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Breakthroughs in Research and Practice

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Chapter 14
Flipped University Classrooms: Using Technology to Enable Sound Pedagogy

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ABSTRACT

The three case studies in this paper show how flipped classroom approaches can facilitate the renewal of university teaching. The case studies form part of a scholarship of teaching and learning that provides opportunities for educators to learn from the experiences of others. Descriptions of course preparation illuminate the application of constructivist pedagogy, the affordances of a range of learning technologies, and a role for university teachers that facilitates their students' engagement with learning. The cases outline the application of flipped classroom approaches at early and later stages of students' learning journeys and show how they introduce parity of learning experiences for on-campus and off-campus students. The case studies show how flipped classroom approaches can be an instrument of change, forming part of institution-wide planning for coherent and effective student learning journeys. They reveal the importance of an infrastructure of learning technologies to facilitate active and interactive learning and the significance of professional development and organized support teams, including technology experts, librarians and instructional designers, in preparing the groundwork for teachers and students using flipped classroom methodologies.

ORGANIZATIONAL BACKGROUND

This paper presents three case studies of flipped classrooms at a multi-campus, regional university in Australia. Since its inception, almost 50 years ago, the university has specialised in distance education gaining a reputation for its adoption of online and blended learning opportunities. Its investment in learning technology infrastructure was described in generational terms by Taylor (2006). The first

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generation was the print based correspondence model. The second stage, multi-media, model incorporated audio and videotape and computer-based learning. The third generation 'telelearning' model adopted audio-teleconferencing and videoconferencing. The fourth generation, flexible learning, model engaged students with online interactive multimedia and internet-based access to resources, and the fifth generation 'intelligent flexible learning' model added to this mix computer mediated communication, using automated response systems and campus portal access to institutional processes and resources. The University currently uses the Moodle Learning Management System (LMS), supported by a range of online tools such as, synchronous and asynchronous voice tools, virtual classrooms, ePortfolios and multiplatform online media presentation systems.

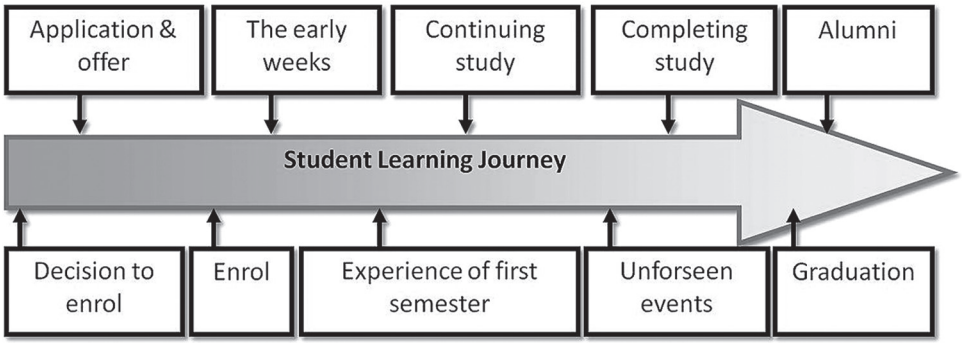
The University has just over 27,000 students of 90 different nationalities. Seventy eight per cent of students study online. Accordingly, the University has attracted students unable to participate in traditional, on-campus, university studies. Many are older students with family and work responsibilities and some are from rural, remote, and Indigenous communities. Thirty-three percent of the University's students are from low socioeconomic backgrounds, so the University may be characterised as engaging with the widening participation agendas now being set by governments around the world.

Organizational planning at the university fosters a range of support systems to create coherent student learning journeys (Hunt & Peach, 2009). This is important because it is known that students want, 'efficient and responsive administrative, IT, library and student support systems actively working together to support … operation[s]' (Scott, 2005, p. 13). The planning processes focus on key interaction points between students and the University (See Figure 1), from decision to enrol, through the first year learning experience, which is crucial to student retention and progression, and on to work-ready graduation or preparation for further study (Sankey, 2012).

