

Gordon (2014) discusses how the use of flexible pedagogies including the use of technology in education gives choice to students over the pace, place and mode of learning. It is self-evident that choice over pace and place of learning are positive developments for students. To be able to access learning resources outside of the lecture room and to be able to pause/replay those resources allows students to interact with the learning resources at their own pace and at their desired location. However, a question arises over the mode of learning. How do we know that the use of multimedia type e-learning resources enhances the quality of learning?

A number of studies have looked at answering this question in the field of accounting and business. A study by Martin et al (1995) on the use of videos in the teaching of accounting concluded that their use increased the level of critical and reflective learning by students, which was in part evidenced by an improved student performance in the assignment. A more recent study by Theuri, Greer, & Turner (2011) looked at whether a multimedia based instructional supplement, prepared using business and accounting students as presenters enhances any or all four lower-level Bloom's taxonomy cognitive skills. Results indicate that the multimedia based instructional supplement is beneficial for enhancing students' overall performance and in enhancing understanding, applying, and analyzing levels of cognitive skills. In a non-accounting context, Partridge, Ponting, & McCay (2011) argue that blended learning can lead to greater student engagement, accommodate different learning styles and can lead to improved student outcomes.

The resources give choice and power to the student in relation to where, when and how they study. This flexibility of pace, place and mode of learning is useful for all students, but is particularly important for identifiable groups of students including first year students, mature students, poor attenders and students with learning difficulties. Progression rates for first year students are an issue across the HE sector internationally. Mature students often have competing family and work commitments that cause them to miss lectures.

Students who miss a class or need to spend extra time on a topic often do so alone with an accounting question and perhaps a recommended solution. The worked example approach used by the FASTER e-learning resources is an effective way of teaching accounting concepts and procedures for all learner types. The added multimedia, interactivity and feedback in e-learning resources may be more effective than text-based outline solutions in engaging learners and supporting them to persist with difficult

concepts and detailed procedures. The added multimedia may appeal to students who self-identify as visual, auditory or kinaesthetic learners. Within the context of Irish higher education, Cosgrave et al., (2013) found students wanted more use of the VLE by lecturers, specifically with increased student demand for multimedia learning resources to be available via the VLE. The 'modern' world of the student accessing on-line revision tutorials created in an interactive platform from a remote location is with us to stay. If and how this changes teaching practice is an important issue to discuss.

As stated above, the main rationale for producing the e-learning resources was to increase student learning. Another rationale was to allow flexibility in teaching. However, our main focus was on designing the resources to maximise student learning. As a team we did not give as much consideration as to how we would use the resources in our teaching practices. This was primarily due to the fact that each team member's teaching practice is individual and contextual. As a team we did not feel it appropriate dictating how the resources should be used. The resources were not used in the same manner by all team members and this shall be discussed in the evaluation section.

E-learning resources can be used by teachers in a number of ways. Students can be asked to use the e-learning resources before, during or after lectures. It has become common practice for teachers to use e-learning resources such as videos as complementary teaching aids during lectures. Also teachers often ask students to use e-learning resources (such as videos and links to websites) as revision aids after lectures. This practice has become easier to adopt due to the ability to upload videos & links on institutional VLEs. Prior to developing these resources, all of the FASTER team had previously used e-learning resources as complementary teaching aids and revision aids. However, only a minority of us had used e-learning resources as preparatory teaching aids.

The Flipped Classroom

The flipped classroom is a term that has gained traction in education in recent years. It refers to providing content and learning material to students before class time and using class time afterwards to actively discuss/problem solve key aspects of that material (EDUCAUSE, 2012). Many would argue that this is not a new phenomenon in higher education as many practices, such as tutorials, have always followed this approach. However, what distinguishes the flipped classroom is its use of the blended learning approach and the opportunities and challenges this generates.

Graham (2006) offers useful categorisations of blended learning based on the effect on pedagogy. 'Enabling blends' improve student access to course materials in both time and space, whereas 'transforming blends' facilitate a radical transformation of the pedagogy. Enabling blends can be simply explained as an improved delivery mechanism (i.e. pace, place & mode), but it is more difficult to explain a radical pedagogical transformation. Dziuan, Hartman, & Moskal (2004) argue that transformative pedagogy can be thought of as pedagogy that shifts from lecture to student–centred instruction, increases interaction between instructor-student, student-student, student-content, student-outside resources, and generates integrated formative and summative assessment mechanisms for students and instructors.

