

## **Pedagogical and Innovative Practice: Using technologies to support Assessment and Assessment Feedback in real-time**

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**Abstract:** The Pedagogical and Innovative Practice (PIP) project is funded by the Centre of Excellence in Learning and Teaching (CELT) at the University of Hertfordshire in the United Kingdom. The project was carried out across a community of practice at the School of Computer Science, with six members of academic staff teaching in teams on a variety of subjects such as data visualisation, and strategic information and planning management. The intention was to address assessment issues highlighted by students as captured on the National Student Survey in the UK; and related to students need for more informative and timely feedback on assessment

With this in mind, assessment practices comprised of learning design and activities intended to support student learning within and beyond the classroom individually and by group learning. These practices were grounded in instructive and social constructivist theories in learning, teaching and assessment practice. Their design was intended to provide learners with timely feedback on their assessment.

Initial lessons learnt as presented in this paper include: planning and preparation by tutors for technology use, different academic experiences, and conceptual perspectives, student and staff engagement, use of different types of assessment methods and practice, and the different types of feedback.

**Keywords:** Assessment, Feedback, Collaborative Learning, Social Constructivism, Podcast, Technology-Enhanced Learning

### **1. Introduction**

In the Higher Education (HE) sector academics are encouraged to set effective assessment tasks that benefit student learning whilst at the same time making efficiency gains in terms of staff time. Given the limited resources and increased student numbers in academia, it begs the question as to how tutors can assess student learning effectively and provide prompt feedback. In addition, in response to the National Student Survey (NSS) results which over recent years (2005-2009) have highlighted the need to provide learners with more immediate feedback on assessment. These challenges may be more pertinent than ever in the current economic climate, and supporting academics to develop effective, yet efficient assessments is of key importance for academia.

With this in mind, this paper provides exemplars from the research of two academics working in teams into assessment and feedback practice whilst teaching their subject discipline and using technology. The pedagogical, assessment and feedback frameworks used by staff from two modules namely: Strategic Information and Planning Management (SIPM) and Data Visualisation in the discipline of Computer Science are presented. On SIPM, these included the use of Podcasting used in a variety of forms which comprised: weekly podcasts which comprised a regular message, a class lecture, assessment feedback, assignment support, updates on research findings. The Flip camera was used to capture real-time assessment practice and feedback in class. Collaborative learning on the Data Visualisation module comprised: learning assessment and feedback practice by the team; co-constructed between the tutors and the students. Furthermore, assessment and feedback practice was constructed intra students and between students and their tutors.

Such practices comprised of learning design and activities intended to support student learning within and beyond the classroom – a blended learning approach, individually and by group learning. These practices were grounded in instructive and social constructivist theories in learning, teaching and assessment practice and designed to provide learners with timely feedback on their assessment.

This paper is underpinned by the concept of assessment *FOR* Learning where students focus on the process of learning rather than Assessment *OF* learning; where students concentrate on their mark/performance. Moreover, blended learning is utilised, in addition to constructivist and social constructivist theories in learning, teaching and assessment practice in this study.

Initial lessons learnt and presented in this paper include: planning and preparation by tutors for technology use, different academic experiences, and conceptual perspectives, student and staff engagement, use of different types of assessment methods and practice, and the different types of feedback. These are discussed in terms of the key challenges, and opportunities for academics whilst taking into consideration the importance of assessment for student learning, prompt assessment feedback, and ways to do this. In addition to how technologies such as podcasts, flip cameras and a wiki may help to support these challenges whilst at the same time make learning and assessment effective and efficient.

Two case studies are presented in this paper which seeks to address pedagogical challenges and opportunities and to explore the pedagogical affordances of technology use in learning with assessment and assessment feedback. Both cases as presented are intended to help tutors to consider a redesign of curriculum, with a view to the process of learning, teaching and assessment practices rather than the outcome of these practices in terms of marks/performance.

