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EDITORIAL

Riding giants: how to innovate and educate ahead of the wave

This special issue contains the research proceedings of the 21st annual conference of the Association for Learning Technology, which was held from Monday 1st to Wednesday 3rd of September 2014 at Warwick University (UK). All papers deal with creative ways of using technology to enhance students’ learning experience. Three of the papers focus on the role of the teacher, on creative pedagogies and innovative approaches to teachers’ professional development (PD). Two papers focus on the role of social media – mobile or non-mobile – within the teaching and learning experience. The majority of the papers deal with institutions and teachers ‘Learning to ride’ the wave of technology innovation, whereas some are at the stage where they are collecting evidence to suggest that they are ‘Staying up, mobile and personal’.

The issue starts off with a paper originating in the United Kingdom, in which Ellis (2014) reports on research in progress within the sector of further education (FE). She describes research embedded in the teaching practice of an FE college, an instance of pedagogical enquiry in a context that is not very research oriented. The paper describes how a research-based approach to curriculum design was applied in which a researcher partnered with FE lecturers in a curriculum design experiment. The goal of the experiment was to explore whether the approach of self-organised learning environments (SOLE) as developed by Mitra (2009) could successfully be applied in vocational education and training (VET). The paper reports on some initial observations about conducting research in live teaching environments, contains first reflections on the SOLE experiment within VET and illustrates how this approach contributes to a culture of collaborative pedagogical inquiry in an FE college.

The second paper by Cochrane et al. (2014) also deals with research within a live teaching environment and experimentation with new pedagogies. Their focus is on the PD of teachers in higher education, specifically on how to design and implement PD practices that foster new pedagogies, deemed necessary to cope with ever-changing technologies, and symbolised by the BYOD phenomenon where students (and teachers) bring their own devices to learning and teaching situations. More specifically, the authors feel the need for a more durable framework for creative curriculum design with innovative technology that moves beyond isolated short-term innovative projects. They propose a framework for creative pedagogies that is a blend of the Pedagogy–Heutatogy–Andragogy continuum (Luckin et al. 2010), Puantedura’s (2006) SAMR model (Substitution, Augmentation, Modification, Redefinition) of educational technology transformation, and Sternberg, Kaufman, and Pretz’s (2002) view of creativity involving incrementation (or modification of a current idea) followed by reinitiation (or redefinition). In the paper, the authors combine this framework with the unique affordances of mobile social media resulting in a framework that can support teachers in designing new course activities and assessments that make use of new pedagogies. The paper goes on to describe some examples of how their mobile
social media framework has been implemented in two PD initiatives: an intensive 1-week workshop, and an international project establishing a global community of practice focused on exploring new forms of student collaborative projects.

The third paper by Vivian, Falkner, and Falkner (2014) also focuses on scalable solutions for teacher PD. It investigated whether a massive open online course (MOOC) can serve as a platform for Australian primary school teachers who need to start teaching a new digital technologies curriculum. The aim of the MOOC was twofold: (1) to deliver computer science content for those teachers that are (relatively) new to the area of digital technologies, and (2) suggest pedagogy on how to teach primary school children. Starting from a literature review of existing online PD practices, the authors designed their own online PD programme as a hybrid MOOC, with aspects of a video lecture–based MOOC and of a connectivist MOOC based on sharing and reflecting on experiences of practitioners. The paper describes the design, development and implementation of the MOOC and presents preliminary data about participation and participant experiences. This preliminary data analysis focuses on the usage of the core course platform, and not yet on the usage of the suggested social media platforms (Pinterest, Twitter, etc.) by course participants.

In the fourth paper, Vivian et al. (2014) study the way that university students use Facebook for academic purposes at an Australian institution. The authors used a mixed-methods approach, including a questionnaire, observation and online focus group interview. This paper focuses on the data obtained by observing the Facebook activity of 70 students during the course of a 22-week university semester. The data show that while the academically related activity on Facebook was rather limited in comparison to the purely social activity, the academic-focused topics were particularly related to sharing experiences about doing work or procrastinating, course content and grades. Academically related activity increased around certain points in the semester, especially when assignments and exams were near, and the nature of the academic topics differed somewhat across time. The authors demonstrate that academic activity permeates students’ personal social networks to a certain degree, and argue that institutions should be aware of the online aspects of students’ academic journey.

**Editorial process**

For this year’s conference, the call for research papers and the call for conference abstracts were processed in two distinct streams. On the one hand, the anonymised conference abstracts were blind reviewed by at least two members of the Conference Programme Committee. After a single cycle of re-submission, abstracts were either rejected or selected for inclusion in the conference. On the other hand, the anonymised full research papers were processed through the normal editorial process of the journal, including full double-blind review and elaborate review and submission cycles.

Twenty-two full papers were submitted, co-authored by 62 authors affiliated with institutions in seven countries (14 papers came from the United Kingdom, two from Australia, two from Spain and one each from Italy, Norway, New-Zealand and Pakistan). After a first editorial round, 20 papers remained and were assigned to over 40 different reviewers, 27 of whom agreed to review at least one paper. Each paper was thus double-blind reviewed by at least two different independent reviewers. The editorial criteria for publication were as strict as for any other submission to the
journal, as witnessed by the fact that only 4 of the 22 submissions were selected for publication. Interestingly, the southern hemisphere is strongly represented in the remaining papers, with two papers originating in Australia, one reporting on joint work from New-Zealand, the United Kingdom and Australia, and one paper reporting on work from the United Kingdom.

Happy reading!

References


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Riding tandem: an organic and collaborative approach to research in vocational education and training

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This study set out to explore the use of the Internet in peer-to-peer learning environments within vocational education and training and to investigate whether this approach could replace traditional teaching and learning. A mixed methods design, including classroom observations, design experiments, interviews and questionnaires was adopted. Although this study represents a mid-term report on work in progress only, a number of observations can nevertheless be made about the process of conducting research within Further Education (FE) colleges. Whilst, traditionally, the pursuit of research is not a priority within FE colleges, this study has encouraged lecturers in Highbury College, Portsmouth, United Kingdom to trial a research-based approach to curriculum development. They have worked as co-researchers in the study from the conceptual phase to implementation. This paper outlines the process of conducting research in partnership with Business lecturers at Highbury College. It presents preliminary findings based on the researcher and lecturers’ reflections on the research methodology and process followed over a period of 9 months.

\textbf{Keywords:} Emergent learning; FE Colleges; SOLE; vocational education and training

Introduction

Further Education Colleges form the backbone of the Vocational Education and Training (VET) system in the United Kingdom. It is a sector ‘where the tectonic plates of the education system and the labour market meet’ (Keep 2012), and, in its simplest terms, the purpose of the VET system is to prepare young people explicitly for work. Given that this is a sector intended to mirror prevailing and emerging industrial needs, it is regularly criticised for lagging behind the workplace in its adoption of digital technologies (Office for Standards in Education, Children’s Services and Skills 2009; Ufi Charitable Trust 2012). Whilst the workplace and the wider economy has seen seismic shifts in business models and working practices as a result of digital technologies (Brynjolfsson and McAfee 2014; Frey and Osborne 2013), the vocational curriculum in FE Colleges has merely dabbled at the margins. The status quo in pedagogical practice remains that of a compromise position where technology is used to shore up out-dated practices rather than to innovate practice (Becta 2010; Blin and Munro 2008).
This compromise is, perhaps, the result of the underlying tension between the concepts of ‘disruption’ and ‘control’ which lie at the heart of the discourse on digital technologies in the education world. Rather than delivering the learning experiences now commonly accepted as a fundamental requirement for personal, social and economic prosperity in the 21st century (Castells 2009; Trilling and Fadel 2012; Zhao 2012), the default practice remains that of replicating or supplementing traditional activities.

As far as FE colleges are concerned, however, there are signs that this may be about to change. Firstly, recent statements from the UK Government Department responsible for VET policy have turned the spotlight on technology, stating:

New technology will play an indispensable role in transforming vocational training. Technology is both directly improving the user experience and raising standards, as users make better choices with easy access to information. Our colleges and providers must take advantage of such opportunities. (BIS and DFE 2013, p. 7)

Secondly, the recently published report from the UK Further Education Learning and Technology Advisory Group (FELTAG) proposed a number of radical measures, including a recommendation to make mandatory ‘the inclusion in every publicly-funded learning programme from 2015/16 of a 10% wholly online component, with incentives to increase this to 50% by 2017/18’ (BIS 2014, p. 23). Whether 50% is a desirable option for students in FE colleges, or, indeed, what 50% online would actually mean in practice, remains to be seen, but the tone of the rhetoric used by policy makers is clearly shifting to one in which the dominant lecturer-centric model of pedagogy is being challenged. It is within this context that this research project has taken shape.

The research project set out to explore whether the methodology of Self-Organised Learning Environments (SOLEs) as developed by Sugata Mitra in the school sector (Dolan et al. 2013), could be applied successfully within VET courses. Study experiments have taken place to date with 150 students across three VET colleges – two in the UK and one in India – in the subject areas of Automotive Studies, Beauty Therapy, Business, Construction, and Hairdressing. The two UK colleges were identified on the basis of having different demographic and curriculum profiles whilst operating in the same VET system, and the inclusion of an Indian College would enable comparisons to be made with other VET systems. The choice of India was further influenced by the recent focus given to the Indian VET system by the UK Government Department for Business Innovation and Skills (BIS), and the formation of Association of Colleges (AoC) India, launched by the UK Minister for Skills and Enterprise, on a delegation to India in 2013 (Linford 2013).

The focus of this paper is on the experience of conducting experiments in the Business subject area at Highbury College where curriculum experimentation is now taking place on a regular basis. Highbury College is a general Further Education College located in Portsmouth, United Kingdom. It trains over 10,000 students each year in a range of vocational subjects and levels. Over a number of years, the college has established a learning culture which supports curriculum enquiry, and an evidence-based improvement strategy is articulated in its pedagogical framework (Highbury College 2013). This paper reports on research in progress and draws some initial observations about the process of conducting research within live teaching environments, highlighting some initial reflections about the effectiveness of SOLE,
and illustrating how this project is establishing a culture of pedagogical enquiry in Highbury College.

**Background**

**Context for the study**

Within the FE system in the UK, the role of employers in shaping policy has been prioritised by successive governments with the aim of establishing a more demand-led and employer-led system (Keep 2006). However, a number of recent studies from employer bodies have concluded that many students leave FE poorly equipped for the workplace (CBI 2012; UKCES 2014) and question whether the traditional model of VET is meeting the needs of today’s students any longer. UKCES, for example, paints a picture of convergence and cross-disciplinary working becoming key features for work in the future, and explores how these skills might best be developed in the FE sector.

A consensus is emerging that the traditional industrial model of VET no longer serves the pedagogical needs of today’s students (Zhao 2012) and the future of FE colleges, as they are currently constituted, is being challenged. With a world of expert opinion and comment available on the Internet at the click of a mouse, the question arises as to what knowledge and skills now actually need to be taught in formal settings. It would seem that colleges, if they are to remain relevant to students, employers and the wider economy, need to rethink the curriculum in terms of content and pedagogy so that it better reflects the demands of an increasingly digital and networked society (Castells 2009). What is needed, perhaps, is what Castells describes as ‘self-programmable’ workers, constantly retraining and relearning throughout working life, with the Internet firmly established as ‘the durable companion of adult life’ (Castells 2009, p. 91). The workplace increasingly demands inter-disciplinary and multi-disciplinary competencies and, to reflect this, recruitment is becoming geared much more to college leavers’ aptitudes for work rather than to qualifications obtained (CBI/Pearson 2014).

The pace and impact of technological change in the workplace, therefore, means that the VET curriculum is often out-dated by the time students actually start their courses and previously taught skills are rendered obsolete from the outset (Frey and Osborne 2013). So, against such a backdrop of ferocious automation and rapid obsolescence of equipment and skills in the workplace, as technology advances at an increasingly phenomenal rate, how best should colleges prepare students to meet these challenges? To answer this question, a brief overview of current thinking on VET pedagogy within a digital environment would help to set the framework for this project for which the preliminary findings obtained are the subject matter of this paper.

**Student-centred learning within a digital environment**

According to Lucas *et al.* (2012), there is a default pedagogy adopted by VET lecturers which lies in the spectrum of ‘learning by doing’ or ‘experiential learning’. Such student-centred and experiential models of learning can be seen as part of a pedagogic tradition dating back to the traditional apprenticeship model of VET which was largely based on learning by watching, working alongside peers and
demonstrating competence through projects such as the production of an ‘apprentice piece’. It exemplifies what Lave and Wenger (1991) refer to as ‘communities of practice’ and promotes the notion of ‘situated learning’ which is context-driven and based on the experience of learning as a social phenomenon. Following from this, project-based learning came to the fore as a pedagogical methodology, providing simulated practice of workplace skills. Here it was hoped that students would become equipped with the skills needed for the informal learning increasingly practised in the workplace. Finally, self-directed or self-paced learning, which supports the learner progressing at their own pace and taking control of their learning, has emerged as a pedagogical approach in recent years, largely influenced by the availability of computer-based learning resources. A common strand underpins all these forms of learning: it is the emphasis on the individual learner managing their own learning whilst supported by the lecturer who adopts the role of facilitator (Rogers 1983).

Alongside this practice colleges are attempting to harness digital technologies to support learning (BIS 2014). The introduction of learning platforms, the adoption of social networking tools such as Facebook and Twitter and, more recently, the development of Massive Open Online Courses (MOOCs), point to the pivotal role that digital technologies are assuming in the 21st century VET paradigm. Given this background, and given the twin realities of the requirement for digitally competent workers for an increasingly digital workplace on the one hand, and the adoption of digital technologies by young adults on the other, the framework for a 21st century VET pedagogy cannot ignore the central role of digital technologies for teaching, learning and assessment. In short, if the workplace is to be increasingly defined by its digital architecture, then the period of learning which precedes employment needs to reflect this or risk being seen as anachronistic in its practice.

In the light of the above, this study set out to explore whether the method of Self-Organised Learning Environments (SOLEs), which is being adopted in school settings around the world (Davis 2013), could usefully form part of the pedagogical spectrum for the 21st century VET institution. The approach of SOLEs, as developed by Mitra (2013), rests on the principles of peer-to-peer learning in Internet-rich environments. Mitra’s experiments established that deep learning can take place when learning is structured around the principles of self-organising systems, that groups of children can teach themselves, and that the absence of the lecturer can be a powerful pedagogical tool (Mitra, Dangwal, and Thadani 2008). This approach sits within a long tradition in FE Colleges of student-centred and discovery learning but redefines such approaches for the digital age with its emphasis on access to the Internet by students working in randomly chosen groups on a range of open questions. Interaction with the task is unstructured and the students are not directed towards resources by the lecturer. The aim of SOLE is to hand to students the total freedom to explore the question from whatever viewpoint occurs to them and see where such exploration takes them. Indeed, in the context of VET, the Internet could perhaps be described as the digital equivalent of the apprentice master– offering virtual and on demand access to expert demonstrations and explanations. Working together in groups, students collaborate in a process of collective learning – reflecting the process of ‘emergent learning’ which occurs in real workplace settings. Such learning is very similar to the realities of learning on the job when employees are required to troubleshoot emerging problems and acquire new skills independently or with colleagues. Given these similarities, the SOLE model could be seen as an appropriate
methodology to develop the confident, proactive and self-programmable workers needed for today’s global workplace.

