

Ethical and Professional Issues: Transcending the Obstacles to Student Engagement

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Abstract

It is vitally important that today's technology-related degree programs provide undergraduate students with the skills needed to appreciate and assess the often complex multidimensional ways in which digital systems may impact on the individual, society, and the environment. Work undertaken by the authors in significantly enhancing the teaching of Ethical and Professional Issues is outlined from the perspective of the practitioner. Particular attention is paid to curriculum development (in which a strong people-centric, research-infused approach is adopted), and to the integration of technologies into key aspects of the teaching process. These developments are considered in the context of enhanced student engagement and in terms of fostering an ethos in which students are encouraged to establish a personal ethical position in relation to the application and deployment of digital systems.

1.0 Introduction

The pace at which interconnected digital systems are profoundly impacting on practically every area of human activity continues to increase and it is impossible to envisage with any certitude the detailed relationship that will evolve in the coming decades between people, technologies, and the environment.

In terms of the technologies themselves, it is evident that the future will be shaped by the use of increasingly powerful ubiquitous systems, the harvesting and accessibility of practically unlimited amounts of data, the use of extensive automated data mining techniques, and by digital systems which will have the superficial capability to mimic

various human attributes. We can also anticipate the introduction of significant and highly innovative disruptive technologies. In parallel the resources (as measured in materials and energy) consumed during the manufacture of ever increasing numbers of digital systems and over the entire lifecycle of these products will continue to have an increasing environmental impact.

Undoubtedly such developments will provide people with a rich spectrum of beneficial opportunities, but will also challenge traditionally held values and have the potential to further empower non-benign agencies.

These and many other significant matters will form a backdrop to the careers of many of today's undergraduate students, and it is particularly important that those studying technology-centric disciplines are provided with the knowledge, skills and understanding that are needed to better appreciate ethical consequences which may be associated with the future development and deployment of digital systems. In the case of computer science (CS) and IT-related disciplines, however, the majority of the standard undergraduate curriculum is devoted to the delivery of courses which, of necessity, essentially focus on concepts, current technologies, tools and techniques. Time constraints often severely restrict the attention that such courses can direct towards providing students with a broader transdisciplinary insight into the ramifications of technologies.

Fortunately, many CS and IT degree programs include a course (typically delivered to first year students) that encompasses coverage of ethical and professional issues. In practice, however, teaching in this area is often primarily driven by the requirements of accreditation bodies, and such courses may not be perceived (either by staff or students) as forming a crucial and integrated part of the overall degree program. A US survey [1] across ABET accredited baccalaureate CS programs indicated that of 50 respondents only ~55% were offering a core course delivered by CS staff in the area of ethical and professional issues. Of the remainder, ~30% endeavoured to distribute content across other courses, and the balance required students to take a course offered by non-CS departments (typically Philosophy) in the area.

This paper adopts a practitioner's approach to outlining aspects of work undertaken in restructuring, developing, and re-positioning a core first year course entitled 'Computing Technology in Society', which is delivered to CS and IT students. Specifically, we discuss the development of course content (including the adoption of a transdisciplinary research-infused curriculum), the integration of technologies into content delivery (including the use of off-campus content recordings and Mediasite), and the use of traditional and online techniques for enhanced student engagement and participation. In this latter respect, a formal environment is provided through Blackboard (the virtual learning environment (VLE) supported by the institution), and a class community is established using Google+. This supports a social learning space

and so is able, in principle, to offer greater user-friendliness and in addition to support flexible communication and collaborative engagements through memberships of multiple groups [2]. However, we acknowledge that the relationship between the use of emerging technologies and their impact on learning/teaching practices is non-trivial and not to be taken for granted [3].

Initially, students are introduced to both the traditional VLE DB and Google+ approaches and are encouraged to experiment with them. The students are then free to use either platform for online communication and discussion. Both Skype and the Google 'Hangout' facility are used to support interactive video communications. Additional changes include the incorporation of a major group project activity, and the modification of the overall assessment structure. These developments have enabled a previously marginalized course to evolve into one that is central to the first year undergraduate experience, and which not only supports students in better understanding the complex issues relating to the ethical and professional application of digital systems, but which also provides additional skills that are directly relevant to their subsequent studies.