SETTING THE STAGE

The case studies in this paper form part of a scholarship of teaching and learning that is designed to improve practice (Trigwell, 2012). According to Ashwin and Trigwell (2004, p. 121) such scholarship may produce a range of knowledge outcomes:

Figure 1. Key stages of the student learning journey (Hunt & Sankey 2013, p. 263)



1. An investigation to inform oneself about an aspect of their teaching/learning. This will result in the production of *personal* knowledge;
2. An investigation to inform a group within one or more shared contexts (typically department or faculty, institution) about an aspect of their teaching/learning. This will result in the production of *local* knowledge;
3. An investigation to inform a wider (international) audience about an aspect of their teaching/learning. This will result in the production of *public* knowledge.

The case studies are based on filmed interviews with practitioners about their use of flipped classrooms. The development of the videos crystallised their own awareness and also shared knowledge within the University. The videos have also been made available open-source, so they constitute public knowledge. This analysis, therefore, addresses all three levels of Ashwin and Trigwell's (2004) range of knowledge outcomes.

This scholarly process and the description of the learning technology infrastructure and planning processes at the University set the stage for this series of three case studies of university-based flipped classrooms. The term 'flipped' refers to the provision of tailored online resources and associated learning activities that facilitate student preparation for classroom or online discussion time focused on the application and consolidation of planned learning outcomes. 'Essentially, what was traditionally completed at home as homework has been flipped to become the focus of classroom learning' (The Queensland Government, 2012). In simple terms, flipped university classrooms represent a move away from standard lectures and tutorials and a move towards learning experiences based on a series of deep learning activities including workshops and mediated online discussion. It makes sense, as Boyer (2013) noted, because 'It does seem ironic that so much time is spent in class 'teaching', and then students are sent home to struggle through the actual 'real work' on their own without any assistance'. However, this characterisation of 'home' work, or private study, as application and consolidation represents only half the story because in universities, with or without learning technologies, private study has always been used as preparation for interactive discussion and analysis in class. Hunt's (2013, p.47) description of a regular reading scheme bears testimony to this, as do the traditional, individual and small group learning approaches at Oxford and Cambridge universities. These are based on prior study and preparation. However, the important feature of flipped classrooms is not that they are new, or that they represent a move away from traditional lectures, or even that they use technologies. Rather, the issue is that flipped classroom approaches combine pedagogy and learning technologies in ways that extend to large numbers of student's opportunities for deep learning through application and consolidation.

The flipped classroom is a form of curriculum design that is intended to shift students from passive to active learning and from surface to deep learning, which Angelo (2012, p. 99) defines as, 'learning that lasts and can be recalled and used effectively after the… [course] has been completed'. Flipping classrooms has been described as, 'providing students with a video that explains the concepts, structure and skills, so that when they get to class… they can get into a real 'workshop' of learning. In this way, the teacher is on hand to give practical assistance, check progress and pick up common errors' (Boyer, 2013, p. 28).

Educause (2012, p. 1) also refers to the use of videos in flipped classrooms:

Short video lectures are viewed by students at home before the class session, while in-class time is devoted to exercises, projects, or discussions. The video lecture is often seen as the key ingredient in the

flipped approach, such lectures being either created by the instructor and posted online or selected from an online repository. While a pre-recorded lecture could certainly be a podcast or other audio format, the ease with which video can be accessed and viewed today has made it so ubiquitous that the flipped model has come to be identified with it.

However, the identification of flipped classroom technology with video use is simplistic. It is also limiting pedagogically because there is a risk that the videos remain a didactic presentation of content because 'You can't magically transform an ineffective lecture by transferring it to video' (ISTE 2012, p. 10). 'Dumping content' online via video or text is not much of a change from traditional university lectures. However, one analysis (ISTE 2012, p. 10) indicated that 'A glimpse of the videos shows … that these teachers are taking full advantage of the medium to create instruction that goes far beyond chalk and a blackboard'. In this context, the import of the three case studies described in this paper is to illustrate the deployment of interactive resources and open source material. They also show how learning management systems can be used to provide opportunities for discussion and debate, both online and in class, in a melange that blurs the so called distinctions between 'home' work and classroom learning. What the three case studies demonstrate is that anytime-anywhere learning, using a flipped classroom approach, can facilitate equal learning opportunities for on-campus and off-campus students. A key point is that flipped classrooms represent much more than pre-recorded lectures for students to listen to ahead of tutorial discussion. Rather, they are about a well-planned approach to use of a range of synchronous and asynchronous tools to facilitate coherent and meaningful learning experiences for all students.