Developing the principles of pedagogical enquiry in further education

The significance of research activity as a means to both personal and professional development is well documented (Barker 2005; BERA and RSA 2014; Vogrinc and Zuljan 2009). Its role as an important reflective activity for practitioners was stressed by Stenhouse (1975), whilst work in the late 1990s (Hargreaves 1996) emphasised the concept of lecturers as producers and users of research. Most of this research, however, is concerned with teachers in the school system. The FE system has tended to fall outside of mainstream research activity, with FE lecturers often experiencing institutional barriers in undertaking research (Scaife 2004). In addition, there is a question of confidence to be addressed in the FE sector in the conducting of research, given what Hillier and Morris (2010) refer to as

The real sense that researchers located in higher education (and government) did not recognise the value of, or indeed the existence of, research conducted by colleagues in FE’. (p. 92)

The absence of a core of FE research capacity in colleges was further compounded by the fact that there was no formal requirement for a lecturer qualification in the FE sector until 2001, when workforce reforms were set in train to require a teaching qualification for those entering the sector, and making mandatory continuing professional development (Foster 2005). The concepts of ‘licence to practice’ and the ‘reflective practitioner’ were both subsequently championed by the Institute for Learning, the professional body for lecturers working in further education. Latterly, however, this policy has become fragmented and, in 2013, the requirement for FE lecturers and trainers to gain a teaching qualification was removed. Furthermore, much of the research activity that occurs in FE colleges takes the form of colleges being invited to be mere participants, as opposed to actual partners, with activity being linked to incentives for funding to support lecturer release and engagement with research. Whilst the concept of ‘research practitioner’ is not a new phenomenon in FE (Hillier and Morris 2010), it is worth noting that, as far as this study is concerned, commitment to the research activity was secured without any external pressures or funding incentives. The lecturers involved have been fully ‘partners’ in the research, as opposed to ‘participants’, and have contributed at every stage of the process. This level of engagement does, we believe, provide a model for other colleges to consider as they seek to identify new modes of delivery as recommended in the recent FELTAG report (BIS 2014).

Research methodology

Research design—pragmatism in the classroom

The methodology adopted for this study has been that of design experiments within an overarching case study framework. In practice, this has meant working in partnership with the college and developing the research design with the lecturers involved, based on a dual objective: to study learning in context; and to develop effective classroom interventions (Gorard, Roberts, and Taylor 2004). The potential
limitations of case studies to produce generalised outcomes (Stark and Torrance 2005; Yin 2014) has been mitigated in this study by the adoption of multiple sources of evidence to enable a triangulation of findings. Classroom experiments were therefore complemented by other datasets – video footage, interviews and questionnaires. This approach embraces the methodological diversity and pluralism of mixed methods, as advocated by Johnson and Onwuegbuzie (2004), and is generally considered to be the most appropriate methodology for a study such as this, given its widespread adoption in the still nascent field of educational technology research (Jones and Kennedy 2012).

The research design consisted of running a series of controlled classroom experiments based on the techniques of random assignment administered using controlled groups of students who all completed standardised assessments so that a comparative analysis could be made. The steps outlined below were applied to all subject areas and taken together comprised the experiment cycle. At the end of each cycle data was collected in the form of test scores and audio and video interviews; the groups were then rotated and the cycle repeated so that each group experienced both the traditional and SOLE approach in a related topic area (Figure 1).

From the start of the process, the researcher has been integrated into the teaching team and adopted the role of ‘practitioner researcher’; this was mirrored by the lecturers stepping naturally into the role of ‘research practitioners’ (Cochran-Smith and Lytle 2009). Following a process of established protocols for ethical clearance, students met the researcher at the start of the term and were given written and verbal

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Figure 1. SOLE experiment cycle.
briefings to the study before it commenced. The process has been to integrate the intervention into the natural setting of the classroom and make the experience as least disruptive as possible for the students and lecturers. The experience of early classroom trials and discussions concerning suitable research methods ruled out the application of pre-intervention measurements as in all cases students had no prior experience of the skills being taught and, therefore, testing prior competency in the skills area was not appropriate. The most extreme examples of this occurred in a construction experiment which involved the erection of a mobile scaffold and a hairdressing experiment which involved demonstrating competencies in cutting hair. In both these cases the use of pure experimental design was not appropriate and therefore alternatives to present a triangulation of findings (combining qualitative classroom observations and video interviews with test data and questionnaires) led to the decision to introduce design-based thinking into the overarching methodology (Gorard, Roberts, and Taylor 2004; Reeves, Herrington, and Oliver 2005). The features of this study which were particularly pertinent in this decision were

- the situating of the research within the daily practice of teaching and learning and with active collaboration of lecturers and students in the process,
- existing and theoretical principles (SOLE and its antecedents of student-centred learning) and technological innovations informed the research; and
- iterative cycles of testing and refinement of SOLE in context were employed.

Traditional teaching and SOLE: some observations

Researcher reflections

This paper has attempted to describe the process in which new pedagogical approaches have emerged in vocational education and training to meet the changing needs of the modern workplace. It is too early in the research to present a detailed analysis of the results obtained from the experiments, but the following observations and reflections from the researcher and lecturer perspectives might prove instructive.

Students are often surprised at how much they can learn from the Internet – we tend to assume that they are totally ‘net savvy’ but often their use is, in fact, limited to social media activity. Younger students select video content once they realise it is acceptable to make a noise in the classroom. Older students, on the whole, search for text-based content. The experiments have prompted discussions with students about how they prefer to learn. Some of the comments made at the end of the lessons are listed below:

I thought it was good. We learnt from each other and she (referring to other student taking part in the interview) could pick out something I’d not noticed. So, like for then, it all adds up in your head as you go along. (Business student)

We enjoyed the freedom of working with friends. With friends it helps to work more efficiently. (Automotive student)

With the Internet, and your team, you make a very good team. (Beauty student)

In all of the assessments which have taken place to date, students who had been in the SOLE lesson mostly scored as well, and sometimes better, than students who had
been taught by the lecturer in the lesson. Although still at an early stage of data analysis, this is an interesting finding, given that the students in the SOLE lesson did not have access to the lecturer’s expertise to direct them and keep them on track in the lessons. Finally, lecturers have continued to experiment with the method themselves beyond the initial experiment cycle. Lessons have been videoed and lecturers are reflecting on the learning dynamics which takes place in SOLE lessons and a culture of supported experimentation is becoming established within the college.

**Lecturer reflections**

Before being approached to be part of this study, the use of tools such as Skype, Google Hangouts, and YouTube, etc. was commonplace within curriculum design. However, its use was never formalised or studied as part of an experiment focussing on teaching and learning. In addition, project-based learning and group work are activities that students engage with on a daily basis but always with a strong steering from lecturers in terms of the requirements and desirable outcomes.

Initially, Self-Organised Learning Environments (SOLEs) seemed a somewhat confusing approach to something well established in our practice (namely, experiential learning and ‘learning by doing’) but, after further discussion and analysis, it was clear that this approach was something different; it was building on these foundations, taking learning as an emergent phenomenon, and combining theories of learning (Carl Rogers’ student centred learning, for example) with the possibilities that the Internet has created for learning.

At first, there was a degree of scepticism. This was mainly due to the pressures put upon all educators in the form of progression rates, success rates, value-added scores and UCAS points. However, the design of the study was such that there would be no detrimental effect on the students’ studies if the SOLE approach did not engage them and allow them to succeed – which was an important factor in deciding whether to take part in the study or not. Working on the research design from the early stages meant that the final design was something of a collaboration, which was particularly gratifying. It was also important to be given the opportunity to review the design as early iterations of the experiments influenced our future decisions about topic choices and timings of the experiments.

Seeing the first SOLE session, delivered to a level 3 BTEC National Diploma in Business, was a rather strange experience to begin with. Students were introduced, very succinctly, to the idea, given the question, asked to form groups of four to work around one computer, then literally ‘let loose’ to complete their research. The initial perception was that it wouldn’t work, that students would struggle with all working on one computer and that one or two students would do all the work. The students were a little slow at first to understand the requirements of the task but they soon began working as a team to research, discuss and answer the question posed. At the end of the session each group then fed back the key points of the research completed. Most surprising was the fact that, after analysing the information presented by the students and comparing it with the material in the traditionally taught session, the students in the SOLE session had covered the majority of the traditional material that would have been delivered and also discovered a considerable amount of extra content that would not necessarily have been discussed as part of the traditional session. This in itself was an interesting outcome and something which we would see repeated in subsequent SOLE lessons.
Initially, it was thought that adopting the SOLE approach would mean topics and sessions would have to be constantly re-taught due to the prescriptive nature of the criteria that need to be covered to pass a BTEC National Diploma. There have been occasions where specific topics have had to be taught traditionally, after a SOLE session, and there have been times when areas have been re-visited where students did not understand the concept in the way that was laid down by the awarding body. However, in terms of creating deeper, rather than surface, learning, it can be argued that, although the specific theory required for the diploma was not addressed, understanding of the topic was in fact greater.

Delivering SOLE sessions can actually be a strange, frustrating experience. Lecturers are programmed to help students find the answer and have an objective for the specific knowledge that is necessary for the students to pass a test or write an assignment, and their goal is to facilitate the student to get to that desired end. However, in the SOLE sessions the lecturer simply poses the question and then facilitates the review stage of the session. It is extremely hard when asked questions such as, ‘What do I need to do?’ or, ‘Is this right?’ not to answer the question and/or guide the student in the correct direction. The notion of SOLE sessions being ‘self-correcting’, where groups naturally come to the right conclusion seemed, again, a little hard to conceive until examples of this happening occurred in several sessions.

After the initial few stages and experiments, SOLE sessions quickly became integrated into the Business team’s schemes of work; students became more confident during the sessions and lecturers became more creative in their approaches. In addition, we noted that, contrary to original apprehensions and fears of time being lost, the method has actually resulted in time gains, providing lecturers with greater freedom to experiment and offer alternative lessons and enrichment activities where students can learn without the restriction of pre-defined assessment criteria.

Discussion
From the fieldwork undertaken to date, questions have been raised about the spectrum of pedagogical approaches which can be adopted in the VET curriculum. These questions have prompted discussions by teachers on how they should approach teaching, learning and assessment. Students have also engaged in the debate and reflected on what makes learning effective for them. Lecturers have considered how they can more effectively develop in students the capabilities to research, analyse, synthesise, and evaluate information and sources related to their vocational area, and what this might mean for their role as vocational experts.

The observations in this paper are offered at the midway stage of a research project and are therefore presented as indicative and preliminary. Nevertheless, what does seem to be emerging from this study is a number of potential benefits to applying SOLEs in the VET curriculum. First, the traditional apprenticeship model was largely based on learning by observing, working alongside peers and demonstrating competence through the production of an ‘apprentice piece’. The practice of SOLE could be seen to be redesigning the apprenticeship model of learning within a digital paradigm.

Second, students are developing knowledge and understanding of the topic without expert lecturer input and are being motivated in this process by the freedom to learn which SOLE offers. A number of times students were observed expressing surprise at the range of materials available for their subject. We run the risk of
assuming the today’s net ‘savvy’ generation already know this as much of the time they use the Internet in social rather than learning contexts. Third, students do seem to develop confidence and are more adept at teamwork and leadership over the course of SOLE lessons. Fourth, in most cases the assessment scores are broadly level between the control and experiment groups, which is itself an interesting result given the students in the SOLE lesson do not have access to a lecturer to guide them to relevant information and keep them on task. In all of the lessons described in this paper, the teachers remarked on the way the SOLE method appeared to energise the students. Finally, one of the most constant features in the post-SOLE lessons feedback was the in depth discussions which took place with students about the process of learning. Students reflected on what worked for them, and even considered whether the topics chosen by the lecturer were appropriate or not for the SOLE approach. There were examples of students requesting the SOLE approach in subsequent lessons as they recognised its relevance to the topic under investigation. This aspect of SOLE in highlighting modes of preferred learning amongst VET students may turn out to be one of the more enduring benefits of employing SOLE in Vocational Education and Training and it will be examined further during the remainder of this research.

Lecturers are reflecting on their role and how face-to-face presence adds value beyond the transmission of information which is now widely available on the Internet. Students have begun to question exactly how they learn best. They have begun to consider how much input they need from the lecturer, and how much information they can actually find out on their own and from their peers depending on their own perceived ability or confidence in a particular subject area.

As a result of this study, Business students at Highbury College have become more responsible for their learning, and have exhibited greater motivation to complete tasks outside of their normal classroom setting, providing lecturers with much welcomed flexibility. Additionally, colleagues have expressed an interest in exploring the method and a cascade process has started with lecturers across the college.

**Conclusion**

This study set out from the conceptual phase to be embedded within an FE college and for the interventions to take place in live classroom settings in a partnership between researcher and lecturer. Details of the initial research design were presented to the lecturers and, following this consultation and a review of initial trials, the research design was agreed. Not only has this project considered a specific pedagogical question within the context of learning technology in VET, it has also provided a platform for the lecturers involved to be both producers and users of the research. It was always the intention to utilise a partnership model in working with the colleges, but the level of enthusiasm and engagement far exceeded expectations, and stimulated the journey of collaborative enquiry described above. The experience of this research project has highlighted the benefits of pedagogical enquiry as a core component of teaching practice and professional development in FE colleges. It has energised the lecturers and the students who have participated in the project and it is continuing to stimulate ideas about teaching, learning and assessment.
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Riding the wave of BYOD: developing a framework for creative pedagogies

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Moving innovation in teaching and learning beyond isolated short-term projects is one of the holy grails of educational technology research, which is littered with the debris of a constant stream of comparative studies demonstrating no significant difference between innovative technologies and traditional pedagogical approaches. Meanwhile, the approaching giant wave of the bring your own device (BYOD) movement threatens to overwhelm education practitioners and researchers preoccupied with replicating current practice on mobile devices. A review of the literature indicates that there are yet few well-developed theoretical frameworks for supporting creative pedagogies via BYOD. In this paper, we overview the development of a framework for creative pedagogies that harness the unique affordances of BYOD. This framework has been used across multiple educational contexts and scale from short workshops through to full courses and international collaborative projects. Our key design principles for supporting creative pedagogies via BYOD include modelling collaborative practice via establishing teacher communities of practice to learn about the affordances of mobile devices in relation to new modes of student learning, collaborative curriculum redesign in response to shifts in conceptions of teaching and learning, and collaborating with ICT Services for infrastructure development across the campus.

Keywords: Mobile Learning; augmented reality; creative pedagogies; communities of practice; social media

Introduction

The ubiquitous ownership and connectivity of mobile devices (smartphones and lightweight tablets) coupled with the collaborative affordances of social media and the contextual awareness of Global Positioning System (GPS) based augmented reality (such as Wikitude or Layar) provide a rich platform for creative student-directed learning experiences. However, lecturers invariably default to using these new technologies within established teaching paradigms that are predominantly teacher-directed and focus upon content delivery (Belshaw 2010; Cochrane 2013; Herrington and Herrington 2007; Reeves 2005; Rushby 2012). As a group of like-minded researchers, we were interested in exploring ways of transferring our experiences of designing new pedagogies enabled by mobile social media into wider educational contexts. In our experience, higher education is dominated by a Web 1.0 teaching...
paradigm that focuses upon teacher-directed content locked within the confines of an institutional learning management system. This information delivery approach to online learning has been termed ‘digital myopia’ (Herrington, Reeves, and Oliver 2005).