Each case study is deeply grounded in the principles for good assessment practice and feedback (Nicol and Macfalane-Dick, 2006) and underpinned by the seven principles of Good Teaching and Learning (Chickering and Gamson, 1987). In addition, both are in response to the National Student Survey (NSS) results which over recent years (2005-2009) have highlighted the need to provide learners with more immediate feedback on assessment. To this end audio was used in case study one in the form of podcasts and as a means to engage with learners outside the class room boundary in various forms as described in this paper. The use of podcasting to engage learners in constructive learning has been shown to be effective on a multimedia module in Computer Science at the University of Hertfordshire (Barker, 2008). Podcasting has also been used to support law students in professional learning by using audio to simulate “real-world” scenarios (Doolan & Simpson, 2010).

Audio use is not new it's in existence since 1877 when Thomas Edison first invented the phonograph which was a device that recorded and reproduced sound. This made it possible to record the human voice. In the 1950s audio was used largely for radio broadcasts and used in schools for learning (Barker, 2008). More recently audio was examined for recording and the transmission of speech. The Audio Supported Enhanced Learning (ASEL) project undertaken in the University of Bradford and the University of Hertfordshire in the UK was intended to support, enhance and personalise the learner experience. The ASEL studies (Stewart & Doolan 2008; Stewart, 2009, Doolan & Simpson, 2010) highlights the changes in practice, for both lecturers and learners that take place when audio is introduced in learning, teaching and assessment practices. Audio has also been used in assessment for feedback highlighting the “human” element brought via mp3 files such as the tone of the tutor voice (Rotherham, 2008).

In case study two a participatory digital taxonomy (Churches, 2009); was supported the use of flip camera and wiki technology (Doolan, 2007; 2010) to accommodate different types of learners in a blended learning context. A flip camera is a small handheld pocket device enabling videos to be captured as they happen and uploaded to any technology platform easily via the in-built USB connector. The intention of recording the assessment and feedback in this way was to help move learners forward in higher levels of thinking. Students were recorded whilst presenting the data visualisation artefact from press, the web or any other of their choice. Students and tutors were also recorded whilst engaged in feedback relating to the artefact as presented. The intention was to support learners in developing skills in the critique of existing data visualisation artefacts both their own and that of their peers. They were required to design of the visualisation artefacts based on varied project definitions and associated datasets which students were required to seek out under the guidance of the tutors. This formative assessment was further intended to support students with the concepts relating to the developed artefact and the process of development relating to data visualisation. Each presentation comprised a group of up to four students who each participated in the presentation as appropriate. This collaborative approach to learning has been shown to help learners make sense of their learning and assessment whilst engaged in the co-construction and collaboration with peers and tutors alike (Doolan & Simpson, 2010; Doolan & Morris, 2010). The underlying

conceptual framework used in this case study was deeply rooted in educator's experiences of using a blended social constructivist approach; the blended approach combines technologies outside of the classroom with face-to-face class-based activities (Doolan, 2008, MacDonald, 2008).

## **2. Case Study One: *Podcasting to support lectures and tutorials using mp3 recorders.***

### **Introduction**

The aim of this term-long podcasting project was to provide a weekly podcast to engage final year undergraduate students with their studies and also to show them the relevance of this particular module for their future careers. The module is called Strategic Information Systems Planning and Management and during the semester in question the focus of the material was on current developments in information systems management. The aim of the teaching team was to encourage the students to look at the material within the context of their wider degree studies and consider the impact on their own future careers in IS/IT management.

The teaching was shared among the three team members and two of these either recorded their classes or took on the weekly task of preparing an information systems news review podcast. Small digital audio recorders were used for recording and the convenience of these was that they were eminently portable for lectures and seminars and to answer questions in class.

Each week the students could access a podcast which was one of the following types:

- a message to engage students
- a full-class lecture
- Staff feedback from the past assignment
- suggestions to support their work in the next assignment
- updates on recent research findings in strategic information systems

The style of recording was varied on a week by week basis as the module team wanted to move away from the notion that every campus-based class session would be recorded. We felt it was important for the students to attend in person and engage in the discussions from the sessions instead of relying solely on the recorded material and the available slides for their input. The weekly commitment was less than 20 minutes to record and upload onto our managed learning environment (MLE) site a regular information update. This was a deliberate choice by the module leader who wanted to see if a weekly podcast was in fact a manageable practice, which she could encourage other colleagues to take part in for the forthcoming academic year.

The class involved had 90 registered students and the podcasts were listened to regularly by a small number and occasionally by the majority.