2.0 Curriculum Development

On the basis of experience gained during the last ten years in preparing and delivering courses in the area of ethical and professional issues at three institutions (located in the UK, US and NZ), it is evident that many students embarking on CS and IT-related degree programs have little, if any, knowledge of the key milestones in the evolution of digital technologies, nor of the fundamental ways in which the 'digital revolution' has impacted on the individual, society, and the environment. Clearly an historical appreciation can be crucial when placing current and future developments in context and in addressing the types of ethical and professional issues that are frequently encountered in the public and private sectors. Historical context is therefore considered as a crucial part of the curriculum. Additionally, in order to provide students with a broad insight into the multidimensional relationships that exist between people, technology, and the environment, content is presented within the context of an overarching transdisciplinary framework.

Key themes incorporated into the course are summarised in Figure 1 and exemplar specific areas of coverage are indicated in Figure 2. There is no 'required' course textbook and in addition to notes provided, students are encouraged to study content drawn from several books [4-6] and from carefully selected articles /research papers. Formal discussion on 'ethics' (including aspects such as Kantianism, Consequentialism, etc) is most obviously positioned at the beginning of the course. Experience indicates, however, that many students are not engaged by this content, particularly when it is presented at an early stage. Consequently an alternative strategy has been developed in which ethical and professional concepts are allowed to naturally

crystallize and emerge as the course develops. This has been found to be a much more satisfactory approach when underpinned by the use of case studies in which students engage with a broad spectrum of 'ethical dilemmas'.

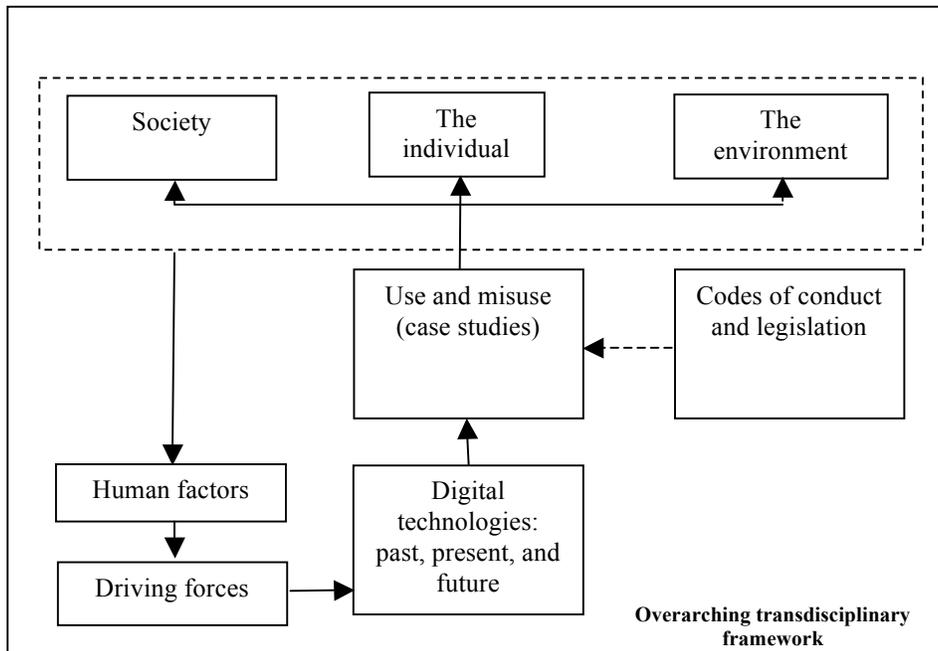


Figure 1: Summarising key themes that form the basis for recent iterations of the course.

2.1 Early Digital Technologies and the Holocaust

Students are presented with a range of case studies which provide historical and cutting-edge coverage. In terms of the former, particular emphasis is placed on early digital technologies which were used both directly and indirectly to facilitate the Holocaust. This discussion is multidimensional, and experience to date has shown that coverage of this area has a strong impact in catalyzing student understanding of many important current issues. Exemplar themes are summarised in Figure 3. These are used to highlight issues such as the use and misuse of personal information, support for centralized administration, and management in which technologies offer to divorce people from the ramifications of their actions, depersonalization through codes and numeric identifiers, and the general concept of instrumental rationalization (of which the Holocaust is perhaps the ultimate example). Experience in incorporating this content indicates that students are readily able to conceptualize and understand not only

the rudimentary methods used to encode data onto punched cards, but also the operating principles of the digital machines and the opportunities that arose when individual machines were eventually able to process ~250,000 cards in each 24 hour period. This focus enables students to rapidly appreciate ways that personal information may be used and misused, and the profound effects that even rudimentary technologies (when judged by today's standards) had on the individual.