Some of the most valued attributes of higher education graduates by prospective employers are that they are creative self-directed learners who can also work effectively in collaborative teams. An education system that focuses upon content delivery and learning measured by examinations and essays does not inspire creativity. Creative pedagogies are concerned with a holistic approach to education focusing upon the learner becoming part of a professional community, involving the dimensions of knowledge, performance and becoming (Danvers 2003). Such a framework will be focused upon cultivating creative pedagogies within the context of the curriculum.

We find the concept of learner-generated contexts (Bruns 2007; Cook 2007; Luckin et al. 2010) to be a useful frame for measuring a curriculum change towards creative pedagogies. The authors of this paper see our roles as stewards and practitioners wanting to move higher education towards creative pedagogies, moving along a continuum from teacher-directed pedagogy, to student-centred andragogy, towards student-determined learning (heutagogy) termed the Pedagogy–Andragogy–Heutagogy (PAH) continuum (Luckin et al. 2010). Heutagogy is a relatively new term (Hase and Kenyon 2001), but it has similar roots in social constructivist learning to Reggio Emilia (Learning and Teaching Scotland 2006), Dewey (1916) and Vygotsky (1978). Blaschke (2012) highlights three key characteristics of heutagogy, including: learner-centred (involving a flexible curriculum with flexible and negotiated assessments), reflective practice (typified by establishing learning journals or eportfolios) and collaborative learning.

Mapping the PAH continuum onto a web-based technological development timeline results in what we call the post Web 2.0 continuum. The post Web 2.0 continuum represents a pedagogical change timeline reflecting key technology developments and their pedagogical affordances from the rise of the Internet, Web 2.0 and the virtually ubiquitous uptake of mobile devices such as smartphones and small format touch screen tablets. We illustrate this continuum in Table 1.

The dates attached to our post Web 2.0 continuum indicate the emergence of three different foci of the web, and we have associated pedagogical approaches with each of these according to their affordances. These do not represent value judgments or exclude any of these approaches, but provide an illustration of the potential of

Table 1. Post Web 2.0 continuum.

<table>
<thead>
<tr>
<th>1995</th>
<th>2005</th>
<th>2013</th>
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</thead>
<tbody>
<tr>
<td>Web 1.0</td>
<td>Web 2.0</td>
<td>Mobile</td>
</tr>
<tr>
<td>Teacher</td>
<td>Student</td>
<td>Collaboration</td>
</tr>
<tr>
<td>LMS</td>
<td>eportfolio</td>
<td>Connectivism</td>
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<tr>
<td>Content delivery</td>
<td>Student generated</td>
<td>Student generated</td>
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<tr>
<td>PowerPoint</td>
<td>Content</td>
<td>Contexts</td>
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<tr>
<td>Pedagogy</td>
<td>Slideshare</td>
<td>Mobile social media</td>
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<tr>
<td></td>
<td>Andragogy</td>
<td>Heutagogy</td>
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<tr>
<td></td>
<td>Social learning</td>
<td>Creativity</td>
</tr>
<tr>
<td></td>
<td>Building learning communities</td>
<td>Active participation in professional communities</td>
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new technologies to support new pedagogies. Unfortunately, this timeline is not reflected in the general practice of teaching and learning in higher education. Generally educators implement new technologies by replicating current practice rather than leveraging the unique affordances of new technologies to redefine the possibilities of assessment and learning activities. In order to do this, we need a culture shift or as Balsamo (2011) puts it, higher education institutions need an epistemological reboot. However, lecturers need to be convinced of the necessity and benefits of changing tried and true practice, and Hase and Kenyon (2007) argue that pedagogical change requires a catalyst. We believe that mobile social media provides such a catalyst, enabling a redefinition of the role of the teacher and learner (Kukulska-Hulme 2010). However, educators do not often like being told how to teach, therefore we brainstormed ways of surreptitiously introducing a culture change by integrating the unique affordances of mobile devices that our students own such as mobile movie production and mobile augmented reality into the curriculum, thus enabling new pedagogies rather than replicating previous practice on a small screen device.

**Mobile movie production**

With the rise of camera phones and now smartphones to almost ubiquitous ownership, the novelty of mobile phone filmmaking has entered mainstream cultural practice. The iPhone became the dominant camera used for Flickr photo uploads in 2010, and smartphones have virtually replaced compact digital cameras for the majority of casual users. Exploring the unique affordances of smartphones for movie production, editing and sharing have become very popular. Smartphones have been used to record music videos, advertising campaigns and even full-length movies. Recently, a new wave of short format mobile video Apps have become widely popular such as Vine and Instagram videos. The collaborative potential of mobile filmmaking is leveraged in Apps such as Vyclone and MixBit. Innovative mobile film editing is facilitated by Apps such as Magisto. However, the predominant usage of mobile movies in education is still focused upon distribution of lecture capture via PODcasts and iTunesU.

**Mobile augmented reality**

Mobile augmented reality ranges from using the built-in camera of mobile devices to trigger interactive 3D models and multimedia via scannable markers, through to overlaying the real world in real time with digital information triggered by geolocation data through a smartphone’s GPS. The educational affordances of mobile geolocation and mobile augmented reality have been flagged for several years (Alexander et al. 2006; Cook 2010; Johnson, Levine, and Smith 2009), but have yet to become mainstream educational technologies. This is partly due to the complexity involved in 3D modelling and the skills required for the development of mobile applications, and partly the cost of AR capable smartphones. The application of mobile augmented reality has also been predominantly in the form of content delivery to student devices, rather than in the facilitation of student-generated content (Butchart 2011; Cook 2010; FitzGerald et al. 2013). Fitzgerald et al. (2012) categorise the predominant mode of mobile augmented reality educational projects as passive/assimilative whereby students are viewers of pre-packaged AR content. In general, the uptake of mobile AR in education has been ‘very modest’ (Butchart 2011), with a focus upon content delivery via: ‘training, discovery based learning, educational games, 3D models, and...
augmented books’ (Butchart 2011, p. 36). In contrast to the passive/assimilative use of AR, Butchart highlighted the potential of smartphone AR browsers as accessible tools for authoring and hosting AR content. However, he found no educational examples of student-generated content for smartphone AR browsers. This is the gap in current educational practice that we explored with the MARMWorkshop (Mobile Augmented Reality Movie Workshop), building upon our first mobile AR explorations in the context of Architecture education (Cochrane and Rhodes 2013). We then extrapolated this process into wider and longer-term curriculum contexts.

**A framework for creative pedagogies**

Our creative pedagogical curriculum design framework is essentially a blend of several interrelated learning frameworks. The frameworks include: the PAH continuum (Luckin *et al.* 2010), Puentedura’s (2006) SAMR model (Substitution, Augmentation, Modification, Redefinition) of educational technology transformation and Sternberg, Kaufman, and Pretz’s (2002) view of creativity involving incrementation (or modification of a current idea) followed by reinitiation (or redefinition). The premise of the PAH continuum is that student-determined learning (heutagogy) need not be the solo domain of post graduate education, but has degrees of relevance at all levels of education, and we can scaffold the introduction of student-determined learning environments. The SAMR framework argues that technology adoption in education can move beyond the substitution of existing educational activities and assessment practices to create new experiences previously impossible or difficult with prior technology. Aligning these frameworks with the unique affordances of mobile social media provides a simple framework (Table 2) for designing new course activities and assessments that leverage new pedagogies. Table 2 applies the columns of the PAH continuum aligned with the levels of the SAMR framework and three levels of creativity to example affordances of mobile social media, providing a curriculum design rubric.

The framework represents a continuum of pedagogical approaches that can be scaffolded across the length of a course or project, building upon students’ and lecturers’ previous educational experience as we explore new pedagogical strategies that move towards heutagogy. Other new learning metaphors that have been developed to support new modes of global learning communities (for example cMMOCs) include connectivism (Siemens 2004) and rhizomatic learning (Cormier 2008; McAuley *et al.* 2010). Two of the key elements of Table 2 include the change in cognition and the ontological shifts that result as lecturers and students reconceptualise learning and the role of technology from information delivery towards enabling a transformative conception of the role of both the learner and the teacher as collaborators in this process.

**Implementing the framework**

We have argued that implementing an effective framework for creative pedagogies must meet three goals (Cochrane, Narayan, and Oldfield 2014): it must model a community of practice (COP), focus upon redefining pedagogy and provide an appropriate technology support infrastructure. Mobile social media leverages the ubiquity of mobile device ownership and enables the formation of professional networks and
Table 2. A framework for using mobile social media to enable creative pedagogies.

<table>
<thead>
<tr>
<th>Pedagogy</th>
<th>Andragogy</th>
<th>Heutagogy</th>
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<tbody>
<tr>
<td><strong>Activity types</strong></td>
<td>Content delivery Digital assessment Teacher as guide Teacher as co-learner</td>
<td>Digital identity Student-generated content Digital presence Student-generated contexts</td>
</tr>
<tr>
<td></td>
<td>Digital identity Teacher-delivered content</td>
<td>Student-generated content</td>
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<tr>
<td></td>
<td>Teacher-defined projects Student-generated contexts</td>
<td>Student-negotiated teams</td>
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<td>Teacher-defined projects</td>
<td>Student</td>
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<tr>
<td><strong>Locus of control</strong></td>
<td>Cognitive</td>
<td>Early to mid-course: Student appropriation of mobile social media and initial active participation</td>
</tr>
<tr>
<td><strong>Cognition</strong></td>
<td>Initial establishment of a course project and induction into a wider learning community</td>
<td>Student</td>
</tr>
<tr>
<td><strong>Course timeframe and goal</strong></td>
<td>Focus on productivity</td>
<td>Early to mid-course: Student appropriation of mobile social media and initial active participation</td>
</tr>
<tr>
<td></td>
<td>New forms of collaboration</td>
<td>Mobile device as collaborative tool</td>
</tr>
<tr>
<td></td>
<td>Mobile device as personal digital assistant and consumption tool</td>
<td>Mobile device as content creation and curation tool</td>
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<td></td>
<td>Mobile device as consumption tool</td>
<td>New forms of collaboration</td>
</tr>
<tr>
<td></td>
<td>Reproduction</td>
<td>In situ reflections</td>
</tr>
<tr>
<td><strong>SAMR (PuenteDura 2006)</strong></td>
<td>Substitution and Augmentation Portfolio to eportfolio PowerPoint on iPad</td>
<td>Reflection as VODCast Prezi on iPad</td>
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<tr>
<td></td>
<td>Focus on productivity Mobile device as personal digital assistant and consumption tool</td>
<td>New forms of collaboration Mobile device as content creation and curation tool</td>
</tr>
<tr>
<td><strong>Creativity (Sternberg, Kaufman &amp; Pretz, 2007)</strong></td>
<td>Reproduction</td>
<td>Incrementation</td>
</tr>
<tr>
<td><strong>Knowledge production</strong></td>
<td>Subject understanding: lecturers introduce and model the use of a range of mobile social media tools appropriate to the learning context</td>
<td>Process negotiation: students negotiate a choice of mobile social media tools to establish an eportfolio based upon user-generated content</td>
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<tr>
<td></td>
<td>Enabling induction into a supportive learning community</td>
<td>Enabling user-generated content and active participation within an authentic project COP</td>
</tr>
<tr>
<td><strong>Supporting mobile social media affordances</strong></td>
<td></td>
<td>Enabling user-generated content and active participation within an authentic project COP</td>
</tr>
<tr>
<td><strong>Ontological shift</strong></td>
<td>Reconceptualising mobile social media: from a social to an educational domain</td>
<td>Reconceptualising the role of the teacher</td>
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Modified from Luckin et al. 2010.

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serendipitous learning. Mobile learning provides powerful tools for enabling the nurturing of learning communities across varied contexts that previously would have been impossible. Focusing upon student-generated eportfolios created from a blend of best-in-class mobile social media platforms enables student creativity and collaboration that is in stark contrast to the typical ‘digital myopia’ enforced by the reliance upon institutional learning management systems. Mobile social media is inherently collaborative but requires a significant rethink of assessment design, using collaborative user-content generation tools such as Vyclone for collaborative video.

Second, lecturers must engage with and model the educational use of mobile social media within the curriculum. This requires reconceptualising mobile social media from a purely social domain to an academic and professional domain of use. Assessment activities need to leverage the unique affordances of mobile social media. Mobile social media can use a variety of collaborative presentation and interaction tools, such as Prezi, and wireless screen mirroring via an AppleTV connected to a large screen display. For example, Google Maps or Google Earth can be used as a collaborative platform to collate/curate student projects from around the world, where student teams link their geotagged content within a shared Google Map. This adds the dimension of authentic context to student projects, with the ability for students around the world to share in the experience of learning of others within the original context.

Linking geotagged content from a variety of new and emerging mobile Apps enables a relatively simple yet dynamic and collaborative experience. Example Apps include Vyclone for collaborative video recording; the online YouTube video editor for collaborative video editing and annotation; Flickr, Instagram and Picasa for collaborative photo sharing/curation; Junaio for embedding QR tags within augmented reality. Academic rigour can be achieved by requiring students to annotate their content using accepted referencing styles, yet turning this into a collaborative curation activity via creating shared Mendeley or Zotero libraries for example. Specific activities will depend upon each students’ context, and should be student negotiable; however, the collaborative element of such projects needs to be clearly defined, as student experience of being active members within an authentic professional global COP is one of the goals of such projects.

Research questions

As an interdisciplinary group of lecturers and educational technologists, we are primarily interested in exploring pedagogical change in higher education and we find a qualitative research methodology the best match to our goals. While using mixed methodologies to gather and analyse participant activity and feedback data, we use action research (Greenwood and Levin 2005) to inform iterative development of the implementation of our mobile social media framework with the goal of developing transferable strategies and design principles.

(1) Based upon our emergent framework for creative pedagogies, how can mobile social media be used as a catalyst to introduce new pedagogies and assessment strategies within a variety of higher education contexts?
(2) What generic bring your own device (BYOD) strategies and design principles can we identify from a variety of institutional contexts?
The data gathered are a collection of participant feedback via reflective blog posts, and curation of participant social media activity via hashtags from YouTube videos, Twitter, Google Plus, Vine and Instagram videos. In this paper, we focus upon the analysis of the curated social media outputs using tools such as TAGSExplorer (Hawksey 2011) and tagboard (for example, http://tagboard.com/moco360) for collating project content tagged with a pre-defined hashtag (#marmw2013, and #moco360). Within the context of both projects, the participating lecturers discussed with the participating students the nature and ethical issues of creating online digital identities, public eportfolios and the appropriate sharing of mobile social media. Thus, the lecturers negotiated a shared understanding of the communities and protocols around each project, and attempted to model appropriate behaviour to their students.

Example framework implementations

In this section, we illustrate the implementation of our framework for creative pedagogies in two contexts including a 1-week intensive workshop, followed by curriculum integration within an international project spanning a variety of course contexts.

Framework implementation 1: Intensive workshop

In the first implementation of our framework, we formed an international (New Zealand, UK and France) COP comprising two mobile learning experts and two mobile film making lecturers to design a week long workshop for lecturers at Auckland University of Technology to explore the potential of mobile augmented reality in their own teaching. The workshop was structured to model a COP of the participants that they could then transfer to their own teaching practice. This workshop aimed to give participants an experience of creating innovative mashups of three of the unique affordances of today’s smartphones, tablets and phablets:

1. Augmented Reality (locating)
   Using geotagging via smartphones’ in-built GPS enables mobile movies to be located within a geographical context, linked to collaborative Google Maps and viewed in Google Earth. This adds a rich layer of contextual information to mobile movies, effectively augmenting a mobile movie with geographical data.