According to Educause (2012, p.1) 'The flipped classroom is a pedagogical model in which the typical lecture and homework elements of a course are reversed'. This definition accords with Hattie's (2009) thoughts about the need to 'Attend first and foremost to the fundamentals of effective teaching and learning, keeping pedagogy ahead of technology'.

Reeves and Reeves (2012, p.114) summarised Hattie's (2009) meta-analysis of 'the foundational building blocks of any robust learning environment' to conclude that the fundamentals of effective teaching and learning include:

1. Teacher clarity in explaining content;
2. High academic challenge;
3. Time-on-task;
4. Timely feedback to students; and
5. Positive teacher–student relationships.

Among the least effective elements of teaching were: computer-assisted instruction; simulations and games; audiovisual methods; programmed instruction; and web-based learning. It would appear that when it comes to student learning, it's not what you've got but the way you use it (pedagogy) that counts.

So what are the elements of pedagogy that have been identified with flipped classrooms? They normally include active learning and student engagement, both of which fall into the broad category of constructivist learning theory. According to Stewart (2012, p. 11) this 'Emphasise[s] student-centred, active learning and the role of the teacher as facilitator. Constructivist learning theory includes:

1. An emphasis on students being active in constructing their understanding of knowledge;
2. A focus on discovery, exploration, experimentation and developing and testing hypotheses;

3. Project work, research-based learning, problem- and enquiry-based learning methods (see Brodie, 2012; Jenkins & Healey, 2012);
4. Awareness of the learning process through use of reflective learning activities, self assessment and evaluation;
5. The role of the teacher as a guide, providing 'scaffolding' to learning – that is, to ensure the student has the requisite knowledge, skills and support to negotiate a new piece of learning – and prompting the student through questioning or modelling.'

One final element in setting the stage for discussion of the three case studies of flipped university classrooms concerns the role of the teacher or lecturer. Goodwin and Miller (2013, pp. 78-79) noted that:

Advocates of the flipped classroom claim that this practice promotes better student–teacher interaction. For example, Bergmann and Sams (2012) point out that when teachers aren't standing in front of the classroom talking at students, they can circulate and talk with students. If teachers use inverted classrooms this way, they are likely to better understand and respond to students' emotional and learning needs

In flipped classrooms, teachers become coaches, focusing more on facilitation than lecturing. This changed role was described by Hunt, Chalmers a Macdonald (2012, p. 27) as a shift from being a sage on the stage to a guide on the side, but, more importantly, to being a meddler in the middle:

The shift in focus from didactic teaching, sometimes described as the 'sage on the stage' model to the 'guide on the side' model, has been challenged by McWilliam (2008) who argues that teachers should be 'meddlers in the middle'. These are teachers who challenge students to think and understand differently. To do this, university teachers need a repertoire of activities that will engage students actively in learning. Scott (2005) found in his study of nearly 95, 000 graduates that students appreciate a range of interactive classroom learning strategies such as buzz groups, debates, lectures and small group work for peer learning, independent study and negotiated learning.

The role of meddler and the variety of teaching strategies described here sits well with the flipped university classrooms described in the case studies in this paper.

CASE DESCRIPTION

The following three case studies of flipped university classrooms refer to two instances (Case Study 1 and Case Study 2) of individual courses of study (also known as subjects, modules or units) and to the use of flipped classrooms applied to a whole degree program (Case Study 3). These cases were chosen to represent different uses of flipped classroom methodology and to show how flipped classrooms have been integrated with students' needs at different points of the student learning journey. For example, Jill Lawrence (Case Study 1) discusses her use of the flipped classroom methodology in an introductory course on academic skills, designed to prepare first year nursing students for university study. The second case study is pitched later in the learning journey, where Steven Goh uses flipped classrooms to create authentic learning experiences, specifically to prepare students for their professional life. In the