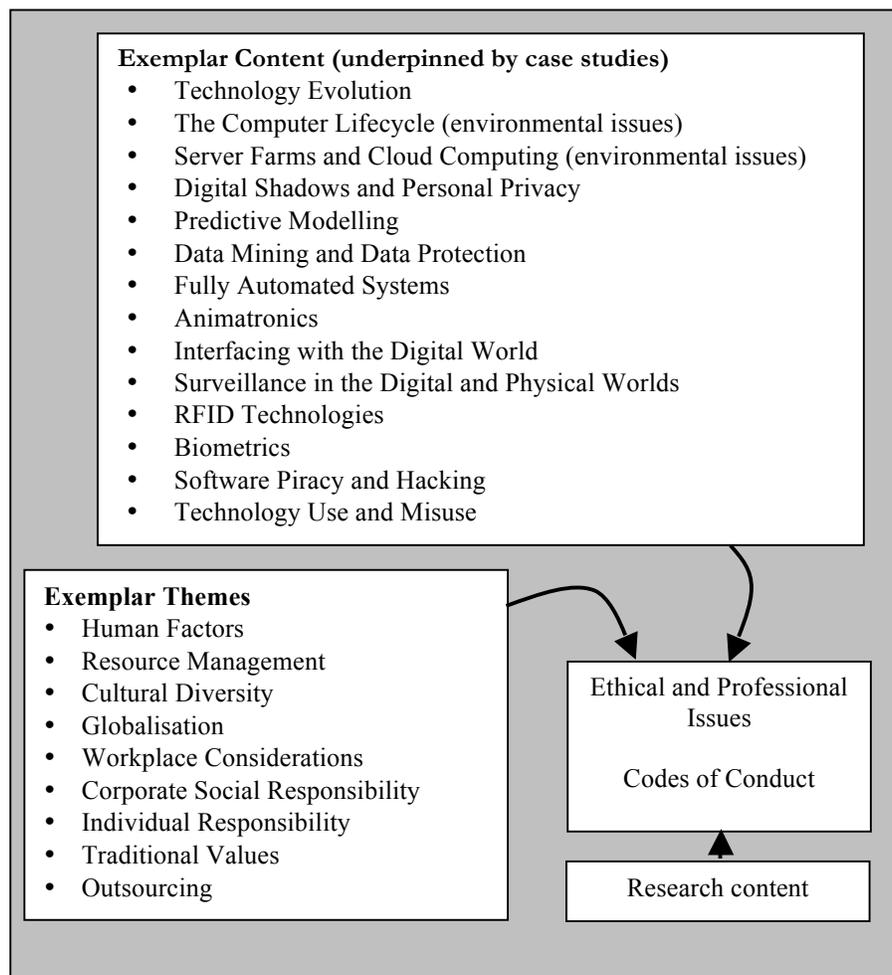


Figure 2: Exemplar course content and general themes.

Responses to surveys completed by students at the commencement of the two most recent iterations of the CTIS course indicated that out of a total of 240 respondents, ~30% had no prior knowledge whatsoever of the Holocaust, and that a further ~35% had only a very cursory insight into this event. However, it is evident that providing students with a people-centric overview of human aspects of the Holocaust (linked to specific examples of people involved (both victims and perpetrators)), together with an understanding of the technologies used, has a most positive impact on student engagement and increases willingness to generally participate in valuable interactive discussion. Further, this case study provides a natural basis for discussion of the use of digital systems in support of more recent genocide in countries such as Rwanda.