2. Mobile Media Production (creating)
   Adding new mobile video applications such as Vyclone, Vine and the YouTube Online Editor for collaboration can enhance the creation of mobile movies and add a unique perspective.

3. Mobile Social Media (sharing)
   Mobile social media provides a way to publish and share creative output with a global audience, using tools such as Twitter, Google Plus and Wikitude.

The workshop explored scenarios for innovative and collaborative team projects using these tools. The participants were expected to create an augmented mobile movie in a collaborative team and explore the application of augmented mobile movie projects within their discipline context. This was supported by the discussion and
critique of examples of collaborative mobile movie production and mobile augmented reality, an introduction to the body of literature surrounding mobile learning, mobile movie production and mobile augmented reality in higher education.

The workshop involved the participants forming production teams of up to four members to create an authentic augmented mobile movie project using a mashup of YouTube/Vimeo/Vyclone/Vine and Google Maps, and then creating a Wikitude world from this content. These projects were then presented to and critiqued by the entire workshop participants, and shared for feedback from global experts via live Google Plus Hangouts. A common hashtag was used to collate the social media throughout the workshop (#marmw2013). The participants were required to bring their own iOS or Android smartphone or tablet device, and a laptop.

Table 3 outlines the core mobile social media (msm) tools used throughout the workshop.

The workshop began by introducing a few short projects that were curated via a shared Google Map (http://goo.gl/maps/pkldm) and then participants formed teams to create their own projects. Participant projects produced throughout the workshop ranged from a mobile-mentary of the massively multiplayer geolocation mobile app game Ingress (http://youtu.be/-SP16YVXs_A) to a selection of mobile films linked into a Wikitude world layer (http://youtu.be/C4dwvdp8vTo).

Participant feedback after the workshop indicated significant impact on their conceptions of mobile social media within their own curriculum contexts, for example:

The #marmw2013 workshop has been a great exercise in exploring new ideas and discovering different approaches to filmmaking, sound recording and the relevance location can have on this content. It has given me the opportunity to try out new ways of working and to test some of my knowledge of mobile geo-spatial and augmented reality. Most of all, the workshop has put me in contact with some extremely switched on people who have opened up a huge body of ideas to pursue with my students and hopefully through further collaborative projects in the coming year. (Participant G + post 2013)

**Framework implementation 2: International project**

The second implementation of our framework involved an international project titled MoCo360. MoCo360 is a non-funded international group of like-minded educators exploring the potential of mobile social media – and in particular mobile film making,

<table>
<thead>
<tr>
<th>MSM applications</th>
<th>Affordance</th>
<th>Example URL</th>
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<tbody>
<tr>
<td>Twitter</td>
<td>Asynchronous collaboration and content curation via the hashtag #marmw2013</td>
<td><a href="http://bit.ly/1fnEmw8">http://bit.ly/1fnEmw8</a></td>
</tr>
<tr>
<td>Vyclone</td>
<td>Collaborative video production</td>
<td><a href="http://bit.ly/1bdR8c5">http://bit.ly/1bdR8c5</a></td>
</tr>
<tr>
<td>YouTube and Vimeo</td>
<td>Video hosting and sharing</td>
<td><a href="http://youtu.be/-SP16YVXs_A">http://youtu.be/-SP16YVXs_A</a></td>
</tr>
<tr>
<td>Google Maps</td>
<td>Geolocating participant projects</td>
<td><a href="http://goo.gl/maps/pkldm">http://goo.gl/maps/pkldm</a></td>
</tr>
<tr>
<td>Wikitude</td>
<td>Mobile AR production and sharing</td>
<td><a href="http://arlink.wikitude.com?dk=bnxgym">http://arlink.wikitude.com?dk=bnxgym</a></td>
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</table>
for collaborative design of transformative student learning experiences. MoCo360 was established by inviting several mobile learning researchers and practitioners across the globe to form a COP focused upon exploring new forms of student collaborative projects, giving their students an authentic experience of collaborating on mobile film production. This COP was formed out of a re-envisioning of a prior collaborative project (Cochrane, Antonczak, and Wagner 2013) and was based upon our newly developed framework for creative pedagogies. Currently participants are drawn from New Zealand, Columbia, France and the United Kingdom (http://goo.gl/maps/mlXEV). A Google Plus Community (http://bit.ly/1fZPnUd) is used as a hub to coordinate the activity and resources of the participating lecturers, who meet weekly via a Google Plus Hangout to brainstorm ideas and curriculum activities. A public face to the project is maintained via a WordPress blog with all of the lecturers as authors and editors (http://moco360.wordpress.com). Twitter is used extensively for asynchronous communication and sharing across the different geographic timezones, and activity and mobile social media resources are collated via a common hashtag (#moco360).


The MoCo360 project began with the lecturers participating in the COP collaborating on designing several shared activities and assessments for their students (outlined on a Google Docs spreadsheet) and then developed into brokering student-generated collaborative projects between the participating student groups using a project Facebook page (https://www.facebook.com/groups/MoCo360/). The MoCo360 lecturers also collaborated with mobile social media App developers Vyclone to enable their App to collate video clips using the #moco360 hashtag. Examples of student collaborative mobile social media activity include: an international Vyclone movie megamix (http://youtu.be/JhSUzTY_ezE), and a student-initiated project illustrating forced perspective (http://theforcedperspectiveproject.wordpress.com/).

Discussion
The two different iterations of implementing our framework for creative pedagogies using mobile social media highlight the three key elements of this framework: modelling a COP, redefining pedagogy and designing an appropriate technology support infrastructure.

Modelling a COP
Using Google Plus Communities has provided a visually powerful way of farming the various groups of participants’ interactions as a COP, and provides a simple way of brokering this concept to students.

Figure 1 is a screen shot of the MARMWorkshop Google Plus Community that provided a model for the participants to later explore with their own student cohorts.

Comparing snapshots of TAGSEnator visual Twitter analysis between the start of the #moco360 project (Figure 2) and after the project has developed (Figure 3)
Figure 1. MARMWorkshop G+ Community.

illustrates how the communities around a project develop initially around the core participants and widen to include the movement of peripheral participants into active participation within the community. This is brokered by the modelling of the appropriate use of these tools by the participating lecturers to their student cohorts, and also between these cohorts.

Figure 2 illustrates that initially the activity of the moco360 project was predominantly around the core group of lecturers, while Figure 3 shows several students becoming significant nodes of conversation as the project progressed.

Adding a geographical context to COP mobile social media participation via Google Maps provides another powerful visual model for students to conceptualise virtual participation within a global COP (Figure 4).

**Redefining pedagogy**

The two example framework implementations focus upon redefining teaching and learning activities and assessment practices around the unique affordances of mobile
social media. This has been a collaborative exercise, supported by the establishment of lecturer COPs around each project. As Cormier (2008) notes, redefining pedagogy around learning communities represents a significantly new role for most lecturers, involving the creation of an ecology for community interaction and brokering student participation within wider networks beyond the confines of a single class. Blaschke (2013) also identifies design strategies for redefining pedagogy towards heutagogy (student-determined learning). These strategies are similar to those that we have embedded within our mobile social media framework, including a focus upon learner negotiation, reflective practice and collaborative learning.

Designing an appropriate technology support infrastructure
Implementing the framework is predicated upon a robust institutional WiFi network empowering connectivity and enabling lecturer and student small screen mobile devices to become collaborative tools via wireless screen mirroring. This requires working with an institution’s IT department to enable wireless screen mirroring via the institutions’ WiFi networks using Apple Airplay, Google Chromecast and Microsoft’s WiDi mobile protocols. As part of our framework development we have designed and built low-cost Mobile Airplay Screens (MOAs) that facilitate student teamwork via their personal mobile devices (Cochrane, Munn, and Antoneczak 2013; Cochrane and Withell 2013). These MOAs can be wheeled into any space that has wireless network coverage and a power point for students to turn into a collaborative space (Figure 5). We have also worked with our IT department to enable classroom presentation systems to provide wireless mirroring access from lecture and student mobile devices. As we partner with other institutions in developing our mobile social media
framework for BYOD we also share how we have enabled infrastructure changes to support the implementation of this framework, including the custom designed MOAs.

**Future research**

Space has limited us to the inclusion of only two examples of how we are implementing our framework for creative pedagogies within wider contexts. Both the #marmw2013 and the #MoCo360 communities of practice are on-going and in the early stages of development, but we can already see evidence of a significant impact on the multiple curriculum contexts involved as they apply our framework for creative pedagogies using mobile social media. Driven by our two research questions, an in-depth evaluation of these two projects will be undertaken at the end of 2014, and this will inform the development of a set of design principles for implementing a framework for creative pedagogies using mobile social media and student-owned devices.
Conclusions
In order to transform students into creative professionals, educators’ need to focus upon ontological pedagogies that deal with the process of becoming, rather than pedagogies that focus upon knowledge transfer. Having developed a framework for creative pedagogies using mobile social media, we have discussed two examples of case studies illustrating how we are beginning the process of implementing and evaluating it within a wider range of higher education contexts. This approach could also be extended to other fields beyond creative industries and design, as critical engagement with new technologies, including mobile social media, grows into a core 21st century literacy in a world where a new wave of students come to our institutions with ubiquitous ownership of a wireless mobile device of their own choosing.

References


Addressing the challenges of a new digital technologies curriculum: MOOCs as a scalable solution for teacher professional development

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England and Australia have introduced new learning areas, teaching computer science to children from the first year of school. This is a significant milestone that also raises a number of big challenges: the preparation of teachers and the development of resources at a national scale. Curriculum change is not easy for teachers, in any context, and to ensure teachers are supported, scaled solutions are required. One educational approach that has gained traction for delivering content to large-scale audiences are massively open online courses (MOOCs); however, little is known about what constitutes effective MOOC design, particularly within professional development contexts. To prepare teachers in Australia, we decided to ride the wave of MOOCs, developing a MOOC to deliver free computing content and pedagogy to teachers with the integration of social media to support knowledge exchange and resource building. The MOOC was designed to meet teacher needs, allowing for flexibility, ad-hoc interactions, support and the open sharing of resources. In this paper, we describe the process of developing our initiative, participant engagement and experiences, so that others encountering similar changes and reforms may learn from our experience.

Keywords: scaling up; MOOCs; open access; professional development; online course; computer science education
More recently, a drive to include computing in the school curriculum has arisen, proposing that all children should have an opportunity to develop computational thinking skills and have a chance to be ‘creators’ of DT (Gander et al. 2013; The Royal Society 2012). Little is known about what impact curriculum changes will have on enrolment and interest in CS; however, it could be assumed that one key factor in the success of implementing this learning area will be appropriate professional development (PD) that provides teachers with the confidence and experience to integrate CS effectively in classroom activities.

Australia is one nation leading a recent wave to introduce CS education into schools (Gander et al. 2013; The Royal Society 2012; Wilson and Guzdial 2010), with the release of the Australian F (Foundation, also known as Kindergarten) – Year 10 DT curriculum (ACARA 2012). The learning area explicitly introduces learning objectives relating to the cultural impacts of technology, computational thinking, the use of digital systems and data, as well as visual programming concepts and practice. While this is an exciting time for CS education, it also raises many big challenges. These challenges include the preparation of teachers to implement the learning area, teacher PD in domain knowledge, the development of resources and pedagogy for F-10 CS education, and more importantly, a need to address these challenges at a national scale. To address some of these issues, it has been recommended that the CS education community can assist by working with primary and secondary administrators (Barr and Stephenson 2011) to guide how to appropriately and effectively integrate new concepts into existing content and pedagogical knowledge and also how to integrate the learning area into classroom. As a university, how can we contribute to this national issue to prepare teachers to implement new computing curricula through scalable and cost effective solutions that could be adopted in other contexts?

MOOCs have been adopted as a means to deliver content (usually freely) across distributed environments to anyone with an Internet connection and computer. Further, social media have been integrated and offer the potential for supporting online community building, collaboration and knowledge sharing, despite learner locations. This approach to large-scale learning may provide a means to deliver content for free and allow teachers to develop a community where teachers can engage in flexible PD. Although online learning is not a new concept, little is known about what constitutes effective MOOC design, particularly for a purpose such as teacher PD.

In this paper, we describe an approach to develop a free teacher PD MOOC targeting the Australian DT learning area. This paper describes our MOOC design and findings about our participant audience and their engagement and experience in the course.

Literature review

New computing curricula

Over the past decade, the need to rethink our education systems in terms of the treatment of CS and information technology has gained global attention (Gander et al. 2013; Seehorn et al. 2011; The Royal Society 2012). Encouraging students to engage in current technologies and participate as creators of future technologies requires more than teaching the fundamentals of digital literacy (The Royal Society 2012).
There is a growing awareness among the CS education community that we must also teach computational thinking, the problem-solving processes and intellectual practices needed to understand the scientific practices that underpin technology. Without this, we face the risk of our youth being placed in the position of consumers of technology produced elsewhere, unable to actively participate as producers and leaders in this field (Gal-Ezer and Stephenson 2009; Gander et al. 2013). Recent reports from the United States and Europe have argued that it is essential that children be exposed to CS concepts and principles from the very start of their education so that every child may at least have the opportunity to learn computing at school (Gander et al. 2013; Wilson and Guzdial 2010).

New computing curricula introduced in England (Department for Education 2013), Australia (ACARA 2012), and New Zealand have been developed to introduce computing into schools; however, little has been done in these regions to prepare teachers to implement the new curricula. The challenges faced by the adoption of new curriculum are extensive and previous reforms have found that teachers feel left alone to struggle with the challenge of implementation (Park and Sung 2013), an issue likely to be more challenging when it is a completely new learning area. A consultation report, with feedback from industry, educators and the general public in Australia (ACARA 2013), has identified significant concerns relating to teacher PD, appropriate pedagogy and resource availability, particularly within the early years (Barr and Stephenson 2011). The report also identified concerns about the ability of teachers to readily make connections between DT and other learning areas. Similarly, rapid curriculum implementation in New Zealand and the United Kingdom have resulted in concerns for how prepared teachers were to implement the new learning area. If teachers are not prepared to teach computing, and lack the appropriate pedagogy and resources, how can we ensure that this global movement of CS into schools is effectively administered to have the desired impact on student learning and interest?

Discussions taking place in Europe (Gander et al. 2013) and the United States (Seehorn et al. 2011; Wilson and Guzdial 2010) suggest it may not be long before similar changes are introduced in other international contexts, bringing these issues to a global scale. The links between higher education, industry, educators and the schooling sector are identified as crucial to implementing new computing curriculum (Barr and Stephenson 2011); however, these connections are also required at a global scale, with various nations sharing strategies and approaches for preparing teachers to implement the new computing curricula. Although curricula may differ, the CS, computational thinking and programming concepts are still the same. Further, resources and lesson plans for teaching such content can always be adapted for particular learning objectives. Sharing approaches to PD in CS education, including design, content and pedagogy as well as findings from teachers’ experiences and engagement will assist in moving implementation strategies forward.