Traditional lectures with the 'sage on the stage' have long been criticised for promoting passive learning by students. One of the main goals of the flipped classroom is to promote more active learning by students in class. Content which traditionally is delivered in lectures is instead delivered online, which leaves time in class for student interaction and collaboration. Potentially, therefore, the flipped classroom combines the benefits of direct instruction and active learning. Strengths of the flipped classroom include more

active learning opportunities for students (Gannon, Burge , & Helmick, 2008), student responsibility for learning (Overmyer, 2012) and efficient use of class time (Cole & Kritzer, 2009).

Bull, Ferster, & Kjellstron (2012) outline that increasing interaction in class "can be done in a variety of ways and with different degrees of adoption, ranging from just a few class sessions a year to a complete re-conceptualization of a course". Therefore there is not a definitive flipped classroom method, as the most effective approach will depend on the context of the situation. The importance of the context is reinforced by Gordon (2014) who highlights that flexible pedagogies, such as the flipped classroom, require interplay between the three principal learning and teaching stakeholders; the students, teachers and educational institutions. The flipped classroom therefore requires teachers who are flexible in their approaches and modes of teaching, students who are flexible to different learning approaches and are willing to take responsibility for their learning, and institutions that allow for flexibility in teaching and learning.

The use of technology is seen by many university leaders as providing new ways to meet the challenges of the higher education sector in the context of economic constraints, increasing globalisation of education and changing pedagogical approaches (Allen & Seaman, 2013). Wanner & Palmer (2015) posit that the flipped classroom is a reflection of a progressive change in higher education towards more student and learning centred pedagogies and practices which are made possible through new technologies and more delivery of online and blended courses. From an educational management viewpoint, a flipped classroom approach appears to significantly improve student learning without requiring a commensurate increase in resources. In a review of the literature, McCue (2014) highlights that blended learning saves money for institutions by enabling lower requirements for physical space and faculty time. Reducing face-to-face lectures can allow more students to be taught in the same building.

However, an uncritical view of the use of education can lead to challenges being ignored. Gordon (2014) argues that whilst technology offers scalability, flexibility and new ways of learning, it introduces new complexities and decisions for higher education providers. These issues can be viewed in terms of students, teachers and institutions. How well can students prepare for the nature of e-learning when control moves from staff to students? How can staff acquire the technological skills and the pedagogical expertise to utilise the technology effectively? What institutional systems and procedures need to change to support e-learning?

Garrison & Vaughan (2011) argue that the blended learning approach used by the flipped classroom is "a fundamental redesign that transforms the structure of, and approach to, teaching and learning". Means et al (2010) found that designing and implementing blended/flipped classes requires an increased time commitment for teachers. Wanner & Palmer (2015) highlight that teachers need to learn new pedagogical skills and new technological skills but that their increased time commitment is often not acknowledged in workload models, institutional and technological support.

Bishop & Verleger (2013) highlight that reports of student perceptions of the flipped classroom are mixed, but generally positive overall and students prefer interactive classrooms activities over lectures. Wanner & Palmer (2015) support the view that a blended approach is preferred by students than a wholly online, and they emphasise that students predominantly want their learning through collaborative, well-structured learning activities in a face to face environment.

However, Mok (2014) highlights that two things are critical for the flipped classroom to work. Students must attend class for the active learning activities, and they must carry out the assigned learning activities

before class. Bishop & Verleger (2013) suggest that a successful flipped classroom approach is to have a mandatory pre-class quiz on the lecture material. In a trial of the flipped classroom Mok (2014) ensured that students watched online videos by requiring them to attempt self-test questions until they got a perfect score. Students' attempts were recorded by the e-learning portal and students who did not attempt the questions were penalised in their class participation marks.

Use of the FASTER resources

The use of the FASTER resources in Dundalk IT differed significantly from the use in Carlow IT and Athlone IT. The use of the resources in Dundalk will be discussed first, followed by Carlow IT and Athlone IT.

Dundalk IT use of the e-learning resources

In Dundalk IT, the lecturer Mario Mac Blain adopted a flipped classroom approach from the outset. Previous to the development of the FASTER programme the same content was delivered to students over 12-13 week modules including Financial Accounting, Management Accounting, Financial Management and Fundamentals of Accounting. These modules were delivered to level 7 and Level 8 students across stage 1 and 2 Ordinary and Honours degree programmes. Year groups ranged from 75 students to 190 students, with split groups of approximately 65 students per lecture. The modules were divided between CA (Continuous Assessment) and Final Examination with a 70% Final Exam / 30% CA split. In level 8 the modules were divided between CA (Continuous Assessment) and Final Examination with 80% Final Exam / 20% CA split. The CA component involved class tests and group work with both formative and summative assessment outcomes. All groups across the modules were given three hours contact per week in class with basic on-line support.