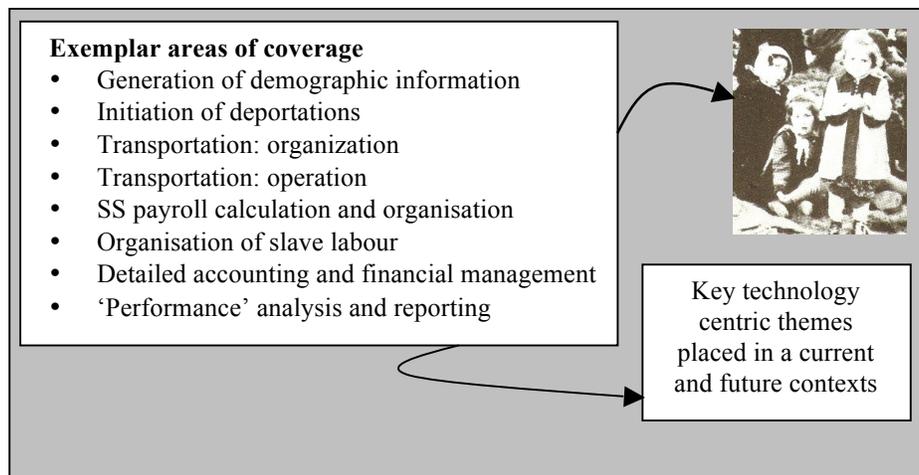


Figure 3: A pivotal case study concerning the use of early digital technologies to facilitate aspects of the Holocaust within the context of an extreme example of instrumental rationalization. Aspects of this pan-European tragedy are emphasized by reference to individual people involved. Students are encouraged to consider key implications within current and future contexts.

3.0 Content Delivery

In order to enhance the delivery of lecture content and provide students with additional transferable skills, three key developments have been implemented. These relate to the extensive use of Mediasite, the formal pre-recording of key content at relevant off-campus locations, and the regular creation of informal short but highly focused videos for student download. Each of these is outlined below:

1. Mediasite: This now plays a pivotal role in the deliver of lecture content and supports the streaming of lectures to a satellite campus where two teaching assistants are present (their responsibilities include setting up and managing communications, handling student questions/interaction and supporting student integration in the overall classroom community). All lectures are recorded and uploaded to the Blackboard VLE thereby providing students with the opportunity of asynchronously replaying content at their own convenience.

Key advantages associated with the use of Mediasite relate to audio and video quality, transmission reliability, and the ability to seamlessly integrate (for example) recorded material and slides. Since Mediasite is primarily intended for streaming applications it only supports unidirectional communication and so an additional Skype link (established with iPads) is used to enable remotely located students to interact directly with the lecturer. Mediasite introduces a 20-30 second latency into the streaming process. This is of little consequence when communication is unidirectional, but can be significant when considered in the context of streamed lectures in which an uplink from a satellite campus is supported using products such as Skype.

Enabling the asynchronous replay of lecture content particularly caters for students for whom English is not a first language or who must (often by force of circumstances) fit their studies around numerous other commitments. By monitoring student attendance at lectures (which are available for replay), and tutorials (which are not available for replay), across two iterations of the course, it appears that the opportunity to replay lectures has had minimal impact on student attendance. Additionally, by making this content available via the VLE it is possible to monitor the extent to which each recording is accessed, and results suggest that many students who have attended a lecture also make use of the opportunity to view its replay.

2. Pre-Recording of Key Content: In order to enhance the educational experience, encourage content retention, and promote student engagement, key content is pre-recorded at appropriate off-campus locations. Central to this approach is the aim of increasing the value of each learning activity by making it more memorable [7]. Thus, for example, content dealing with ethical and professional issues arising from the current processing of e-waste was made at a regional e-waste recycling facility, and content concerning the use of digital technologies to facilitate the Holocaust was made at the National Holocaust Memorial Museum. Subsequent Mediasite recording of the actual lectures enables the on-location segments to be accompanied by relevant PowerPoint slides etc, thereby ensuring full content integration.

3. Informal Focused Recordings: Regular use is made of focused recordings (less than 4 minutes in duration). These are typically used to introduce aspects of the course, reinforce key content, and address FAQ's. The use of iPad and iPhone technologies greatly facilitates this process and so makes it easier to provide fast responses to

student queries. Student feedback indicates that this approach is perceived to be a valued teaching and communication modality.

The successful implementation of the three approaches outlined above places demands on the lecturer. In particular, the presence of the video camera within the lecture/tutorial environment may initially be perceived as invasive and off-putting. Furthermore, when content streaming is used, it is vital to work with the technology to ensure that the remotely located students do not feel isolated, and that they are truly integrated within the overall classroom environment. Initially this requires conscious effort.