Teacher PD

Despite significant changes in education with the emergence of technologies and software in recent decades, online teacher professional development (oTPD) has not necessarily adapted to such innovations (Brooks and Gibson 2012). In a review of teacher PD, teachers expressed that programmes were typically insufficient and too short to deal with many aspects of curriculum reform; resulting in authors advising that PD needs to be systematic, on-going and developmental rather than one-off.
sessions (Park and Sung 2013). Currently, online modes of delivery and online communities may offer a means to maintain on-going development.

In a review of the literature, Brooks and Gibson (2012) describe PD models as falling along a continuum: beginning with face-to-face PD, to online teacher professional development (oTPD), which is structured Internet-based learning, and finally, technology-mediated professional learning (TMPL) which is a blend of both in a flexible nature. Although, there are more models of online learning to potentially work with (Harasim 2012), we have selected the approaches (oTPD and TMPL) proposed by Brooks and Gibson (2012) to explore. In Table 1, we compare the characteristics of oTPD and TMPL, with MOOC approaches, which will be discussed shortly.

However, which approach is suitable for delivering PD where participants must acquire new content knowledge, develop pedagogical knowledge and view exemplars linked to curriculum objectives? The approach of the TMPL model may work for promoting teacher professional learning networks and the co-creation of resources: an issue needing to be addressed in F-6 DT education. The model of TMPL acknowledges that teachers are not only drawn by the technological affordances of an online space but that they are participating in teacher communities or within online spaces and social network technologies out of specific curricular needs or collegial support. Essentially, TMPL also supports ‘just-in-time’ learning by seeking support in online professional networks, which can be an advantage for teachers needing support during implementation periods. However, for a new learning area some content will need to be delivered in logical sequences aligned with curriculum learning objectives, which will require the adoption of a more structured pace, but with a flexible and networking aspect to accommodate teacher workload and existing knowledge of the topics.

A key reason that teachers become engaged in online professional learning, across a number of studies reviewed, was due to the strong connections among the curriculum, student learning and teaching approaches (Brooks and Gibson 2012). How can we adopt a balance of these approaches to scale-up teacher PD nationally? One option is to look at massively open online courses (MOOCs) and approaches to delivering courses at such a large scale, to see if we can align the methods to design a course that meets teachers’ needs of connecting the curriculum, student learning and teaching approaches.

**Massively open online courses**

MOOCs offer one means to deliver education at a broad scale to individuals with technological means and Internet access. Although online learning is not new, it has been argued that the difference between online learning and MOOC environments are the (1) combination of teaching approaches course instructors use, (2) massive levels of participation and (3) openness (Glance, Forsey, and Riley 2013). Previously, technology-driven education has seen many names applied to describe this mode of learning, such as distance education and e-learning (Rudestam and Schoenholtz-Read 2010), making existing research about online learning useful for informing potentially best practice in MOOCs. However, consideration towards the factors that differentiate MOOCs needs to be taken into account when selecting tools and approaches. Technologies and approaches selected need to cater for the ‘openness’ and ‘scale’ of the MOOC audience (Glance, Forsey, and Riley 2013).
<table>
<thead>
<tr>
<th></th>
<th>oTPD</th>
<th>xMOOCs</th>
<th>TMPL</th>
<th>cMOOCs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Focus</td>
<td>Online learning, self-directed study, course or module completion. Individualised models and cohort models.</td>
<td>Online learning, self-directed study, course completion. Some courses offer optional levels of engagement.</td>
<td>Blend of online and face-to-face learning. Social media (created and teacher-initiated groups).</td>
<td>Online-networked learning. Registrants create knowledge and engage in online publishing activities and self- or peer assessment, depending on personal learning goals.</td>
</tr>
<tr>
<td>Platform</td>
<td>Learning management system (LMS) as core.</td>
<td>Core platform for content delivery and modules – perhaps through a service provider.</td>
<td>Online learning and face-to-face blended. Teacher-initiated networks and online communities.</td>
<td>Distributed networks. A common platform or content aggregator may be used as a hub.</td>
</tr>
<tr>
<td>Teacher emphasis</td>
<td>Content and delivery. Discussion forums for support.</td>
<td>Content and delivery. Discussion forums for support.</td>
<td>Encouraging networking (face-to-face and online), co-construction of knowledge and community support networks.</td>
<td>Encouraging online networking and professional community formation and co-construction of knowledge.</td>
</tr>
</tbody>
</table>
Typically, two different types of MOOCs have been identified, one being based on existing university courses that embrace the use of videos to deliver content and online assessment (‘xMOOCs’) (Glance, Forsey, and Riley 2013) and the other courses based around online communities and connectivist principles called ‘cMOOCs’ (Siemens 2005, 2012). The characteristics of both formats are described in Table 1. In reference to the two PD approaches previously mentioned, xMOOCs are similar to oTPD and cMOOCs are similar to TMPL. However, there are also a number of ‘hybrid’ MOOC versions surfacing that combine a mixture of xMOOC and cMOOC approaches, blending a structured pace with a focus on participant-led communities, such as EDMOOC by Coursera, and MOOC-EDs introduced by the Friday Institute (Kleinman, Wolf, and Frye 2013).

Enrolment in MOOCs have reported significantly high enrolment rates, with edX and MITx reporting a total of 841,687 registrations from the fall of 2012 to the summer of 2013 across a number of their courses (Ho et al. 2014). In that year, 43,196 participants earned completion certificates. On average, there was a 5.17% completion rate across the courses, with a 9% completion rate for those who went beyond ‘enrolment’ in the course. A typical measure of completion within xMOOCs is the completion rate for those that complete half or more of the course, known as explorers – edX and MITx report a completion rate for explorers of 54%. A supporting component of xMOOCs are the community forums, which have seen engagement anywhere from 6.5 to 25.7% with an average of 7.9%.

In comparison, cMOOC enrolment figures have been found to be ranging from the hundreds to the low-thousands. Researchers of cMOOCs typically report engagement through social media activity, for example, in MobiMOOC, the course generated 1827 discussion threads, 1123 Twitter contributions and 335 links shared on Delicious (de Waard et al. 2011). However, closer analysis reveals that a small core of participants generates activity. For example, in CCK11, 700 individuals enrolled for the course but researchers identified that only 18% (n = 126) of registrants were actively involved in the course (Kop, Fournier, and Mak 2011) and in PLENK10, of the 1616 ‘subscribed’ participants, only 40–60 individuals were identified as contributing actively. Similarly, in the course, First Steps in Teaching and Learning (FSTL12) over 200 individuals signed up for the course (Roberts 2012) but only 60 registrants actively participated throughout the 6 weeks and only 14 undertook assessment and received a certificate.

The literature so far suggests that the majority of registrants are professionals and enrol in the courses for PD, personal interest and to develop knowledge (Belanger 2013; Belanger and Thornton 2013; Breslow et al. 2013; Evans-Cowley 2013; Fini 2009; Miller and Odersky, n.d.). Such findings suggest MOOCs are a potentially appealing option for those interested in undertaking teacher PD; however, are they an effective approach for delivering teacher PD and what constitutes effective design? Taking a leaf from the MOOC approaches and what we know about oTPD and TMPD, we consider the development of an open online course in CS education, aligned with the Australian curriculum learning objectives so that teachers are able to easily put into-action lesson ideas and make connections between CS, content and pedagogy.

While research has begun to pedagogically evaluate MOOCs (Glance, Forsey, and Riley 2013), there is a great deal more required in terms of understanding the online
courses and how learners operate. Participants reportedly struggle with the overwhelming abundance of information and requirement of self-directed learning (Kop 2011; Mackness, Mak, and Williams 2010; Roberts 2012). This brings us to our research question:

How can we design a MOOC, as a large-scale professional development approach to address the challenge and support teachers with the implementation of a new computing curriculum?

In this paper, we describe our design process and rationale, followed by preliminary results relating to participation, engagement and teacher experiences. We conclude the paper with directions for future research and online PD in this field.

Context and design

The context

In Australia, ‘primary school’ includes the first year of school, called Foundation (F) followed by year 1, and so on, until year 6 or 7, (depending on the state) and secondary school (also known as high school) includes years 7 or 8 to year 12. In 2013, there were a total of 9,393 schools in Australia (Australian Bureau of Statistics [ABS], 2013). It is estimated, in 2011, that there were 123, 600 primary teachers in Australia, with around 80% engaged in classroom teaching.

The average age of primary teachers is 42.1 and 44.5 for high school teachers, with leadership roles being held by those around 50 years of age (Cordova, Eaton, and Taylor 2011). In Australia, the teacher workforce is predominately female, particularly in the primary years (81% of primary teachers and 57% of secondary teachers). In Australia, teachers are reportedly spending 46 hours per week on all school related activities and about 8 or 9 days a year towards professional learning (Cordova, Eaton, and Taylor 2011).

In the DT curriculum, students learn CS knowledge and skills, and have opportunities to create digital solutions through designing and visual programming. However, a significant focus is on developing computational thinking, logic and problem-solving capabilities (ACARA 2013). The curriculum focuses on developing knowledge of digital systems, information management and the computational thinking required to create digital solutions. The core is the development of computational thinking skills: problem solving strategies and techniques that assist in the design and use of algorithms and models. The Australian Curriculum describes the nature of learners and curriculum across three broad year-groupings: Foundation to Year 2 (ages 5–7); Years 3 to 6 (ages 8–11); and Years 7 to 10 (ages 12–16). In the senior years (Year 11 and 12), students may select from specialised strands in the DT learning area.
Australian primary school teachers are typically generalist teachers, with 80% reportedly teaching in generalist classrooms (Cordova, Eaton, and Taylor 2011), trained to teach across the various learning areas prescribed by their state or territory. Some teachers may choose to specialise in a particular learning area, such as Physical Education; however this depends on the school. Some schools are fortunate enough to have an ICT teacher but this is not typically the case for all, with only 6% (\( n = 7,500 \)) currently teaching computing (Cordova, Eaton, and Taylor 2011). In Australia, 17% of teachers report having had some post-secondary education in computing, with only 8% having been trained in the practice of computing (Cordova, Eaton, and Taylor 2011).

In identifying a need to resolve the challenges introduced with the introduction of new computing curriculum, the need to provide teachers with appropriate support to ensure DT education is implemented effectively, and not perceived as ‘digital literacy’, we initiated the idea of a PD MOOC to support Australian teachers. The team working on the project involved three individuals from the CS education research group at The University of Adelaide. Team members on the MOOC development team included two CS education lecturers with significant experience in introductory programming, problem-based learning and CS education pedagogy. The third team member was a research associate with experience in CS education research and qualifications in education and primary school teaching.

**Design approach**

The development of the MOOC involved content development and the more technical development of the course website through course builder. Although Google Course Builder is a free platform, technical development (in the form of coding) was required to initially construct the course using the web guides, as well as support and maintenance, which could be done by one of the CS lecturers.

Unlike previous MOOCs, where the content may have already been available from existing university courses or through aggregating web information, F-6 CS education lacks resources and content and so the majority of effort involved developing web content, 5-minute (average) concept videos and worked examples that linked to the Australian curriculum learning objectives. The development of content was achieved through brainstorming sessions between the team, drawing on their various expertise, experience and knowledge. We drew on and adapted existing lesson ideas from existing organisations and initiatives such as CS Unplugged and Code.org, and drew on lesson ideas and approaches from education texts in other learning areas, such as Mathematics, Science and Literacy. We worked closely with curriculum developers and curriculum elaborations to align content and lesson ideas to the Australian DT learning objectives. As previously mentioned, forethought is essential in online learning as lessons cannot easily be adapted (Beetham and Sharpe 2007). To develop a MOOC that aligned with teacher needs we collaborated with a range of experts in education to gather feedback on lesson ideas and content. Figure 1 presents the out MOOC development process. We began the development of the MOOC in November 2013, with a launch date in mid-March 2014.

There were initial outlay costs associated with acquiring equipment to produce the course videos, such as lighting, software (Camtasia), a green-screen, a computer, microphone and video camera. As we were also based in a tertiary institution, we were
required to purchase resources, such as blocks, craft materials, robots, and tablet applications, that could be used to showcase lesson exemplars. We also purchased education textbooks about teaching other learning areas so that we could make cross-comparisons and develop teaching and learning approaches for this new F-6 learning area.

**Review of existing empirical literature**

To determine what empirical pedagogical literature was available for CS education, we began by undertaking a semi-systematic review of research papers about CS education, implemented for children between the ages of 5 and 18, using Simon’s system (2007) to determine (1) the subject matter taught; (2) the age group studied; and (3) data collection methods. Our review identified F-6 as significantly lacking empirical research and resources and, where research was undertaken, it was to measure student interest in CS as a career rather than the explicit measurement of learning and teaching developments (Falkner, Vivian, and Falkner 2014). Our findings suggest these are the year levels that urgently require teacher support and the development of learning and teaching resources and so to begin to address this national challenge, our course focuses on these year levels, F-6, by delivering CS content, aligned with the learning objectives.

Learning from our review of online PD and MOOC pedagogy, we designed an approach that combined both oTPD/xMOOCs and TMPL/cMOOCs. In doing so, we are able to not only deliver discipline content knowledge in CS combined with learning objectives and classroom activities but also create an environment where teachers can share knowledge and collaborate, as well as seek and provide ad-hoc advice. Adapting these approaches and using a MOOC allows for teachers to engage in professional learning, where they are part of a larger community, and are undertaking a series of modules that are relevant to their practice and are on-going (rather than a one-off event).

Figure 1. The MOOC development process.

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<table>
<thead>
<tr>
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</thead>
<tbody>
<tr>
<td>Review empirical studies and F-12 CS Education resources</td>
<td>Collate activity ideas and develop content to align with the learning objectives</td>
<td>Deploy the course modules.</td>
</tr>
<tr>
<td>Review MOOC designs and literature.</td>
<td>Record videos and write web content. Send content and activity ideas to teachers for feedback.</td>
<td>Monitor and gather social media activity, Course Builder Analytics, YouTube data, survey and reflections.</td>
</tr>
<tr>
<td>Approach teachers, computing experts, industry, organisations and research groups (local and international) for feedback and support in development.</td>
<td>Refine and adapt based on feedback. Develop the course and align teacher MOOC tasks.</td>
<td>Respond to teacher feedback. In-course.</td>
</tr>
<tr>
<td>Apply for ethics approval to conduct MOOC research.</td>
<td>Create course platform in course builder (technical) and social media spaces.</td>
<td>Review and re-design for a 2nd version.</td>
</tr>
</tbody>
</table>

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Citation: Research in Learning Technology 2014, 22: 24691 - http://dx.doi.org/10.3402/rlt.v22.24691
**Course structure & topics**

One of the challenges we identified was that, as a new learning area, the content would be unfamiliar and potentially overwhelming for many teachers. Therefore, the course was designed around a series of topics that align with the Australian curriculum, delivered in a logical order, suitable for someone learning CS for the first time.

Our goal in the first unit was to provide an introduction that showcases the application and creation of DT to solve real problems, with an equal representation of males, females and youth as creators to dispel misperceptions that CS careers typically involve ‘programming’, are for ‘males’ or ‘nerds’. Further, we wanted to establish different terminology for DT (e.g. computing and CS) and distinguish between using ICT, digital literacy and creating and solving problems with digital technologies (the latter being the goal of the curriculum). In unit 2, the more familiar topics of patterns (creating and continuing sequences and recognition) and data representation (collecting and representing data in different ways, with and without technology) were introduced because of the potential links to what teachers are already doing in Mathematics and Science. In subsequent units, we moved towards the use and application of data by computers and digital data as well as the introduction of more abstract concepts, such as algorithms.