The lecturer in Dundalk made a number of significant changes to the modules in order to embed the flipped classroom approach. Delivery of the module was changed from a semesterised basis to a year long delivery over two semesters. Adjustments to the modules including delivery time, timetabling, class size, class balance, and Moodle platforms (Modular Object-Oriented Dynamic Learning Environment) augmented the embedding and development of the FASTER programme. Class contact was increased from three to four hours a week and delivered in two hour slots. Classes were timetabled early in the day with smaller group sizes. Continuous assessment was increased significantly from 30% to 50% of the overall module and group tutorials were organised.

An introductory lecture was given where the FASTER resources were introduced to the students. Students received a summative continuous assessment exam on each of the FASTER resources.

Athlone IT & Carlow IT use of the e-learning resources

Since the production of the FASTER resources, Luke Fannon and Orlaith Kelly (accounting lecturers in AIT) and Susan Brennan (accounting lecturer in Carlow IT) used the resources mainly as a revision tool allowing students to use them at their own discretion when revising material in advance of the final exam or as a learning tool when they may have missed a lecture. The resources were available for students on each institute's VLE. Students were encouraged to access the resources once the topics were covered in class. No formal survey was carried out but informal discussions yielded a very positive response. Students found the resources very user-friendly and easy to navigate. The videos were particularly well received and students found them to be an invaluable "at home" resource for revision purposes. The use of the

resources as a revision aid did not impact on the teaching practice of any of the lecturers involved, apart from uploading the resources onto the institutional VLE.

However, it was felt by the lecturers involved that the resources were not being used to their full potential. Bull, Ferster, & Kjellstron (2012) spoke of different degrees of adoption of a flipped classroom approach and this is reflected in the change of approach for the current academic year for AIT and Carlow IT, where the lecturers involved decided to adopt a flipped classroom approach for one element of their courses. The flipped part of course has yet to be covered this semester in Carlow IT, but has been covered in AIT during the first semester.

Both lecturers in AIT made a FASTER resource available to students via Moodle. The introductory financial accounting module is a five credit module run during semester one of the academic year. The students were informed that there would be a continuous assessment exam on the area five weeks later as per the programme exam schedule. The double entry book-keeping resource was used with a group of 15 students on the Accounting Technicians Year 1 programme and the bank reconciliation resource was used with a combined group of 60 students (40 from Higher Certificate in Business Studies Year 1 programme and 20 from the Higher Certificate in Business and Social Media Marketing Year 1 programme). At first, an 'introductory lecture' took place where the students were introduced briefly to the resource and asked to view the resource in their own time and work through the various sections of it. They were given a hard copy of the 'question to try' which is contained within the resource and asked to attempt that question using the hints given within the resource. They were requested to take their solution to a 'follow-up lecture' which was approximately three days later.

At the follow-up two hour lecture students were given another question to attempt, whilst working in groups of two or three, while the lecturer walked around the group looking at students' question attempts and getting feedback on how they interacted with the resource. A number of other questions were completed in during this lecture with assistance from the lecturer. The teaching approach reverted to normal after this with a number of follow up lectures given where students worked on more difficult questions in order to fully understand the topic.

Evaluation – lecturers' perspective

In AIT, the success of the flipped classroom seemed to be affected by the size of the class involved and having a lecture in an IT laboratory. It worked better with the smaller class of 15 students than the larger class of 60 students. The lecturer of the fifteen students found that the teaching of double-entry bookkeeping was greatly accelerated by using the FASTER resource as part of a flipped classroom approach. Students moved onto advanced bookkeeping questions more quickly than in previous years where the topic was taught using traditional methods. During the follow-up class when the lecturer got feedback from students on their use of the resource it was obvious that the majority of the fifteen students had completed the question and had their solutions with them at class. The fact that the majority of students engaged with the resource contributed greatly to the success of the approach. Had only a few students utilised the resource, it would have been very difficult to move onto advanced questions without leaving the majority of the class behind.

When the fifteen students were given their first introductory lecture on using the resource they were taken to an IT laboratory and shown how to access the resource via Moodle VLE. The lecturer felt that this greatly contributed to the successful use of the resource as students were more likely to use it once

they had physically accessed it already during a lecture. However, access to an IT lab was not possible in the larger group of sixty students. Furthermore, the majority of students in this group were mature students (58%) so this may have contributed also to the fact that most students within the group engaged with the resource.