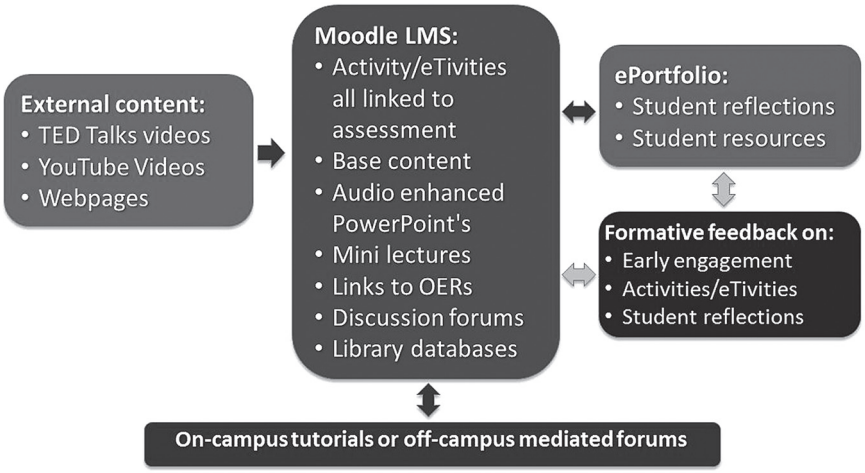
final example (Case Study 3), Karen Noble outlines what happened in the Education Faculty to flip a degree program. This was part of a university initiative to move all Education courses substantially online.

Case studies normally draw on 'a number of data-gathering measures' (Berg, 2001, p. 225). The data used to support these three case studies arises from two main sources: a series of interviews; and documentary (published) evidence. The recordings of each case are available online (Lawrence and Sankey, 2013; Goh and Sankey, 2013; Noble and Sankey, 2013) under a Creative Commons, attribution, non derivative licence. The purpose of the recordings is to share 'well-documented experiences … not by blind adoption but by critical adaptation' (Wals, Walker & Blaze Corcoran, 2004, p. 347). The purpose is also to engage with the transformative agenda of integrating learning technologies with constructivist pedagogy to enhance student centred learning.

Case Study 1: Academic Skills Development

In her account of flipped classroom methodology in an academic skills course (Lawrence & Sankey, 2013), Jill Lawrence notes that students are provided with little content in terms of readings and lectures. Learning is activity-driven (e-tivities), modelled on the work of Gilly Salmon (2013). She utilises open-source resources such as TED Talks (www.ted.com) and YouTube videos because, "There are gurus and experts all over the world". She sees little point in reinventing the wheel by creating yet more resources. In addition to these, she makes available an audio-enhanced PowerPoint presentation each week, using Adobe Presenter. She changes these every semester based on students' feedback. The essence of each week's study lies in one to three e-tivities organised as an initial 'spark' idea, a stated purpose, a stimulus, such as a YouTube video, a task for students to complete, and a 100 word reflection about the activity. Each activity is closely linked to assignments, so that students who fail to engage with the continuous learning inherent in e-tivities might find it difficult to complete their assignments. They will also have little basis for ongoing study because learning outcomes are vested in the e-tivities and not in lectures, videos and readings, though these do add value to learning (See Figure 2).

Figure 2. The flipped classroom model used by Lawrence



Examples of learning activities early in the semester include interviewing students who have previously completed the course to explore how they successfully negotiated university study. Students are also invited to respond to an electronic questionnaire about learning style (http://www.vark-learn.com/english/index.asp) and to reflect on their own learning strengths and weaknesses. They then post on the discussion board of the Moodle learning management system brief points arising from their activities. For example, after the first week of study, they document their learning strengths and identify possible support people. Tutors for the online discussion groups provide early one-to-one feedback to students, and peer feedback is also invited. The outcomes of activities are discussed in class and in online discussion fora. Early in the semester, first year students, particularly mature-aged students, frequently provide negative feedback about online fora. By the end of semester, most become more positive once they have mastered the medium. Lawrence notes a strong correlation between participation in discussion fora and student success (Lawrence & Sankey, 2013), so she poses as her next challenge 'innovations' to engage unwilling participants.

In her paper about empowering online pedagogy for commencing students Lawrence (2013, p.8) provides evidence of student feedback indicating that the combination of fora and e-tivities increases student engagement:

For me the forums have also been an excellent way to interact with fellow students through the sharing of opinions and feedback. It made me feel like I was learning collectively with other students, much like a classroom situation (portfolio reflection).

The use of short e-tivities and YouTube clips … has provided a positive experience for me because of the variety, which tends to keep my attention (forum post).