For each unit, we introduced the topic (e.g. ‘digital systems’) and the Australian learning objectives relating to the topic. Each unit was broken into sub-topics and for each sub-topic a concept video was created (or an existing suitable video used) in which the concept was explained and supported with analogies and real-world examples. For each unit, two full lesson exemplars about the sub-topics and a web resource with various lesson activity ideas were included. Links were made to the Australian curriculum ‘expected outcomes’ for children and assessment strategies were suggested. The goal was to provide core content knowledge and lesson idea inspiration so that teachers could feel comfortable creating and thinking of their own lessons to meet the learning objectives. The sequence of units for the DT course is outlined in Figure 2.

<table>
<thead>
<tr>
<th>Unit 1: Introduction</th>
<th>Unit 2: Data (Patterns &amp; Play)</th>
<th>Unit 3: Data (Representation)</th>
<th>Unit 4: Digital Systems</th>
<th>Unit 5: Information Systems</th>
<th>Unit 6: Algorithms &amp; Programming</th>
<th>Unit 7: Visual Programming</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>CORE</strong></td>
<td>All lessons</td>
<td>Data Encoding and Different Representations Digital Data: Images, Sounds and Text Example Activity 1</td>
<td>Hardware and Software Computer Networks</td>
<td>Services Social Protocols</td>
<td>All lessons</td>
<td>What are visual programming environments Algorithm Design in Visual Programming Example Activity 1</td>
</tr>
<tr>
<td><strong>NON-CORE</strong></td>
<td>Counting in Binary Example Activity 2 Activity Ideas 1 &amp; 2</td>
<td>Input and Output Example Activities</td>
<td>Searching Encryption Example Activities</td>
<td>How to use Scratch Programming using a visual Programming Environment Example Activity 2 Activity Ideas 1 &amp; 2</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Figure 2. Unit topics and core and non-core components of the course.
We introduced algorithms and visual programming last, with the deliberate goal to demonstrate that CS is more than just programming and that the learning area can include ‘plugged’ and ‘unplugged’ activities. Further, we wanted to explicitly demonstrate the importance of teaching concepts and computational thinking and to have teachers establish a sound understanding of the concepts, prior to visual programming.

Teachers were provided with a list of ‘core components’ and optional components (identified in Figure 2), with the ability to select their own learning path, depending on their previous experience and interests. Teachers were encouraged to complete as many units as they wished, however were prescribed a ‘minimum’ for completion, which involved fully completing the core components as well as the tasks for the three following units: ‘The Introduction’, ‘Data – Patterns and Play’ and ‘Algorithms and Programming’. In addition, teachers were asked to complete an additional unit of their choice, including both core and non-core components.

**Technology**

We have adopted a series of online course ‘spaces’ and technologies that support particular aspects of the course. In Table 2, we describe the two main course spaces, the supporting online spaces that provided participants with additional resources and finally, our additional course spaces along with their features and intended purpose.

**Assessment**

Two assessment tasks were included: one as a peer assessment task based on the creation of a teaching resource and the last as a lesson plan portfolio. For each unit, teachers were asked to post a task on the Google + community page for the course. These tasks were designed to be informal and promote the exchange of tools, resources and lesson ideas. In all cases, teachers were provided with three options so that we could have a variation of content being shared. For example, ‘Find and share a useful data source that teachers could use as a resource for classroom activities. Please share with the community, along with your ideas on how this data source could be used in the classroom’. The final task involved a ‘lesson plan portfolio’. Teachers were asked to create two detailed lesson plans or briefly described sequence of activities about any of the topics covered in the course. Participants were to share this to the Google Community page and peer-review two others’ portfolios with a post ‘comment’.

In terms of PD accreditation, each state and territory differs; however, teachers are able to secure recognition for PD hours if they demonstrate committed hours towards activities. Therefore, we created an optional completion document, whereby participants could formally submit their unit tasks and associated content to receive a certificate, linked to the Australian professional standards for teachers (Australian Institute for Teaching and School Leadership [AITSL] 2014).

The course was self-paced, allowing for teacher flexibility and the completion of modules in any order, at any pace. Unlike previous MOOCs, our concern was not ‘enrolment’ and ‘completion’ statistics. We were satisfied if teachers were enrolling to access and use the resources and content without formal completing tasks. We initially released the first three units, weekly from the 22 March 2014, and then
Table 2. The course ‘spaces’ and technology: rationale and purpose.

<table>
<thead>
<tr>
<th>Technology</th>
<th>Features</th>
<th>Purpose/rationale</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Main course ‘spaces’</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Google Course Builder Platform</td>
<td>Course modules; Forum; Announcements (also emailed); Information About the Course; Additional resources; Details about Q&amp;A Hangout Sessions.</td>
<td>This is the key platform for content, course information and task specifications. The core platform has an announcements page and a forum space for course questions.</td>
</tr>
<tr>
<td>Google+ Community</td>
<td>The community page was organised into ‘topics’, where participants post their Task or assignment activity for each unit. An additional topic was created to share additional resources and events.</td>
<td>This space allowed participants to network, share ideas and activities and to collectively build an online series of resources corresponding to topic areas. It allowed for community feedback and ‘ad-hoc’ learning.</td>
</tr>
<tr>
<td><strong>Supporting online space for additional resources</strong></td>
<td></td>
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</tr>
<tr>
<td>Pinterest</td>
<td>‘Boards’ with pinned content sorted into topic areas that aligned with the Course Units.</td>
<td>Pinterest is popular among teachers for sharing and ‘bookmarking’ teaching ideas and resources. Even without an account participants can view content. Participants could locate additional resources, lesson ideas &amp; tools for F-10 DT Education. Content shared by participants also pinned to relevant board. Uploading content videos to YouTube allowed for us to access viewer analytics and maintain these for public access – an outreach initiative to promote and support CS Education.</td>
</tr>
<tr>
<td>YouTube</td>
<td>‘Concept videos’ about F-6 DT content and lesson ideas created and embedded into Course Builder module lessons.</td>
<td>Uploading content videos to YouTube allowed for us to access viewer analytics and maintain these for public access – an outreach initiative to promote and support CS Education.</td>
</tr>
<tr>
<td>Google+ On Air Hangouts</td>
<td>Google On Air Hangouts were scheduled weekly for the first several weeks. They were automatically recorded and uploaded to YouTube for later-viewing. Q&amp;A question poll was on for viewer questions.</td>
<td>These hangouts allowed for instructors to build a connection with participants watching, discuss common course questions, respond to questions posted and showcase guest speakers working in areas of F-12 CS Education and outreach.</td>
</tr>
<tr>
<td><strong>Additional course spaces</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Twitter</td>
<td>To share research and news about F-12 CS Education.</td>
<td>To maintain wide user-engagement and promote the course &amp; CS Education.</td>
</tr>
<tr>
<td>Google+ Page</td>
<td>To share research and news about F-12 CS Education.</td>
<td>To maintain wide user-engagement and promote the course &amp; CS Education.</td>
</tr>
</tbody>
</table>
released all subsequent modules at once, allowing educators to work at their own pace, through the units, up and until the 30 June 2014.

**Data collection and analysis**

We were able to obtain data about participant demographics, participation and experiences through various avenues, such as through YouTube analytics, Course Builder learner analytics, Google+ Community page and voluntary surveys. During the course, participants were informed through course information that their data may be collected and analysed for research purposes and to improve future courses. Data collection and analysis were approved by the University of Adelaide Human Research Ethics Committee.

**Course results**

Overall, we had 1378 people enrol in the course, via the course website, and 473 participants continued to connect to the Google+ Community page. Although not core requirements of the course, engagement with Twitter and Pinterest was reasonable; however, the majority of the engagement occurred with the course and in the Google+ community space (Table 3).

**Demographics**

In unit 2, participants were provided with a voluntary anonymous survey, requesting their location as part of an exemplar activity to be presented back to participants. Although the participation rate is low (n = 174), we can see that the majority of participants appear to be from South Australia, Queensland, New South Wales and Victoria. Advertising and visits generally covered these areas, suggesting that for future courses, more targeted advertisements and connections need to be made to Western Australia, Northern Territory and Tasmania (Table 4).

Unsurprisingly, with the majority of teachers being female in Australia (81%) and the average age of teachers being between 40 and 50, the majority of the cohort were female and between the age bracket of 45–64 (see Figure 3).

This is quite a different audience to the often ‘young professional male’ enrolling in edX and MITx courses. However, this demonstrates that we were able to target our intended audience and attract a female demographic that is significantly lacking in post-secondary courses and careers (Koppi et al. 2013).

<table>
<thead>
<tr>
<th>Site</th>
<th>Enrolled/subscribed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Google Course Builder</td>
<td>1378</td>
</tr>
<tr>
<td>Google+ Community Page</td>
<td>473</td>
</tr>
<tr>
<td>Twitter</td>
<td>294</td>
</tr>
<tr>
<td>Pinterest (10 boards, 637 pins)</td>
<td>336</td>
</tr>
</tbody>
</table>
Participation and engagement

Of the 1378 enrolled in the course, 99 participants completed the course and 438 did not engage in the course any further than enrolling. As a result, we have a 7.2% completion rate, or 10.5% completion rate for those who went ahead and began the course. When considering completion rates, and measures of MOOC engagement, we consider engagement across all course components, and within core components specifically. Our completion rate overall was 7.2%, with a further 5.73% of participants exploring half or more of the course (without completion) and 56.39% of the participants completing less than half of the course. In terms of core components only, 8.13% of the participants explored half or more of the core components (without completion) and 52.3% of the cohort (group of MOOC participants) explored less than 50% of the core components. Our completion rate for explorers was 55.7%, and 46.9% when considering core components only.

Overall, across the course platform and the Google+ community, the completion rates were mostly in-line with what one would expect to see in MOOCs in terms of enrolment and completion. However, 34.3% of the cohort (n = 473) viewed and/or engaged with the online community – a significant increase in engagement over typical MOOCs. The completion rate relative to those that engaged with the community is 20.9%. A key motivating factor for this engagement was tying the course tasks in with the use of the Google+ community – a strategy that resulted in the co-creation of F-6 DT resources and lesson plans. Many of the teachers highly valued the resources being shared, the sense of community and the content that they

Table 4. Number of participants by location (according to voluntary survey, n = 174).

<table>
<thead>
<tr>
<th>Location</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Queensland</td>
<td>46</td>
</tr>
<tr>
<td>New South Wales</td>
<td>33</td>
</tr>
<tr>
<td>Victoria</td>
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<tr>
<td>South Australia</td>
<td>31</td>
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<tr>
<td>Australian Capital Territory</td>
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</tr>
<tr>
<td>Western Australia</td>
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<td>Northern Territory</td>
<td>2</td>
</tr>
<tr>
<td>International</td>
<td>4</td>
</tr>
<tr>
<td>Grand Total</td>
<td>174</td>
</tr>
</tbody>
</table>

Figure 3. Gender and age bracket of cohort (via YouTube analytics – based on 4,565 views from 19 March to 29 June 2014, across 26 videos).
created together. One pre-service participant even expressed that ‘although I have finished this course, I keep coming back to make use of all the resources this community has to offer and to make further comments’.

In accordance with the participation and engagement described previously, we had a high number of viewers watching videos during the first unit \((n = 462)\), slowly decreasing during each module (to 66 in unit 7). According to the YouTube analytics, the average video length created by the Computer Science Education Research group, was 5.8 minutes – ranging from around 1 minute to 11 minutes. This timeframe is typical of the ‘Khan Academy’ and xMOOC style video length and as the results suggest are the desired length as the average length watched was 4.37 minutes. The results suggest that small concept videos work; however, designers need to consider presenting important information at the beginning.

**Experience**

We invited course participants to respond to an online survey and to provide a reflection about their course experience after they had completed the final module of the course. We received 50 responses, which we acknowledge are biased towards participants who completed the final module. We were interested to know if the course had had any impact on their perception of CS and careers in CS, to which 26 of the 50 said that the course influenced their perceptions a great deal as they were not previously aware of career opportunities and 16 said they learnt more than what they had previously known.

The challenging topics reported by participants were around binary mathematics, with two teachers mentioning that the topic was challenging. One of the teachers said they felt they ‘still don’t really get it . . . [because] mathematical logic is not my forte’. While a number of participants reported the later topics being more challenging – from Unit 4 onwards – they thought they were ‘more interesting, provoking’ or ‘challenging but not difficult’. It appeared that demystifying some of the concepts and breaking down the language into examples and definitions assisted teachers in learning the content. One respondent, more comfortable in the topics, reported that: ‘Nearly all the modules were new in name but as I started to go through the MOOC I realised there was so much that I already did and understood’. For those who were new to the content, many had commented on the language and that the process of learning what concepts meant made implementing the learning area a lot less scary and ‘foreign’. For example, one respondent commented: ‘the language was the most challenging part [but once] you saw what ‘visual programming’ or ‘algorithms and programming’ encompassed it took the anxiety out of the topic’. Drawing on these comments suggest that making concept videos supported with everyday examples and exemplar activities can potentially assist teachers in understanding new discipline content.

**Discussion**

We have received generally positive comments from participants, via the questionnaire or informally via email. Teachers have expressed gratitude for the opportunity to participate in the course. One comment that stresses this appreciation was from a remote participant who expressed ‘Thank you for providing this course and also making it freely available. Living in country areas it is not always easy or affordable
to go to PD sessions. It has allowed me to network with other teachers who share the same interest and gather valuable resources’. However, in our current analysis we are lacking the perspective of teachers who have not completed the course and their experience. Understanding the motivations and experience of those who did not complete the last module may provide insight into how we can improve the MOOC and meet various needs and expectations.

The participation and engagement rates in this MOOC have been successful, in terms of the level of participation MOOCs generally receive. Particularly, the use of the Google+ community to share and build a repository of online resources, the short concept videos, the flexible learning pathways, the blend of content and exemplars as well as breaking down discipline language and concepts into relatable items, have proven to be positive design features of the course. A key to delivering content for a new learning area to educators appears to be finding the right balance of ‘challenge’ for teachers. New content and activities need to provide educators new to the discipline area with the fundamental knowledge but also opportunities for educators who are more comfortable with the learning area to extend themselves and act as mentors for others.

We have also learnt about areas for improving our course, namely, providing clear videos and instructions for participants who are not overly familiar with the technology and platform being used; reducing some of the compulsory workload for the courses or condensing the content in general. A concern expressed by a digital learning leader who was participating in the course was that they were lacking in confidence to develop and publicly share lesson plans in the community – something that they commented we often willingly assume teachers will do openly. This poses an interesting challenge: do we offer alternative tasks that are private, and if so, what trade-off would this have on the development of resources and community activity? In this case, we foresaw the need to develop F-6 resources urgently, with all participants benefiting from one another’s resources.

While Google+ community appeared vibrant, we are unsure as to the extent that the community helped facilitate offline connections. Future work will investigate how to better facilitate these connections in subsequent courses through the use of technology and/or course design as well as the extent that the teachers continue to use the community for support.

Conclusion

We have trialled a MOOC approach to deliver PD to Australian teachers to support them with the implementation of a new computing curriculum. The process and course design described in this paper were intended to make a strong connection between the DT curriculum, CS content and teaching approaches (Brooks and Gibson 2012), as well as support ad-hoc interactions, resource development and flexible learning. We adopted a TMPL and hybrid-MOOC approach, with a core course platform that contained unit topics supported with content and videos, but also the integration of Google+ Community as a secondary course space. The community will remain open, providing an opportunity for continued use and for future cohorts moving through subsequent versions of this course to integrate with the existing community.