The flipped classroom approach did not work as well with the larger group of sixty students. The introductory lecture was held in a lecture theatre as the group was too large to have in an IT laboratory. During the follow-up two hour lecture three days later, it was obvious that a number of students had not accessed the resource. This lead to a problem in that many students were able to progress whilst roughly a third of the class did not know how to progress with the new question given out in class, even though they were working in groups. Students who completed the question were allowed to leave class, whilst the lecturer worked through the question with those that had not completed it. A formative exam was given in the following class four days later where students worked alone at a question. The lecturer walked around the room and talked to each student to gauge their progress. Many of the same students still had not looked at the resource and were not able to complete the formative exam question. As stated above, the teaching practice returned to normal after that with approximately two weeks taken to finish the topic.

In Dundalk IT, before the flipped classroom approach was adopted, the average pass rate across introductory financial accounting modules was 75.2% with an initial fail rate of 24.8%. This failure rate reduced to 11.6% subsequent to repeat examinations. Post introduction of the FASTER programme as a support tool to enhance the learning outcome through 'flipping' the delivery, the programmes accomplished a pass result of 96.7% with a net 3.26% fail across the entire range. Furthermore, when reviewing the results per student body, 158 students failed between 2008 – 2010 across a total of 1355 students with in contrast 107 students failing between 2011 – 2015 with a student total of 3277.

Table: Dundalk IT Pass Rates for Introductory Financial Accounting

	Student No	**Pass**	**Fail**	**% Pass**
2008-2010	1,355	1,018	158	88.4%
2011-2015	3,277	3,170	107	96.7%

The FASTER programme as a tool enabled a more enhanced formative assessment with more productive time spent in class plus individual study time provided. The objective of formative assessment was to monitor student learning to offer ongoing feedback that would be used to improve teaching and by the students to advance their learning. It aided students to identify their strengths and weaknesses and targeted areas that needed more work. The formative assessment also identified students who were struggling and allowed the lecturer to identify difficulties directly.

From a summative assessment perspective, the FASTER programme delivered through the Moodle resource provided the ability to evaluate student learning at the end of the module by comparing it against a standard or benchmark by way of final examinations. In these cases examination questions including the following subject areas were set to test the student competencies: Bank Reconciliation, Cash Flow Statements, Ratio Analysis and Trial Balance. The resulting information from the summative assessments was used formatively to guide student and faculty efforts and activities in subsequent courses.

Evaluation – students' perspective

After the topic taught using the flipped classroom approach was completed in AIT by each lecturer, the students were asked to complete a survey on their use of the resource.

In the accounting technician group, twelve students (80% of the class) completed the survey, all of whom had used the resource. 58% of these were aged 23 years or greater. Students were asked to rate their knowledge of double-entry bookkeeping before and after using the resource as expert, intermediate, novice or no knowledge. 75% of the students rated themselves as 'novice' in terms of their knowledge of the double entry bookkeeping topic before viewing the resource, while 25% of students stated they had 'no knowledge'. After viewing the resource, 83% of students rated their knowledge as 'intermediate' while 17% rated themselves as 'novices'. 42% of students felt that additional support of the FASTER resource would be needed to explain difficult bookkeeping questions.

The following is a list of some of the comments received from students when completing the survey:

- "Very well designed with clear instructions and easy to use for complete beginners like myself"
- "Found this very useful as it was very easy to use, the videos explained everything in great detail, the only fault I found was that if you have a problem you can't ask it anything and therefore I couldn't use it 100% of the time, or instead of a lecturer"
- "Very helpful and easy to follow – I like that it is available for me to use in my own time"

The Higher Certificate in Business Studies Year 1 & Higher Certificate in Business Studies and Social Media Marketing Year 1 classes were taught together in one combined group of 60 students. Twenty students (one third of the group) completed the survey. 85% of respondents had looked at the resources. The three respondents who did not look at the resources said that they did not look at them because the lecturer subsequently covered the material in class. 40% of the students rated themselves as 'novice' in terms of their knowledge of the double entry bookkeeping topic before viewing the resource, while 50% of students stated they had 'no knowledge'. After viewing the resource, 80% of students rated their knowledge as 'intermediate'. 80% of students felt that additional support of the FASTER resource would be needed to explain difficult bookkeeping questions. The majority (75%) of students in both the accounting technicians and business studies groups 'strongly agreed' that the resource was well-structured and easy to follow and 75% of students 'strongly agreed' that it was easy to use.