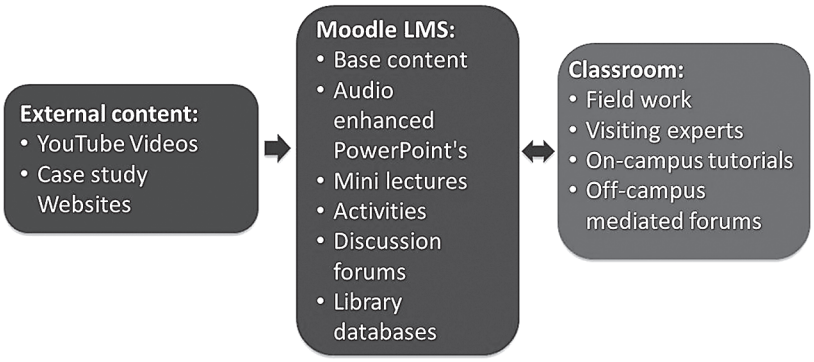
Lawrence (2013) concludes that the flipped classroom approach has sustained, positive outcomes over a five year period. However, she sees it as an iterative process involving constant change. She acknowledges that, 'for a minority of students online engagement remains problematic' (p.9). So she has searched for an opportunity for students to be 'tracked and confronted explicitly' (p.9) when they are not fully participating. She plans to use Moodle's learning engagement (analytics) plug-in because it will provide a clear understanding of how the students access different aspects of their courses.

Case Study 2: Authentic Learning

Steven Goh was inspired to flip his third-year Materials Technology course to address students' low engagement and surface rather than deep learning. He wanted a shift to an authentic learning pedagogy: 'from engineering science to engineering practice' (Goh & Sankey, 2013). To achieve this, he wanted students to learn how to source databases of information, rather than using traditional study guides and textbooks, because this is something they must do in the world of work. He also decided to 'introduce an authentic learning activity based on a true life case study' (Goh, Cochrane & Brodie, 2012, p.2). For this he uses YouTube, as well as off-air recordings of television programs about cases of materials failure such as airline crashes (See Figure 3). Further links to the world of work are created by taking students on site visits and by inviting crash investigators to share their first-hand experience and knowledge.

Goh (2013, p. 2) believes that, 'if students are immersed in a rich and authentic professional environment with real-time input from industry practitioners, they are more engaged with the learning experience'.

Figure 3. The flipped classroom model used by Goh



However, this was the first time something like this had been tried and students were not accustomed to it. They did not like the innovations, declaring that the course coordinator was not doing enough teaching. In response to this feedback, Goh set about managing students' expectations because "Students need somewhere to start". He pre-recorded presentations, using Camtasia Studio, to explain that he wanted students to engage in this way in order to prepare them for professional life. He also worked to establish a credible relationship with his students through classroom and online discussion. Very quickly, he noticed that traditional distinctions between on-campus and distance education (external) students began to blur. Oftentimes, on-campus students chose not to attend campus-based tutorials, electing instead to join online discussions. Goh makes transparent when and where on-campus tutorials will be and many distance education students chose to travel in to campus to engage with on-campus tutorials. As a result of relationship building and the management of expectations, student feedback became more positive, vindicating Goh's perseverance with flipping the classroom.