This MOOC paper should provide a framework and ideas for others encountering new curriculum implementation. The partnerships developed through this MOOC
have been valuable and the process of developing this course has cemented the importance of interdisciplinary and cross-institutional relationships to address the challenge of supporting teachers to implement new computing curriculum in terms of the development of professional learning courses, appropriate resources and for increasing awareness among the education community. International relationships are equally important as implementation of computing curriculum is a global challenge and sharing best practice and strategies will play a vital role in developing effective pedagogy, professional learning and resources so that the introduction of computing education can have the desired effect on student learning and engagement in CS career pathways.

Acknowledgements
We thank Google for supporting the development of this teacher professional development MOOC as well as the journal reviewers for their valuable feedback.

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The academic journey of university students on Facebook: an analysis of informal academic-related activity over a semester

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This paper reports on an observation of 70 university students’ use of their personal social network site (SNS), Facebook, over a 22-week university study period. The study sought to determine the extent that university students use their personal SNSs to support learning by exploring frequencies of academic-related content and topics being discussed. The findings reported in the paper reveal that students used their personal SNSs to discuss academic-related topics, particularly to share experiences about doing work or procrastinating, course content and grades. Mapping academic-related activity frequencies over the 22 weeks illustrated that around certain points in the academic calendar, particularly times when students’ assignments or exams were nearing, academic activity increased, suggesting that SNSs may play an important role in a students’ academic experience.

The findings suggest that many students today may be leaving traces of their academic journey online and that academics should be aware that these interactions may also exist in their own students’ online social spaces. This study offers opportunities for future research, particularly research which seeks to determine differences between individuals’ academic activity, the extent that intensive SNSs use supports or distracts students from learning, as well as the extent to which universities should or can harness SNSs to improve the student experience.

Keywords: informal learning; social networking; Facebook; university students; social network sites

Introduction

Social network sites (SNSs) have increasingly become an important part of students’ everyday lives, however, to what extent are they playing a role in the academic lives of university students? University students are frequent users of social media; yet, limited research has applied in-depth investigations into the extent that students are embracing certain social media for informal learning. Understanding how students are using SNSs outside of the conventional classroom context to support learning may provide guidance about how social media could be integrated into the formal university context.

This study was part of a PhD project, whereby the researcher adopted a mixed-method approach, inclusive of a survey, Facebook observation and a focus group...
to understand how students were using their personal SNSs to support their learning experience at university. This paper reports on the aspect of this PhD study pertaining to the Facebook observation by reporting on the frequencies of students’ academic activity and the topics students discuss. The goal is to explore the extent that students are using their social network space for academic purposes.

**Review of related literature**

Prior to discussing the methodology and results, this section presents the literature about university students’ use of SNSs, with a particular focus on Facebook.

**University students’ use of SNSs**

Research demonstrates that students are using their personal SNSs to support their learning (Corrin, Bennett, and Lockyer 2010; Corrin, Lockyer, and Bennett 2010; Jones et al. 2010; Lampe et al. 2011; Madge et al. 2009; Mazman and Usluel 2010; McEwan 2011; Selwyn 2009). Facebook use is global, and informal use of Facebook to support learning has been demonstrated by the literature thus far across a number of contexts. In the United States, a survey of 283 college students revealed they were primarily using their SNSs for informal learning purposes, which involved student to student interactions about non-required course content (Towner and Muñoz 2011). In one UK study (Jones et al. 2010), researchers found that 30.4% of university students reported using SNSs for course-related conversations, and in another 46% (22% monthly) of students reported using their SNS daily or weekly to informally discuss academic coursework (Madge et al. 2009). Although, small in sample size ($n = 42$), a case study of UK students reported that if they had a single choice, they would prefer to use email for communication between teachers and peers, but most students were active Facebook users (79%) and were still open to the idea of using Facebook for academic communication (45%; Reed 2013). In Australia (Corrin, Bennett, and Lockyer 2010, p. 393; Corrin, Lockyer, and Bennett 2010, p. 648), about 60% of first-year university students reported using SNSs for academic purposes. Both UK and Australian studies were conducted in 2008, warranting further studies into academic use of Facebook, to determine if academic usage has changed since. Further, both studies adopted surveys and, therefore, the language and survey questions as well as the perception by students as what constitutes ‘informal learning’ or ‘academic activity’ may differ. It may be that students do not always recognise or recall academic activities on their sites.

Student use of SNSs for academic practices includes using the site to organise group meetings; revision; coursework enquiries; social support about academic matters; venting about coursework and tutors (Madge et al. 2009; Selwyn 2009). Within SNSs, students have been found to create groups and discussion spaces accessible through their personal accounts (Bateman and Willems 2012). Additionally, members in the SNS were engaging in the practice of ‘peer tutoring’ whereby students assisted one another through the learning process and provided help where necessary (Bateman and Willems 2012, p. 60). In a similar method to this study, Selwyn identified five themes that emerged from observation of education-related interaction on UK university students’ Facebook profiles. These academic-related interactions included the following themes: ‘(1) recounting and reflecting on the
university experience; (2) exchange of practical information; (3) exchange of academic information; (4) displays of supplication and/or disengagement; and (5) “ban-
ter” (Selwyn 2009, p. 161).

However, what relationship does social Facebook use have with academic-related use? An examination of a popular German SNS, StudiVZ, revealed those who are more frequently using the SNS, in general, also had a higher interest in the use of the site for study-related exchanges (Wodzicki, Schwämmlein, and Moskaliuk 2012). This was also the case where Lampe et al. (2011) discovered that the intensity of students’ personal Facebook activity correlated significantly with their reported Facebook use for academic purposes, suggesting that as students use the SNSs more frequently in their lives for social purposes, so too are they likely to engage in academic-related use of their sites. UK researchers surveying first-year British students found that students generally report an increase in academic activity towards the end of the semester (Madge et al. 2009) and that, interestingly, as Facebook use became more embedded into their everyday university life and students were organising group work and activities, they tended to report increased use. The researchers noticed that student use of the site had developed from using it as an SNS to also using the site as an ‘informational educational’ network.

**Impact on academic performance and experience**

Some studies have expressed concerns that SNSs can be potentially detrimental to study habits (Junco 2012; Kirschner and Karpinski 2010) because Facebook use was found to correlate with lower Grade Point Average (GPA) results (Junco 2012) and because some students have expressed that Facebook can be distracting to their studies (Kirschner and Karpinski 2010; Yu et al. 2010b). However, this has been challenged by other studies that have found students’ online social networking practices were not significantly related to GPA scores (Yu et al. 2010b) nor to have any generalisable impact on grades, even over a 2-year period (Pasek, More, and Hargittai 2009).

Although there may be cause for concern, SNSs do provide students with an alternative means to seek academic support from peers and develop university relationships (McEwan 2011). Studies have supported claims that the use of SNSs can have positive impact on a student’s social university experience and psychological well-being (Ellison, Steinfield, and Lampe 2006, 2007; Greenhow and Burton 2011; Manago, Taylor, and Greenfield 2012; Stutzman 2011; Yu et al. 2010a, 2010b). Specifically, one study of 187 students from Hong Kong, Mainland China and the US revealed engagement with SNSs was linked to higher self-esteem, satisfaction with university life and performance proficiency (Yu et al. 2010a, p. 1499). Further, Stutzman, Capra, and Thompson (2011) investigated students’ network behaviour as they transitioned into a US college and discovered that SNSs were a valuable technology that supported transition into college: socially and academically. Examination of students’ structural networks during transition demonstrated that supportive and social-informational uses of SNSs in transition exert a direct and mediated positive effect on overall adaptation. Moreover, interviews with 15 freshmen (first-year university students) revealed that SNSs were useful to the students in pre-transition preparation, for social adaptation, and for academic support throughout the transition.
Although the literature reveals thus far that university students are adopting SNSs to support informal learning and that there are a number of benefits to the university experience in doing so, a number of these studies have investigated students’ use of SNSs via self-reporting surveys and although these are valuable, self-reporting is not always reliable (Muijs 2011). Further there are issues with what students perceive as ‘informal’ or ‘non-formal’ learning activities to involve. Academic learning can take place across a range of contexts and, therefore, academic boundaries are often ambiguous (Kaplan 2008). The boundaries between formal and informal learning are not mutually exclusive (Anderson, Lucas, and Ginns 2003; Colley, Hodkinson, and Malcolm 2002; Trinder et al. 2008), are often blurred and cannot easily be separated (Trinder et al. 2008). This makes it difficult not only for students to possibly imagine and articulate their learning activities but also for researchers to identify and classify ‘academic activities’.

This study expands on the approach adopted by Selwyn (2009) by observing actual Facebook activity of students at a fine-grained level: coding each post and each piece of activity on their walls as either academic or social, and categorising them by topic over a semester. Furthermore, this study takes an ethnographic approach, where the researcher has technically become a node in the students’ online social network web, therefore being able to observe the interactions taking place as a network ‘friend’ without the need to interfere.

Although there are numerous social media sites available, Facebook is a significantly popular site. Students, from developed countries, are reportedly using the site up to several times a day (Bicen and Cavus 2011; Corrin, Bennett, and Lockyer 2010; Ellison, Steinfield, and Lampe 2007; Jones et al. 2010; Junco 2011; Manago, Taylor, and Greenfield 2012; Mazman and Usluel 2010; Miller, Parsons, and Lifer 2010; Pempek, Yermolayeva, and Calvert 2009; Shambare 2012; Steinfield, Ellison, and Lampe 2008; Yu et al. 2010a). In a pre-survey associated with this study, the participants reported that Facebook was the most used and preferred SNS by students at the university (Vivian and Barnes 2010). As a result, this study chose to follow students’ Facebook use, and the results reported in this study are acknowledged as being specific to the Facebook context and the context of the University of South Australia. However, other similar universities and researchers in this field will find these results of value.

Method
The entire PhD project involved a mixed-method study including an online survey of 812 students at the University of South Australia, observation of students’ Facebook activity and an online focus group. The observation involved the collection and analysis of 70 university students’ personal Facebook site activity over a period of 22 weeks. Lastly, the study included a focus group, hosted within a Facebook ‘group’, which involved 15 students sharing their perceptions and experiences with using SNSs to support learning. The results reported in this paper are derived from the observation of students’ Facebook activity.

The observation of Facebook activity involved the adoption of a virtual ethnographic approach. An ethnographic approach involves ‘recording the life of a particular group and thus entails sustained participation and observation in their milieu, community or social world’ (Charmaz 2006, p. 21), and in this context, the community was online. The role of the researcher in this study was that of
participant-observer. The researcher needed to become involved in the context setting as this allows for optimal views of the participants in question (Creswell 2008). Although Creswell (2008) discusses the role of the participant-observer in terms of physical settings, the same can be applied to a virtual environment. The researcher in this study immersed herself into the participants’ personal SNS and took on the role as an inside observer (Creswell 2008). The researcher took notes, recorded participant activity and was able to interact with participants, when the participants initiated the interaction with the researcher. Some examples being, when a participant would message the researcher to let them know about a student Facebook group that they were part of or if the participant shared an article or link about Facebook use on the researcher’s site. The researcher did not initiate any interactions with participants directly or with participant Facebook activity, unless it was to advertise a conference paper or presentation, to thank participants or to invite participants to the focus group. These activities would always be posted on the researcher’s profile page as a general announcement rather than directly to individuals.

**Ethics approval**

For each stage of this study, considerations were made about how to protect the rights of the participants involved in regard to ‘human dignity, autonomy, protection, safety, [and the] maximization of benefits and minimization of harms’ (Markham, Buchanan, and AOIR Ethics Working Committee 2012, p. 4). This is especially important in Internet research because, as outlined in the AOIR Ethics Working Committee recommendations, human subjects, private/public, and data/persons are some of the three most discussed issues. Careful considerations were made in each stage to ensure issues such as these were carefully addressed. Ethical issues were carefully outlined, and submission was made to the University of South Australia Human Research Ethics Committee and approval was granted prior to commencement.

**Context and sample**

The researcher investigated university students at the University of South Australia and their use of SNSs and so non-probability purposive sampling was used to recruit participants. Purposive sampling is gathered with a purpose in mind, but without randomness (Creswell 2008; Vogt 2007). The approach involved volunteer sampling, whereby the researcher advertised and promoted the research to potential participants and those who were willing to volunteer constituted the sample (Muijs 2011). The study also involved convenience sampling, which is where the researcher selects participants because they are willing to be studied and are available (Creswell 2008).

The first stage of this PhD study involved a survey, which was advertised via the University of South Australia student portal and by an emailed university careers newsletter. At the end of the survey, students were asked to tick a box and enter their email address if they were interested in participating in the second stage of the project, whereby a researcher would observe education-related use of their SNS activity. Information letters, consent letters and a link requesting the researcher as a Facebook ‘friend’ were sent to the email address of those who volunteered. Students
were asked to state in the ‘friend request’ that they consent to the research and provide details about their year of enrolment and program of study.

Of the 812 survey participants, just over 100 students volunteered. Due to time limitations and the magnitude of data in Facebook activity, only those who had completed the online survey were included in the SNS observation, resulting in a total of 70 students. Within the sample, 75.7% were female, 24.3% were male and a majority of participants (88.6%) were reportedly local students (11.4% international). Some 85.7% students were studying full-time (14.3% part-time) and 78.6% studied internally, yet 60% had some form of employment. The sample comprised 37.1% of students studying in the division of education, arts and social sciences, 38.6% studying within health sciences, 12.9% from IT and engineering and 11.4% from business.

**Data collection and analysis**

The SNS observation commenced 2 weeks prior to Study Period 5, which ran from 12 July 2010 until 12 December 2010 (see Appendix A). This period was selected for observation because it covered the university study period, as well as 2 weeks prior and 2 weeks after.

NVivo 9 was used to organise and analyse the Facebook data. Each student was created as a ‘case’ in NVivo, and his or her Facebook activity for each week (for the 22 weeks) was copied and pasted into a document, which was imported to NVivo and linked to the particular participant. Folders were created for each week of the study period so that the researcher could track activity over time. Each student’s activity was coded according to:

1. **Type of Facebook activity:** (a) status updates; (b) posts to the individual’s wall; (c) shared content to the individuals’ wall or shared publicly by the individual; and (d) other instances of activity recorded, for example, that the individual commented, wrote or shared content on another’s wall.
2. The activity was also coded as ‘academic’, ‘social’ or both ‘social and academic’ in nature.
3. Activity that was ‘academic’ or ‘social and academic’ was also coded according to the topic, for example, if it was about ‘exams’ or ‘assignment deadlines’.

NVivo frequency counts for the occurrence of the aforementioned data were exported to an Excel spreadsheet and then SPSS for statistical analysis. Additionally, data about academic-related activity were explored further in NVivo. Combining both quantitative and qualitative data strengthened the study; the findings are reported in the following section.