### **Summary of Findings**

This section is intended to provide a snapshot of students views which were captured using a paper based survey handed out in class at the end of the term. They were also polled online as part of the weekly podcast. From an enthusiastic commitment to listen at the start there was some dropping off but also evidence that students were going back to listen again to the materials.

In one poll 92.5 % of the students taking part (n=40) agreed that the previous podcast – on report writing - had been helpful.

What the students said:

*Podcast was helpful with the assignment*  
*Podcasts were easy to find and available 24/7*

*Listening again to recorded lectures was good for taking notes*  
*They enjoyed listening to the podcasts*  
*Valued the opportunity to engage in their learning*  
*Supported confidence building*  
*Enhanced relationship with the tutors*

### **Personal Reflections on the use of weekly podcasting with graduating students**

The primary aim of this mini project within the PIP stable of piloting innovative practice was to determine how easy it would be to incorporate regular podcasts into a busy lecturer's timetable as a means of keeping engaged with the students on their course especially when there was a different tutor out of the three taking the classes each week. The secondary aim was to see how students in the School of Computer Science reacted to the availability of podcasts, and whether it increased their engagement with their studies. The aims related to the overall project aim to provide learners with more timely feedback on assessment.

The students reported that they enjoyed listening to the podcasts and their online presence gave the students a certain security week by week that the module leader was engaging with them even if she was not physically present at their lectures. The time taken for recording the weekly recordings was minimal when compared to the rest of the teaching and administrative load and they were easy to upload to the institutions managed learning environment.

Student reported that they would like '*podcasts of all their lectures*' but this academic is uncertain of the long term benefits to student engagement if they can access all possible materials online when they are registered at a campus-based university. It is certainly a means of staying connected with the students which we intend to use in the future as it allows a large module team to have a single online presence on a regular basis with the students.

### **3. Case Study Two: Using Flip cameras to engage tutor and learners with assessment and assessment feedback**

#### **Introduction**

This case study presents the tutors practice in the developing of a deep awareness and appreciation of what can happen when merging social constructivist approaches to learning and technology use such as a flip camera. Combining the two; leaving behind footprints in innovate educational practices (Doolan, 2010) which colleagues wish to further explore in their practice. The social constructivist approach used in this case study engages learners' collectively and collaboratively through group based learning activities to construct, and share knowledge through interactions (Vygotsky, 1978). This is shown in this case study by learner engagement whilst collaboratively co-constructing assessment and assessment feedback by engaging in the planning, preparation, design, implementation, and evaluation of the learning and assessment process. Through this engagement by forming relationships with peers (Lave and Wenger, 1991) and with their tutor based upon the foundation that learning is a social activity (Wenger, 1997) whilst engaging in learning activities (Doolan, 2008).

With this in mind, this case study example highlights an overview of the use of collaborative learning to engage learners in the development of higher order skills such as critical analysis, whilst presenting and engaging in peer learning and review. These are essential skills both to gain deep understanding of subject matter, and for the workplace as per the first case study presented in this paper. This study was also designed with the overall aim of the project that of exploring opportunities to provide more timely and informative feedback on learner assessment.

The 18 learners who took part in this study are potential Information Technologists (IT) professionals studying on a Data Visualisation module as part of the final year of a BSc in IT. This study comprised a number of learning activities in the form of mini-projects which included the need to negotiate, collaborate, research, discuss, debate, use critical analysis, remembering and other higher order skills to understand facts and information and successfully demonstrate acquisition of such skills via the presentation to a collective audience comprised of tutors and students alike in addition to being

recorded by a third party. The artefact took the form of posters, software development, and graphics and other forms of data visualisation artefact to grasp and demonstrate understanding of subject content whilst putting into practice work-related skills such as communication, working and relating with each other. Learners chose to be in a group of three or four to work on their learning and presented their artefact on a fortnightly basis. Following each in-class presentation learners and tutors provided feedback. This engagement with learners and learning formed part of the formative assessment culminating into the summative assessment; in the form of a final year exam. In addition to learner agreement to collaborate, learners negotiated and agreed on the learning activities and their learning outcomes as part of their formative assessment over a semester in the academic year 2010.