Case Study 3: A Flipped Degree Program

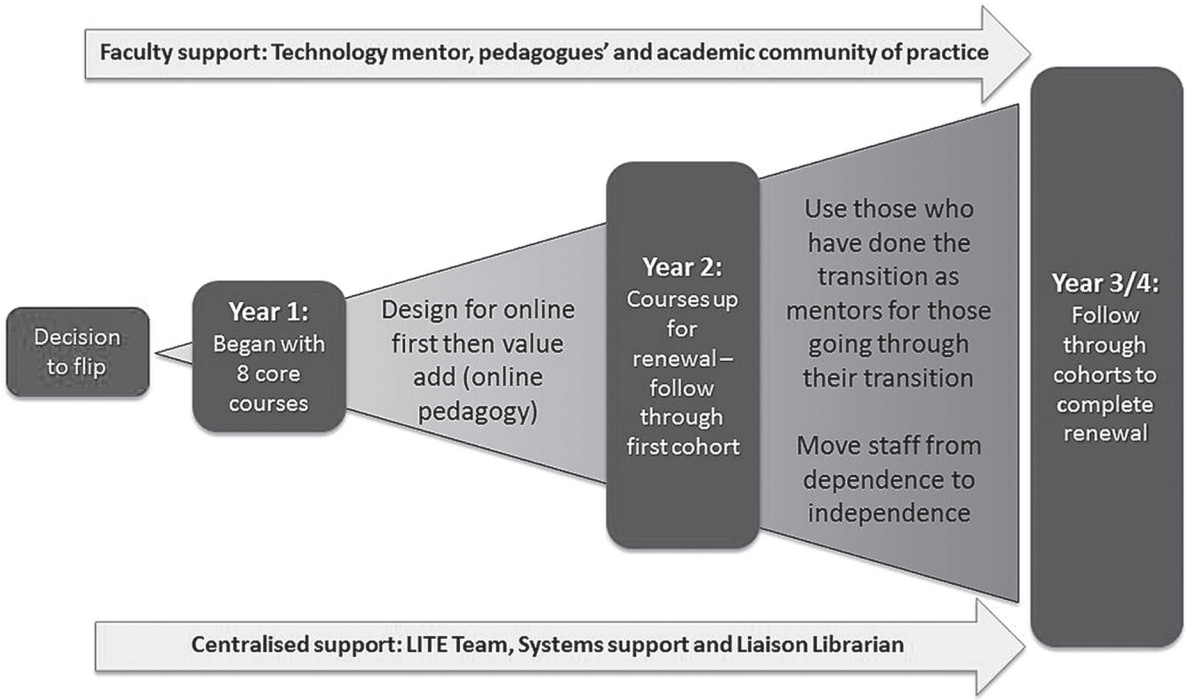
The University introduced new policies requiring all courses to have an online presence. The Faculty of Education took this opportunity to flip 148 courses in their degree program. One motivation was to maximise the learning outcomes associated with students' on-campus time. The Faculty also wanted to address concerns about parity of experience between on-campus and distance education students. Traditionally, this had been achieved by capturing lectures to make them available to students studying by distance education. However, the quality was poor and it is less than engaging for students to listen to one-hour lectures online. A decision was taken to design for online study "first and foremost" creating a balance of synchronous and asynchronous learning opportunities for all students. Courses are now driven by students' learning activities. They still have online lectures, but these are purpose-made and broken into short and sharp presentations described by the Faculty's Associate Dean as "less naïve and more sophisticated". The faculty librarian assists with researching relevant open source material. As this is an education faculty that trains teachers, it was deemed important to model good practice, so all courses utilise critical reflection in a pattern of learning described as "deconstruct, confront, theorise and think otherwise".

The Faculty's Associate Dean (Learning and Teaching) who led the change, refers to the importance of designing courses with an 'online first' approach. This required strong support from the Learning Innovation and Technology Enhancement (LITE) teams, comprising learning and teaching designers, technology experts, librarians, and multimedia developers. However, their help is stretched thinly across the many demands of faculty staff so communities of practice (McDonald *et al*. 2012) have been implemented through which early adopters and mentor colleagues model specific techniques and strategies that work in flipped classrooms. This has resulted in a move from dependence to independence in the ongoing maintenance of courses. Part of the change leadership involved re-educating students to the new approach, but the faculty is now at the stage where students have experience only of flipped classroom methodology. In this Faculty, flipped classrooms have become a 'business as usual' approach to teaching (See Figure 4).

CURRENT CHALLENGES/PROBLEMS FACING THE ORGANIZATION

The three case studies reveal common, successful elements in flipped university classrooms. Each shows effective integration of constructivist pedagogy with a wide range of learning technologies. All noted a shift from content-driven courses to process-driven curriculum design based on learning activities. This gave rise to a corresponding shift in the role of university teachers as they became 'meddlers in the

Figure 4. Change leadership strategy to develop program-wide flipped classrooms



middle' who facilitate and guide student learning. The application of flipped classroom methodology to on-campus and distance education courses is of particular interest in these case studies because it shows how this approach creates parity of learning experiences and opportunities for 'anytime anywhere' learning for all students. The case study also showed the application of flipped classroom methodology to generic skills, such as academic skills and reflective practice, and to discipline-based courses, such as materials technology.