**Results**

This section reports the findings from the study in three sections: the overall frequency of students’ Facebook activity, the representation of frequency of Facebook use over a university study period and, lastly, the types of academic topics discussed by students on their Facebook pages over the university study period.
Frequency of Facebook activity

Observation of 70 students’ SNS activity revealed that overall, 97.1% \((n = 68)\) of students had some type of public academic-related activity on their SNS profile (Figure 1). This activity was initiated either by the user’s published content or text, or by content or text published by a network friend. Only 2.9% \((n = 2)\) of students did not have any academic-related content. However, students who had no academic activity on their Facebook profiles may have been using private applications with their network to discuss academic matters.

Whether the activity was initiated by content posted on the user’s wall (a post by a network friend) or whether that academic activity was initiated by content published by the user (via a status update) was found to be very similar. An example of an academic status update with thread comments is presented in Figure 2.

To provide an overall context of the types of activity present on student walls, the total weekly mean of activity results for each type are presented in Table 1. To clarify, a ‘post’ (or ‘posted academic activity’) is content posted by a user’s network friend.

Figure 1. Percentage of students who had academic-related activity present on their social network site.

**Figure 2.** Example of an ‘academic’ status update with thread comments.
onto the user’s Facebook profile and a ‘status update’ (or ‘user academic activity’) is activity or content posted by a user on his or her own wall for others to see in their newsfeed. On inspection of the table, it appears that a large proportion of student Facebook profile pages consist of status updates (5,176 in total). Content posted (3,000 in total) by network friends and content shared (2,003 in total) by the user also contributed a large portion of wall activity. Results published about the pre-survey associated with this study (Vivian and Barnes 2010) showed that the two applications with the highest agreement of usefulness for academic purposes were private embedded-applications (private messages and instant chat). However, the three embedded-applications with the next highest levels of observed activity were status updates, commenting and posting (Table 1). This is interesting as it highlights that although this study is observing public embedded-applications, students are likely to be using private embedded-applications for academic-related exchanges that this study could not observe.

Further, activity was broken down into ‘types’: whether it was academic, social or both. Table 2 presents the overall coding summary of the posts, user shares, shares by friends, and status updates for the conversation types.

Inspection of the Table 2 reveals that, although the majority of Facebook activity was social in nature, students are also using their personal SNS to discuss academic-related matters. Conversations solely academic in nature were more frequently occurring on status updates \( (n=975; 18.8\%) \), whereas, when academic activity were also social in their nature, they were more likely to occur on postings \( (n=206; 6.9\%) \).

Between individual students, the frequency of status updates and posts varied, with some students having no activity at all, to others publishing status updates (academic or social) on a weekly or daily basis. The comments on status updates and posts varied, from no response to several comments. Some threads contained ‘conversations’ between the user and their network friends, whereas other threads were more of a ‘broadcast’ or announcement to their network, which received little or

<table>
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<th>Table 1. Weekly mean of student activity types.</th>
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<td>Status</td>
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<td>Commented</td>
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<td>Posts</td>
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<td>Tagged in a photo</td>
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<td>Posted a link to another wall</td>
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<td>Friend shared</td>
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<th>Table 2. Descriptives for type of activity by type of conversation.</th>
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<td>Status</td>
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<td>Friend shared</td>
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no activity. The researcher observed one exceptional case, which involved students communicating about an assignment via a status update, with a result of 300 comments in the one single thread. These findings confirm that academic discussions are, to some extent, entering students’ social spaces and that students are using their SNSs to discuss topics related to their experience as a university student. However, there are opportunities for future research to explore differences between students and the response and reactions students receive to certain academic activity.

**Facebook use over time**

It is evident that students are using their personal SNS to discuss academic-related content. However, do students’ use of Facebook for social and academic purposes change over the university semester?

Figure 3 presents a comparison between the weekly mean of social and academic activity for status updates and posts over the study period in a line graph. The results illustrate that student activity in Facebook – both academic and social – fluctuates over the 22 weeks. The charts show the superposition of variations in student academic activity over an almost constant background. A regression fit shows the constant background for status updates at 0.66 per week (status updates = 0.664 + \( \text{week} \times 0.006 \), \( t(70) = 4.978, p < 0.001 \)) and for posts at 0.34 per week (posts = 0.339 + \( \text{week} \times 0.001 \), \( t(70) = 5.822, p < 0.001 \)). These compare with social statuses that had a constant underlying mean of 2.748; social posts had a constant underlying mean of 1.555. The weekly mean was averaged between the 70 students, with some students having no activity at all and others having more activity. Although the frequencies are low, what is interesting to note is that there appears to be a pattern in usage over the 22 weeks. However, further research is required to explore individuals and their academic activity over the course of a semester and how and why some students are using the site more or less than others and how they are managing their use.

![Figure 3. Comparison of academic and social activity over the university study period (semester) according to weekly mean for all students.](image-url)
The graph demonstrates the intimate connection of Facebook activity to the academic life of students. Many of the rises and falls in academic activity correspond to key points in the student’s academic calendar. Generally, academic activity on Facebook starts low prior to the commencement of the study period, rises during the study period, drops in the semester break, and rises again near the end of the study period when assignments are falling due. Status updates are at their highest in week 14 (on average, 1.2 times per week) and week 15 (on average, 1.2 times per week). This time of the study period is the examination period for many students (see Appendix A), or a time when final assessments are due. It may be that students are using their status update to talk about their experiences with studying for, and doing exams and assignments. At certain points throughout the study period, as academic conversation increased, social activity decreased and vice versa, suggesting that academic activity take precedence in students online social spaces. For example, social activity appears to decrease from week 14 to 15, and academic activity appears to increase from around week 13 to 15.

This activity is the same for postings by the user’s friends. Most academic postings occurred in week 15 (on average, 0.8 times per week). These weeks are both before the university break and the end of the university semester, a time that is usually more intense for final assessments. Academic status updates are at their lowest (on average 0.2 times per week), the first week after the study period concludes. This is also a similar trend for academic postings. In all weeks, the sharing of academic-related content via the share application was relatively low.

As the study period concludes, academic-related activity is reduced, suggesting that other social topics take prominence. Interestingly, there is a slight increase in the weekly mean frequency after the study period concludes from post 1 to post 2. Post 2 begins on the week starting of December 6th. Student results are officially released on the first Saturday of December (being the first in 2010). Therefore, it is possible that a slight increase in academic activity is due to students conversing about their results. Similarly, ‘Prior 1’, in the graph, shows that the mean of academic frequency was slightly higher than the following week. The dates in Prior 1 coincide with the release of results for the previous study period. Whatever its detailed interpretation, Facebook activity of an academic nature reflects formal academic life.

These findings are consistent with the findings from a survey of first-year British students in which researchers identified that students generally report an increase in academic activity towards the end of the semester (Madge et al. 2009). This was certainly the case for the tracking of activity over the 22 weeks; however, although the weekly mean of activity increased prior to the end of the semester, it also increased and decreased at points throughout the university study period. These results suggest that there are changes in the mean frequency of academic and social activity over the university study period. Academic activity increased and decreased significantly at certain points in the university study period, and these changes coincided with events on the academic calendar. Although it is possible that these changes are occurring due to specific events on the academic calendar, the frequencies do not reveal why these changes occur. Content analysis of students’ academic activity may confirm if these weekly mean changes in academic activity are reflecting key events in the academic calendar. Further examination of particular cohorts within university programs may reveal more insight as to when student activity increases and decreases in relation to key course assessment.
Exploring academic-related topics within Facebook

Content analysis was applied to students’ status updates and posts on Facebook to determine what topics students were discussing across the university semester (non-academic activity were not categorised). Within SNSs, students alternated between many different topics, and at times one status update or post may cover several different topics. SNSs are complex spaces, and one limitation is that it is difficult to code data into categories because of the reliance on researcher interpretations of decodifying data. When categorising the data, codes were made to the most prominent category of the conversation. At times, there were too many different categories in a single conversation, and hence a small number of statuses or posts were omitted from being categorised. These instances accounted for less than 2% of total posts and statuses, thus unlikely to make a substantial difference to the total figures.

Table 3 presents the total frequency of topics, broken down across the university study period (weeks are grouped for ease of viewing). A matrix table was created in NVivo, producing a table presenting the frequency of topics discussed by students on their Facebook wall. In the table, the two most frequent topics for each banding are represented in bold and a number of topics where notable changes have occurred have been represented in italic.

The results from categorisation of students’ Facebook activity in this study also identified a series of conversation categories similar to research findings by Selwyn (2009), as many of these topics also relate to one’s life as a student. In Table 3, what we see is that, before the study period begins, students are discussing grades from the previous study period. Then, during the first 4 weeks, there is an increase in topics relating to doing work, procrastinating and levels of motivation. Students continue to share their experiences of doing work and course content throughout the study period.
period time, with a slight decrease in the mid-semester break. The topics identified in this table illuminate and support the fluctuations in students’ academic SNS activity and highlight academic topics that may be of concern and importance to students and their experience. Seldom are students discussing topics such as careers; however, topics like ‘placements’ and ‘careers’ may very well depend on the stage of their academic program (degree) and the type of program they are enrolled in, warranting further research into types of topics discussed according to programs and year level.

Discussion

The results in this paper indicate that some students are leaving traces of their academic journey in online environments and that educators and institutions should be aware that students in their own contexts may be using SNSs for academic-related purposes. A limitation of the study is that only a small sample of students was observed and that the study included existing Facebook users without including students who were not Facebook users. Therefore, the results reported in this paper are only indicative of the students in the sample and those using Facebook. Further, the results presented are for all 70 students in the sample, without taking into account individual use of Facebook and differences between students. There are opportunities to compare individuals, contexts, users’ and non-users’ experiences and preferences as well as student use across a range of different programs. Further, this study investigated students’ use of SNSs; however, there are many technologies and software available, and exploring how SNS use fits within students’ use of other technologies for informal learning may expand our understanding of how students are supporting their university experience and communicating with peers.

The increase in academic-related activity around exam and major assessment periods suggests that students are potentially seeking help or wanting to share their academic experience and could benefit from having opportunities to connect with peers in online spaces during these times. This paper reveals that topics such as ‘course content’ and ‘talking about doing work’ and ‘grades’ are prominent; however, more detailed analysis of these interactions, coupled with invitations for students to reflect on their use, may reveal how they are using their SNS during particular points in the academic semester and how they perceive their use of SNSs to impact on their learning experience. Moreover, some courses adopt student forums where students can seek and provide support about course-related issues, however, how do conversations and topics in formal course spaces compare with informal spaces? Do formal course forums also have increased usage during exam and assessment periods and what topics are they discussing? Some universities have created institutional profiles to engage with the wider public, and a similar analysis approach to this study with student interactions with public institutional SNS profiles and formal course forums may reveal what types of interactions are occurring, the topics being discussed and how personal SNS academic-related use differs. Such analysis may help to identify if interactions intensify at particular points throughout the semester and the types of support individuals are seeking.

The integration of SNSs into learning management systems may provide another ‘informal’ space where students can socialise, maintain peer relationships and seek and provide ad-hoc support, which could be particularly helpful to off-campus students or for students that undergo course placement. However, authors, like Reed (2013), suggest that forcing SNS use on students may not be appropriate and a
number of concerns arise regarding student privacy, student–academic relationships, student preferences and consideration towards students who are not using SNSs. While it may be possible for lecturers to find ways to include SNSs without needing to be connected to students, such as by creating Facebook ‘groups’ or encouraging students to create their own groups, is it the role of universities to initiate informal student spaces or should students be left to initiate their own learning in social spaces, if they require it? Regardless, the issues surrounding privacy, student-to-teacher relationships and the use of SNSs for formal learning need to be explored further and that clear guidelines around appropriate institution use and practice need to be developed.

Another aspect for research development in this area relates to the collection and analysis of social media data. The processes used to collect students’ SNS data in this PhD project was time consuming and therefore restricted to one university in South Australia and with 70 students. There would be significant value in educational researchers to work with computer scientists to develop algorithms and programs for automated data mining and analysis of students’ SNS activity, particularly targeted at academic activity. With an increasing interest in learning analytics among educational researchers, finding ways to efficiently and effectively mine and monitor student behaviour and data in social spaces with minimal effort and interference may provide great insight into their learning experiences and learning processes.

**Conclusion**

This paper demonstrates that, within this particular sample, academic Facebook activity and the frequency of particular academic-related topics fluctuate at certain points in the academic semester. As technology is increasingly ubiquitous, it appears that some students may be leaving traces of their university experience in their personal online spaces and that these traces may provide valuable insight into understanding students’ learning processes, their experiences and interactions in social spaces.

Technologies, and particularly SNSs, receive a negative portrayal in the media for being disruptive to learning, which brings us to ask whether students’ use increases in frequency because students are procrastinating during study or whether students increase use of SNSs during these periods to support learning. The findings from this study call for a need to further investigate how students use SNSs, particularly around critical points in the academic study period, and how SNS practices fit in relation to other communication methods and the student experience.

**Acknowledgements**

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**References**


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Appendix

Appendix A: University of South Australia academic calendar for study period (semester) 5, 2010.

<table>
<thead>
<tr>
<th>Holidays</th>
<th>Prior 1</th>
<th>Prior 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>12-Jul-10</td>
<td>Mid-break</td>
<td></td>
</tr>
<tr>
<td>19-Jul-10</td>
<td>Mid-break</td>
<td></td>
</tr>
<tr>
<td>26-Jul-10</td>
<td>Week 1</td>
<td></td>
</tr>
<tr>
<td>02-Aug-10</td>
<td>Week 2</td>
<td></td>
</tr>
<tr>
<td>09-Aug-10</td>
<td>Week 3</td>
<td></td>
</tr>
<tr>
<td>16-Aug-10</td>
<td>Week 4</td>
<td></td>
</tr>
<tr>
<td>23-Aug-10</td>
<td>Week 5</td>
<td></td>
</tr>
<tr>
<td>30-Aug-10</td>
<td>Week 6</td>
<td></td>
</tr>
<tr>
<td>06-Sep-10</td>
<td>Week 7</td>
<td></td>
</tr>
<tr>
<td>13-Sep-10</td>
<td>Week 8</td>
<td></td>
</tr>
<tr>
<td>20-Sep-10</td>
<td>Mid-break</td>
<td>Break 1</td>
</tr>
<tr>
<td>27-Sep-10</td>
<td>Mid-break</td>
<td>Break 2</td>
</tr>
<tr>
<td>04-Oct-10</td>
<td>Week 9</td>
<td></td>
</tr>
<tr>
<td>11-Oct-10</td>
<td>Week 10</td>
<td></td>
</tr>
<tr>
<td>18-Oct-10</td>
<td>Week 11</td>
<td></td>
</tr>
<tr>
<td>25-Oct-10</td>
<td>Week 12</td>
<td></td>
</tr>
<tr>
<td>01-Nov-10</td>
<td>Week 13</td>
<td></td>
</tr>
<tr>
<td>08-Nov-10</td>
<td>SWOT-VAC</td>
<td>Week 14</td>
</tr>
<tr>
<td>15-Nov-10</td>
<td>Exams</td>
<td>Week 15</td>
</tr>
<tr>
<td>22-Nov-10</td>
<td>Exams</td>
<td>Week 16</td>
</tr>
<tr>
<td>29-Nov-10</td>
<td>Holidays</td>
<td>Post 1</td>
</tr>
<tr>
<td>06-Dec-10</td>
<td>Holidays</td>
<td>Post 2</td>
</tr>
</tbody>
</table>

Core teaching and assessment period 26 July 2010 to 26 November 2010.
SWOT-VAC = Study Without Teaching Vacation (Australia).
Dark gray/shading = teaching period; light gray/shading = breaks.