## Summary of Findings

This section provides an overview of findings gathered using observational method in the form of researcher notes and gathered relating to the practice of tutor and learners alike. In the role of consultant to the tutors and researcher/observer in class both learners and tutors were found to engage in the collaborative presentations and feedback fortnightly in-class sessions. As time passed this engagement became stronger and more frequent with learning becoming explicit and visible.

These observations are based on measuring in-class engagement with higher order skills development (Bloom, 1956). It was particularly noticeable that learners grew ever more confident as the weeks went by. Developing a sound awareness and understanding of subject related material, work-related skills.

Furthermore the group dynamic became very strong. Learners expressed that they valued this opportunity to build relationships with learners and their tutor alike. They used words such as “love” and “friendship” and “equal treatment” when relating to their tutor and peers. Learners further reflected upon their formative assessment and feedback practice at times the researcher used prompts to expand on topics as they arose and to elicit further learner perceptions of their experience of the assessment and feedback practice undertaken as part of the data visualisation module.

All 18 learners present in class chose to remain and evaluate their experiences. These were recorded using a flip camera and a summary of findings are presented using the students own voice and based on their experience of engaging in the assessment and feedback practices with tutors on this module:

When asked the question: ***What you would like from your tutor when engaging with assessment and feedback?*** Learners replied:

*“Smile” [sic], “A friendly approach” [sic], “To feel equal and respected” [sic], “Somebody who shows an interest in us” [sic], “... gives time “ [sic],, “...communicates with us” [sic], “provides choice” [sic],, “sets a framework” [sic],, “helps us to continue learning.. “[sic], “provides meaningful feedback “[sic].*

It is apparent that although technology in this case a flip camera was used to record the assessment and feedback, learners continue to value the “human” approach to learning, teaching and assessment. Learners demonstrated that they valued the tutor approach and the learning design on the module. Specifically they valued the opportunity to engage with each other and their tutors in an assessment conversation where learners chose the methods and artefact for presentation as part of their formative assessment. Indeed they chose to carry out the formative assessment given the module specifies summative assessment only in the form of an exam. Learners were very strong in their views on the characteristics and qualities they perceived as important for their tutors’ to possess. At times learners were outright in naming members of the academic staff who they perceived as failing to possess these characteristics and qualities. At times needing reminding to focus on the question and refrain from using names. Learners were reminded that names would be removed from recordings and transcripts to protect identity and ensure confidentiality.

Overall as a consultant and researcher/observer in this study learners truly engaged in their own learning and assessment practice from design to implementation and including evaluation. Learners valued the depth and type of assessment feedback and its timeliness. Learners highlight the importance of the role of the tutor, not only in fluency in subject and sound assessment and feedback practice. Moreover, in “social” and “humanity” relating to the well-being of learners in their charge.

Learners went so far as to use words like “love” and “friendship” whilst reflecting on their tutors practice and in relation to the group dynamic.

### **Personal Reflections on the use of weekly podcasting with graduating students**

My intention was to act as a consultant to new staff on pedagogical practices including assessment and feedback to support new academic staff whilst engaged in assessment and feedback practice charged to set up a new module, on a new programme as new inexperienced academic. Although staff engaged in the professional development opportunities on offer institutionally; putting these into practice at the chalk face can be quite a challenge. I was privileged to engage with the tutors and learners alike on the data visualisation module. They demonstrated such passion for learning and were keen on engaging with this study although this was their final year of study on a BSc programme.

In this study the tutor was flexible providing time outside of the timetable to engage further with learners. Such was the interest of the team of tutors and learners whilst engaging in learning, teaching and assessment on this module. We found the practical use of a flip camera to be problematic given there is the need to consider who will do the recording. In this study it required two persons to be present in class; one to hold the camera and a tutor to facilitate presentation and discussion. However, a learner(s) volunteered to help.

I found this uncomfortable as this creates a barrier to learning given the student focus was through the lens of a camera. However, this needs to be explored further to reach any sound conclusions. Personally I felt that I was infringing on the tutors and learners space. At the start of the study to reassure learners I found it was important to make clear what will happen to the recorded data. In this case, ethical approval was granted institutionally however, I also felt it important to ensure that learners provided explicit permission and felt comfortable for their work to be recorded and uploaded onto a wiki to provide further learning opportunities.