This paper demonstrates how the implementation of flipped classrooms in this University was aided by a well established infrastructure of learning technologies, especially the use of tools affording student engagement in the Moodle learning management system such as voice enhanced presentation capture tools. As Anderson (2008, p. 68) noted, the task is 'to choose, adapt, and perfect, through feedback, assessment, and reflection, educational activities to maximise the affordances of the Web'. This presents a continuing challenge for the University because it has to manage just-in-time support from technology experts, librarians and instructional designers.

The case studies also revealed the extent of change leadership and professional development required to prepare staff to manage both the technology and the pedagogy of flipped classrooms. Teaching staff at the case study university were supported by an integrated professional development program (Hunt & Sankey 2013) which includes a university-wide initiative to develop communities of practice (McDonald *et al.,* 2012) to facilitate peer learning. In addition, as the Education Faculty case study illustrated, each faculty has an associate dean of teaching and learning whose job it is to garner resources and to make change happen at course level. The lesson is that a flipped classroom methodology is most successfully implemented in an organization that fully supports this approach to teaching and learning.

One challenge in implementing flipped classrooms was student resistance. Some perceived that academic staff were not doing enough teaching, and some were intimidated by the technology. This challenge was addressed by a range of strategies to increase what Anderson *et al.* (2001) call a cognitive and social presence in all learning environments. A key strategy was to organise students into online or on-campus discussion groups with an instruction to tutors to respond quickly to students. This accords with Kift's (2009) transition pedagogy to enhance first year learning at universities. For example, she noted that first-year students should 'receive regular, formative evaluations of their work early in their program of study to aid their learning and to provide feedback …on progress and achievement'.

Student retention rates are a challenge for all universities, not only because students who drop-out of university represent a loss of income but also because it is a lost opportunity for each student who leaves. The first year of study is a particularly vulnerable time for students. To address this, Kift (2009) identified a transition pedagogy which included the recommendation that 'the first-year curriculum … have strategies embedded to monitor all students' engagement in their learning …to identify and intervene with students at risk of not succeeding'. This paper has demonstrated that the affordances of flipped classroom methodology, in particular the use of a learning management system and appropriately designed and scheduled learning activities, increased opportunities for staff to monitor students because their access to learning resources can be recorded: 'Use of the medium in this way will permit instructors to conduct assessments with greater granularity. Teachers can embed questions throughout materials to determine when and where students begin to struggle' (ISTE 2012 p11). This aligns with the literature on discipline-based learning and threshold concepts because teachers can monitor students' understandings of key concepts before moving on. According to Land (2012, p.42), a threshold concept:

May be seen as a crossing of boundaries into new conceptual space where things formerly not within view are perceived, much like a portal opening up a new and previously inaccessible way of thinking about something. Successfully negotiating a threshold concept allows the learner to access a transformed way of thinking and practising, a fresh mode of reasoning and explanation and new understandings, perceptions, discourses and conceptual terrain, without which the learner would find it difficult to progress within a particular field of study.

Another strategy to address student concerns about flipped classrooms was to manage students' expectations by focussing on learning outcomes and by establishing the relevance of the course to students' professional lives, particularly through authentic learning activities and assignments, where the distinctive feature 'is the recognition of the potential of the activity, context and purposes of work to develop high-level knowledge and skills' (Garnett 2012, pp. 165-166). As Reeves and Reeves (2012, p. 117) observed, 'it is much more effective to engage students in tasks that reflect the ways their knowledge, skills, attitudes and intentions will be applied in the real world'.

CONCLUSION

In conclusion, these case studies have described the application of flipped classroom approaches to university courses. The discussion has shown that flipped classrooms are informed by constructivist pedagogy, which is part of a long tradition dating back more than a century:

[It is a] philosophy of learning known as 'constructivism', essentially a theory that knowledge can be constructed only in the mind of the learner. This reflected much of Dewey's thinking and was … given a stronger foundation through Piaget's work. The onus was clearly shifting to the learner as the creator of understanding.' (Stewart, 2012, p. 7)

The case studies have shown that, at this university, the infrastructure of learning technologies deployed in flipped classrooms is part of a decades' old tradition of constant renewal occasioned by the university's focus on distance education (Taylor 2006) which has positioned this university well for an expansion in the use of the flipped classroom approach in higher education.

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