The following are some of the comments received from students

- "Helps with understanding the subject better and can cover things that the lecturer was not able to cover in class."
- "I guess I'm old school .. When it comes to numbers, I find videos hard to follow, prefer lecturer's explanations"
- "I can access it at home and can go over in almost forensic detail anything I am struggling with. I was finding the Bank Reconciliation a bit confusing. I went onto the videos and paused and started my way through them, great facility. One or two classmates were struggling also but few of these guys had used the facility. I have told them they are missing a great learning aid!"

Analysis

There is a feeling that the resources were under utilised when being used as revision aids in Carlow IT and Athlone IT. This enabling approach gives flexibility to the students over the place, pace and mode of their learning, but it did not have a transformative effect on pedagogy as outlined by Graham (2006).

If the students engage with the flipped classroom approach it makes a big impact on learning and teaching, and can have this transformative effect. In accordance with the literature, students were generally

positive about the e-learning resources, but still felt they needed face-to face interaction. The lecturer of the accounting technicians found that the approach greatly accelerated the teaching with students. The accounting technician class is a small class of fifteen students and 100% of them viewed the resources – partly due to the fact they were introduced to the resources in an IT laboratory and they knew the lecturer would be checking with each of them in the follow up class.

However, using the flipped classroom approach involves far more than simply making the resources available for students before classes. The continuous assessment schedule may need to be reconsidered, so that students are encouraged to engage with the resources. Assessment drives learning and it was clear with the larger group of sixty students in AIT that many of the students did not look at the resource. This may have been because there was no summative assessment until five weeks later. Perhaps a formative in-class exam in the follow up lecture (after introducing the e-learning resources in the previous class) would encourage students to engage with the resources. Another option would be multiple choice questions to be done before the follow up lecture. Early engagement would encourage the formation of good habits. One of the respondents to the survey commented *"one or two classmates were struggling also but few of these guys had used the facility. I have told them they are missing a great learning aid!"*. If these students who were struggling engaged early in the semester with the resources they might begin to take more responsibility for their independent learning, and might enjoy classes as they would be able to work through the group questions done in class.

The majority of the students (75%) agreed that additional support to the FASTER resource would be needed to explain difficult questions. Therefore, if the flipped classroom approach is to be embedded further for the topic, and eventually the entire module, the lecturers would need to continue to produce e-learning resources, plan follow up interactive class activities and redesign the continuous assessment.

As discussed earlier, Wanner & Palmer (2015) highlight that teachers' increased time commitment is often not acknowledged in workload models, institutional and technological support. Our experience in designing and implementing the FASTER e-learning resources resonates with the findings about lack of institutional support and acknowledgement. The resources were designed and produced whilst team members worked their full teaching load, which varied between 18 to 20 teaching hours per week. No reduction in teaching load was offered during the development phase of the FASTER resources. Whilst the institutes offer support with regards to software, the physical infrastructures are insufficient to operate a flipped classroom approach. IT labs are generally at full occupancy and large class groups find it hard to gain access to the IT labs. The majority of academic offices in our three institutions are open plan and shared with a number of colleagues, which makes it very difficult to create e-learning resources where silence is required to record audio.

The significant effort and duplication of work involved in designing and implementing e-learning resources reinforces the need for collaboration and sharing between institutions. It is also important that the e-learning resources are shared under CC licence.

Concluding remarks

The process of generating the resources was quite labour intensive and involved accounting subject experts being bought up to speed on instructional design issues and on use of software. The lecturers involved are not particularly advanced in their use of technology, but they are comfortable with using it and have an interest in pedagogy. Having an e-learning specialist as part of the team was vital.

However, it is as important to put as much thought into how the e-learning resources are going to be used. There is a feeling that the resources were under utilised when being used as revision aids. A flipped classroom approach offers a transformative blend that can go beyond an improved delivery model to one that radically improves teaching and learning. Considerable thought and effort needs to go into embedding the resources in a blended delivery model so that the resources are used to their potential. Our experience in AIT has shown us that we have made a good start, but if we wish to embed the flipped classroom approach even with the one topic selected, further e-learning resources are required for more difficult concepts, with new lesson plans required for follow up interactive sessions and integrated formative and summative assessment to be developed. In short, some good work done but a lot more to do. The flipped classroom requires flexible students, flexible teachers and flexible institutions (Gordon, 2014). From our experience, an increased lecturer time commitment was required to incorporate this blended learning approach within our teaching. This approach also required students to take increased responsibility for their own learning. Whilst the lecturers involved and many of the students involved have shown flexibility, the same cannot be said of the institutions involved. Institutional support is needed in the form of improved infrastructure and flexibility with regards to recognition of workload.

We have a strong belief that these FASTER resources offer huge potential for collaboration within the HE sector. We would be very interested in hearing from interested parties.

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