I found it was important to ensure that the recordings played a key role supporting learning, teaching and assessment. Hence, the wiki use and uploading the recordings interestingly learners watched again not only their own video recording but that of their peers. Citing the usefulness of doing so, in terms of learning from others content, research and visual methods used in the presentations. The majority of students commented on their appearance, sound of voice, and expressions. Once learners got use to seeing themselves on camera they focused more on their presentational and content development. “I really grew in confidence...” [sic] “I am a techie and I don’t naturally get on with people...” [sic].

Overall, it was evident that the use of a flip camera used to record the assessment and feedback was deemed a success. Moreover, it was evident that the tutor style and approach in terms of openly engaging with students and tutors alike was valued by these students.

A learner cited “.it helped me build confidence” [sic]. On observation from the start of the semester to the end; as observer/researcher; I watched how learners developed not only in confidence. Moreover in their ability to present argument, critically review and analyse their own works and that of others, reference works, demonstrate a real love of learning and a great pride in learning socially preferring to share with peers and tutor alike. I also observed such fondness and appreciation for the efforts and time provided by the tutors on the Data Visualisation module using such terms as “love” and “friendship” [sic].

### **4. Conclusion**

This study highlights the need to ensure that technology when utilised as a means to support learning and assessment practice, and timely feedback the importance of the tutor approach in preparing the learning design and supporting learners in their learning. Whilst providing support for transition in to the workplace. In both case studies one of the aims of the teaching team was to encourage the students to engage with the learning materials within the context of their wider degree

studies and consider the impact on their own future careers in IS/IT management and as IT professionals.

Both case studies have shown a need to engage learners with their learning and assessment and at the same time, develop and build positive relationships between tutor-learner and learner-tutor.

In case study one the use of podcasts by the tutor as module leader has been shown to increase learner enjoyment whilst listening to the weekly podcasts. In addition, their online presence provided the students with a sense of security and helps to build student confidence week by week. In particular, this alleviated some tutor concerns that of the lack of engagement with learners whilst the tutor as module leader could not be physically present with students.

Using podcasts in this way was found by the tutor to provide a sense of reassurance. Particularly in the role of module leader and felt engagement took place via podcasts providing prompts and hints for learners nurturing the tutor-learner relationship. The tutor in this case study found that the time taken for recording these weekly recordings was minimal when compared to the rest of the teaching and administrative load. In addition, the tutor highlighted that after recording the podcasts that these were easy to upload using the institutional resources was keen to continue this practice next academic year.

In contrast the videos produced in case study two required some tutor training prior to uploading these to the institutional resource. Using the institutional resources for this purpose was found to be problematic and a way around the institutional resource had to be found to successfully upload the video. The institutional wiki was also deemed to be problematic for tutor and learner needs in this study. Therefore, when using flip cameras to record learner engagement with assessment and assessment feedback some technical support or prior training may be needed to help with this. Using the flip camera for recording in itself is easy and requires minimal effort. There is a need to consider logistics; some planning in advance is required. For example, the room used for recording, check the light and position of learners and tutor in the room. There is also a need to consider who will do the recording and to make clear to learners what will happen to the recorded data.

To support learners flexibly there are implications on staff resources in particular; time and effort involved in engaging with students using technology and in providing flexible opportunities for learners to engage with academics as was evident in case study 2. This requires changes in practice. In case study 2 tutors were provided with the support and resources to help in the design of curriculum in particular formative assessment practice and feedback. This is not generally the case and becoming less so in the current academic climate. Such changes in the practice of assessment and feedback and technology use presents opportunities in addition to challenges. A change to workload models is needed to provide the flexibility as presented in this study particularly relating to case study two as presented in this paper.

Finally, this paper presented an overview of two academic experiences of using technology to support learning, teaching and assessment. The assessment was designed with the intention of providing students with more timely feedback moreover formative feedback. Case study one was tutor driven and based on instructive theory. Case study two was more socially construed with students playing a key role in their learning with the tutor acting as more of a "facilitator" of learning and based on social constructivist theory. |

These cases may support other academics who wish to explore the use of technologies such as podcasts for voice recording and flip cameras for voice and video recording in taking up the challenge. Changes in assessment practice and feedback in both case studies have been found to provide a range of opportunities for tutors and learners and to motivate and engage learners and tutors alike. A tutor reflects on using podcasts "*It is certainly a means of staying connected with the students which we intend to use in the future as it allows a large module team to have a single online presence on a regular basis with the student*" [sic].