4.0 Student Engagement and Participation

The effective teaching of ethical and professional issues is underpinned by discussion-centric content delivery. However, in large classes many students are often reluctant to participate in interactive discussion. Furthermore, experience to date in delivering first year courses in this area at three institutions has highlighted the difficulties of rapidly engaging all students in productive interactive online interaction via a VLE's discussion board (DB).

During the previous iteration of the course, a trial was conducted in which students were simultaneously offered two online discussion scenarios. In each case, students were actively encouraged to participate in both student and lecturer initiated discussion. One scenario involved the use of the standard Blackboard DB, and the other the use of a class community established via Google+. Supporting the latter initially involved a significant investment of time – particularly in ensuring that each student had a gmail account, in recording their gmail addresses, and in inviting each student into the appropriate 'circles'. These were created at two levels. Firstly, all students were invited into a 'class circle' (used to support overarching class discussion), and secondly a circle was formed for each project group. Students were introduced to both forums and encouraged to engage with the Google community via mobile devices and to make use of features such as 'push notification'. This ensures that a student receives notification on their mobile device whenever there is an activity such as the posting of a message or the sharing of a resource.

Over the duration of the course, the Google+ class forum attracted significantly more student postings than the traditional VLE's DB – although it is recognized that the volume of postings does not in itself necessarily correlate to the quality of the learning experience [8]. Contrariwise, postings made via the traditional DB tended to be more significant when viewed from a content perspective. Overall the willingness of students to actively engage with the Google-based community facilitated student group activity and may have been a key factor in the successful outcome of all group project work.

5.0 Assessment Structure and Group Project Activity

During their first year, many students are faced with a significant number of assignments and this can lead to an undue focus on submission deadlines and a decline in a student's interest in the overall learning experience. In re-designing the CTIS curriculum it was decided to remove all summative assignments and revert to a simple assessment structure – specifically a group project (50%) and a final exam (50%) – with a requirement that in order to pass the course at least 35% of the available marks must be obtained in each component. This approach is augmented by regular interaction in physical tutorials and via the VLE DB and Google+ environments. Additionally, students are supplied with formative assignments and are expected to study and discuss carefully selected research papers relating to core content and case studies.

Students are encouraged to establish their own project groups (typically comprising 4-6 members) – with assistance being provided when needed. Each group elects a project group coordinator who facilitates activities and communications. A choice of four projects is offered, and student-initiated projects are also welcomed. From the outset, each group is expected to make regular use of their Google+ project circle for communications, project management, and collaboration.

It is recognised that issues with group dynamics are often central to difficulties experienced by students, especially when first undertaking group project work. Consequently, both the lecturer and teaching assistants overview project circles and monitor progress. Support/intervention is offered when necessary. Inbuilt flexibility in the marking structure ensures that not all students within a group are automatically awarded the same grade – a point that is emphasised to students. Experience to date demonstrates that less motivated students often respond positively to the project subject areas and to peer pressure (which emphasises the professional responsibilities of the student toward the project group as a whole). Originally, project grading was carried out on the basis of a formal report and presentation. This has been superseded by poster and video presentations (each video is ~5 minutes in duration and is uploaded to YouTube).

6.0 Student Feedback

The redevelopment of the course curriculum, coupled with the infusion of technologies into all aspects of course delivery has generally been welcomed by students, and has had a positive impact on student engagement. This is reflected in student feedback (formal and informal) and in the end of course results. Indicative response summaries to a survey carried out towards the end of the previous iteration of the course (54 respondents) are summarised below:

1. Pre-Recorded Lecture Content: Overall this approach received a positive reaction with 81% of responding students indicating that the technique helped in their learning of the course content. In addition, students responded positively to the impact of the recordings on increasing relevance, facilitation of understanding, and general stimulation.

2. Use of the VLE DB and the Google+ Class Community: In response to a question in which students were asked to identify the platform which had best facilitated their discussion of course content and deepened understanding/knowledge of the discipline, responding students expressed preference for the Google approach. Some 65% of the students indicated their use of mobile devices for accessing this platform and 68% of respondents agreed/strongly agreed as to its usefulness in managing, communicating, and collaborating with group members. In relation to the use of 'push notifications', 46% of respondents indicated their use of this facility.

3. Transferable Skills: Some 82% of responding students indicated a belief that the course had provided confidence, knowledge, and digital skills that would be of value in their future studies.