## References

- Barker, T. (2007) Podcasting in an Advanced Computer Science Module: Supporting Constructive Learning *In Proceedings of the 6th European Conference on e-Learning*, Copenhagen Business School, Copenhagen, Denmark 4-5 October 2007
- Blooms, B. S. (1956) *Taxonomy of Educational Objectives, Handbook 1: The Cognitive Domain* New York, David McKay Co Inc.
- Chickering, A. Gamson, Z (1987) *Seven Principles for Good Practice in Undergraduate Education* Washington Centre News 1987
- Churches, A. (2009) Blooms Digital Taxonomy Online at:  
<http://www.montgomeryschoolsmd.org/uploadedFiles/departments/techtraining/homepage/BloomDigitalTaxonomy2001.pdf> [accessed 02 June 2010].
- Doolan, MA. (2007) Our Learners are the Net Generation Growing up in a Digital World. How then do we Engage with and Support this Type of Learner? *In Proceedings of the 6th European Conference on e-Learning*, Copenhagen Business School, Copenhagen, Denmark 4-5 October 2007.
- Doolan, M. A. (2010) *Forthcoming Role of the Tutor in Enabling Student Learning through the Use of a Wiki. Educating Educators in Social Media* [In press] Emerald books. United Kingdom.
- Doolan, M. A. (2010) The Role of the tutor: developing a Pedagogy using audio to support collaborative assessment EDULEARN 2010. Barcelona: EDULEARN 6-8July 2010.
- Doolan, M. A. & Simpson, M. (2010) Engaging Tutors and Learners through Audio Supported Pedagogy *In Proceedings of the 5th Annual Blended Learning Conference 2010*, 16-17 June, University of Hertfordshire.
- Doolan, M. A. & Morris, P. (2010) *In Proceedings of the 5th Annual Blended Learning Conference 2010*, 16-17 June, University of Hertfordshire.
- Lave & Wenger, E.
- MacDonald (2008) *Blended Learning and Online Tutoring* Gower publishers 2<sup>nd</sup> edition.
- Nicol, D.I & Macfalane-Dick, D. (2006) Formative assessment and self-regulated learning: a model and seven principles of good feedback practice published in *Studies Higher Education 2006 Vol 31(2)*, 10=99-218.
- NSS (2005-2009 online at:  
[http://www.qub.ac.uk/directorates/AcademicStudentAffairs/CentreforEducationalDevelopment/StudentFeedback/StudentFeedbackFilestore/Fileupload\\_173350\\_en.pdf](http://www.qub.ac.uk/directorates/AcademicStudentAffairs/CentreforEducationalDevelopment/StudentFeedback/StudentFeedbackFilestore/Fileupload_173350_en.pdf) [accessed 02 June 2010].
- Stewart, W. & Doolan, M.A. (2008). Listen to this: enhancing the learner experience through the use of audio within next generation technologies. *Paper presented to the HE Academy Annual Conference, July 2008*.
- Stewart, W. (2009) *Audio Supported Enhanced Learning*. Joint Information Systems Committee (JISC). Online at:  
<http://www.jisc.ac.uk/whatwedo/programmes/usersandinnovation/asel.aspx> [accessed 02 June 2010]
- Rotherham, B. (2009) Sounds Good: Quicker, better assessment using audio feedback. Joint Information Systems Committee (JISC) online at:  
<http://www.jisc.ac.uk/whatwedo/programmes/usersandinnovation/soundsgood> [accessed 28 May 2010]
- Stewart, W., Doolan, M.A. (2008). Listen to this: enhancing the learner experience through the use of audio within next generation technologies. *Paper presented to the HE Academy Annual Conference, July 2008*.  
Available from: <http://www.jisc.ac.uk/whatwedo/programmes/usersandinnovation/asel.aspx> [accessed 28 May 2010]
- Vygotsky, L.S. (1978) *Mind in Society*. Cambridge MA: Harvard University Press.
- Wenger, E. (1998) *Communities of Practice: Learning, Meaning and Identity*. Cambridge: Cambridge University Press

**Other resources:** If you wish to share resources go to: <http://madoolan.com> [accessed 02 June 2010]

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