7.0 Discussion

Student feedback to date confirms that some students do indeed '...see a disconnect between [technology related] tools they use to learn and the tools they use and operate in modern life' [9]. However, the author's experience in delivering courses across all levels of tertiary education (from first year to postgraduate) indicates that the majority of students are initially doubtful about the merits of technology infusion, and participate with a degree of reluctance. Furthermore, when students have the opportunity to use either a traditional VLE (Blackboard) or the Google+ community, essentially the same level of effort and encouragement is required to catalyse their regular active participation.

A student's perception of the value of the online component of a course increases when clearly identified advantages are encountered. In this respect, experience to date coupled with student feedback indicates that support for rapid communications can be a key ingredient. For example, in the case of the CTIS course, students are not only encouraged to raise questions via the traditional VLE and Google+ communities, but are also able to contact the lecturer using, for example, Skype, direct email, and mobile phone. This further supports the 'rapid response' approach to student queries and provides a clear-cut and welcomed example of an important benefit that can be derived through the adoption of technologies. Subsequently, the use of online tools to support project group communications further highlights tangible benefits associated with flexible learning. Such relatively simple but clearly identifiable benefits can directly catalyse student engagement and result in the formation of a dynamic online

community. Thus in the previous iteration of the CTIS course 77% of respondents to the survey cited above indicated that they would like to see approaches introduced in the CTIS course adopted in other courses.

Feedback relating to the use of the Google+ community has been most positive and its ability to support various communication modalities across a range of platforms is most advantageous. Contrariwise, in the case of larger classes, ensuring that all students have recorded gmail addresses, together with the need to invite each student into the class circle, is time-consuming. However, towards the end of the previous iteration of the CTIS course, a number of students requested that the Google+ community be preserved so that it could continue to be used by the class in their subsequent core courses (on a self-managed basis). The use of the community across multiple courses better justifies the time directed towards its establishment, and perhaps reflects a first step in transitioning towards a ‘seamless learning’ approach [10].

It is evident that the infusion of useful technologies into the teaching of ethical and professional issues can greatly enhance the delivery of discussion-centric content, student engagement, and interaction. In addition, it provides first year students with important technology-centric skills, confidence, and experience. When subsequent courses also embrace useful technologies this is of great value, although it can result in dissatisfaction when students are faced with courses that may pay only lip service to the infusion of technology.

Acknowledgements

The authors would like to express their gratitude to staff at the Centre for Learning and Teaching at AUT. Particular thanks go to Stanley Frielick and Vickel Narayan, together with members of the technical support staff.

8.0 References

- 1 Quinn M J (2006). On teaching computer ethics within a Computer Science department, *Sci. and Eng. Ethics* 12, 335-343.
- 2 Rambe P (2012). Activity theory and technology mediated interaction: cognitive scaffolding using question-based consultation on Facebook, *Australasian J. of Edu. Tech.* 28, 1333-1361.
- 3 Ng’ambi D & Bozalek V (2013). Editorial: Emerging technologies and changing learning/teaching practices, *Br. J. Educ. Technol.* 44, 531-535.
- 4 Duquenoy P, Jones S & Blundell B G, *Ethical, legal and professional issues in computing*. Middlesex University Press 2008, ISBN 978-1-84480-749-9.
- 5 Reynolds G W, *Ethics in information technology (4e)*. Course Technology Cengage Learning 2012, ISBN 978-1-111-53412-7.
- 6 Fleddermann C B, *Engineering ethics (4e)*. Pearson Education Inc 2012, ISBN 978-0-13-214521-3.

- 7 Veletsianos G (2011). Designing opportunities for transformation with emerging technologies, *Edu. Tech.* 52, 41-46.
- 8 Vonderwell S (2003). An examination of asynchronous communication experiences and perspectives of students in an online course: a case study, *Internet and Higher Education* 6, 77-90.
- 9 Herrington J & Parker J (2013). Emerging technologies as cognitive tools for authentic learning, *Br. J. Educ. Technol.* 44, 607-615.
- 10 Sharples M, McAndrew P, Weller M, Ferguson R, FitzGerald E, Hirst T, Mor Y, Gaved M, and Whitelock D, *Innovating Pedagogy 2012: Exploring new forms of teaching, learning and assessment, to guide educators and policy makers*, Open University 2012. Retrieved 31st July, 2013, from Open University: http://www.open.ac.uk/personalpages/mike.sharples/Reports/Innovating_Pedagogy_report_July_2012.pdf