# ALT-C 2012

## A confrontation with reality

## Conference Proceedings

*Research in Learning Technology*
Supplement: ALT-C 2012 Conference Proceedings

# EDITORIAL

## Editorial for proceedings papers

Here are the Proceedings Papers of the 2012 ALT Conference "A confrontation with reality'', held in Manchester, England. Each paper reports on a piece of research, possibly in its early stages, states a point of view or summarises an area of work, perhaps giving new insights. This supplement contains 18 papers, an increase over previous years.

The conference has five themes which are:

- **Problem solving** – finding effective solutions to technical problems and using learning technology to solve institutional problems.
- **Openness and sharing** – methods and frameworks for collaboration and sharing of knowledge and resources between practitioners and between providers, and the evidence to justify this.
- **Entrepreneurialism** – moving resources from where they have low yield for learning and for learners to where their yield is higher.
- **Mainstreaming** – applying learning technology on a large scale in pioneering ways that enthuse learners and are welcomed by teachers and administrators.
- **Sustainability** – of technologies, models and approaches.

*Problem solving* is the bread and butter of learning technology practitioners. Two papers look at new solutions to familiar pedagogic problems. Essa and Ayad (2012) discuss how to use predictive and statistical techniques to identify those students most at risk of not completing a learning programme – in a way that also helps to identify an appropriate intervention to address the learners' difficulties. Taylor (2012) looks at the problem of using video effectively in a physiotherapy context to support learners on placements, rather than relying on occasional face to face visits.

The other three papers on problem solving are more focussed on the actual techniques being used. Mor and Craft (2012) report on a workshop looking at all aspects of the evolving use of learning design – from tools through methods and frameworks. Alsubait, Parsia and Sattler (2012) propose an ontological approach to automatic generation of analogy questions in multiple choice format. Flavin (2012) discusses, in part through survey results, the increasing role of disruptive technologies – those that were not designed for education but have become widely adopted by learners.

The largest number of proceedings papers is in the area of *openness and sharing*. This area often coincides with the need to confront reality in terms of the limited resources available. McGuigan and Golden (2012) report on the introduction of a standardised online tutoring system for learners gaining a Teaching Qualification in Further Education: the system provides generic email, blog and micro-blog facilities and allows support to be roster-based. Cochrane (2012) reflects on three

ISBN 978-91-977071-4-5 (print), 978-91-977071-5-2 (online)


http://dx.doi.org/10.3402/rlt.v20i0.19205

failed m-learning projects, identifying critical failure factors by comparing them with a larger number of successful ones. A significant cause of failure is not updating pedagogy to match the introduced technology.

Two further papers on openness and sharing have a discipline base. Reinhardt and Rosen (2012) report on forming a national and international peer support group through a website for medical exchange students. Naamani and Taylor (2012) reflect on the use of podcasting in a vocational area, specifically Hairdressing and Beauty Therapy.

When the openness and sharing is of ideas and policies the results can be of wide applicability. In the policy area, McNeill (2012) analyses published social media policies from 14 universities with special reference to the need to respond to demand, whilst guarding against possible threats. Mor, Warburton and Winters (2012) look at the use of workshops that share experiences in order to produce design narratives and resulting design patterns, with a view to wider adoption. Finally, Heap and Minocha (2012) analyse the results of a survey of scholarly bloggers which looks at their motives for blogging and especially at the use of blogs as an effective way of sharing scholarly knowledge.

Perhaps unsurprisingly, because in UK education the word is still widely viewed with suspicion, *entrepreneurialism* attracted very few proposals for the conference as a whole and only one proceedings paper. Narayan, Davis and Gee (2012) discuss the entrepreneurial use of mobile Web 2.0 tools to reinvigorate two courses in New Zealand.

For the conference as a whole, *mainstreaming* was the most popular area but for proceedings papers this was not the case. Perhaps proceedings papers are more ahead of the curve and hence potentially not on it at all. Two institutional experiences in London are reported. Jordan (2012) discusses the introduction of video for peer feedback and reflection at the University of the Arts, including the important areas of training and dealing with student anxieties. Glover *et al.* (2012) cover the simultaneous introduction of a new open VLE at City University with its integration with other key institutional systems, such as those for external information and for video streaming.

The other two mainstreaming papers look more to the future. Munnerley *et al.* (2012) debate the social, cultural and technical issues surrounding the wider use of augmented reality systems by both learner and teacher. Griffiths, Ogden and Aspin (2012) discuss the near-future impact of HTML 5 and especially its support for semantic content, giving scenarios for its use in transforming the learner experience.

Also unsurprising in a UK context when reporting on a period when impact is yet to become too intrusive a concept, *sustainability* was overall not popular and attracted only one proceedings paper. Clayton (2012) reports on developments in New Zealand towards mass customisation and self-reflective frameworks following a government-enforced greatly increased participation rate in tertiary education.

In covering such a wide variety of topics, the authors have identified tensions between technology, practice, learner, financial, institutional and policy realities. Their approaches have been innovative, but have been grounded in the need to achieve results for learners. Together, these papers form a significant contribution to confronting reality. Enjoy reading them.

**References**

Alsubait, T., Parsia, B. & Sattler, U. (2012) 'Automatic generation of analogy questions for student assessment: an Ontology-based approach', *Research in Learning Technology*, vol. 20, DOI: 10.3402/rlt.v20i0.19198

Clayton, J. (2012) 'Mass-customisation and self-reflective frameworks: early developments in New Zealand', *Research in Learning Technology*, vol. 20, DOI: 10.3402/rlt.v20i0.19187

Cochrane, T. (2012) 'Secrets of mlearning failures: confronting reality', *Research in Learning Technology*, vol. 20, DOI: 10.3402/rlt.v20i0.19186

Essa, A. & Ayad, H. (2012) 'Improving student success using predictive models and data visualisations', *Research in Learning Technology*, vol. 20, DOI: 10.3402/rlt.v20i0.19191

Flavin, M. (2012) 'Disruptive technologies in higher education', *Research in Learning Technology*, vol. 20, DOI: 10.3402/rlt.v20i0.19184

Glover, I., *et al.* (2012) 'A tale of one city: intra-institutional variations in migrating VLE platform', *Research in Learning Technology*, vol. 20, DOI: 10.3402/rlt.v20i0.19190

Griffiths, L., Ogden, R. & Aspin, R. (2012) 'A profile of the future: what could HTML 5 do for HE by 2015?', *Research in Learning Technology*, vol. 20, DOI: 10.3402/rlt.v20i0.19199

Heap, T. & Minocha, S. (2012) 'An empirically grounded framework to guide blogging for digital scholarship', *Research in Learning Technology*, vol. 20, DOI: 10.3402/rlt.v20i0.19195

Jordan, L. (2012) 'Video for peer feedback and reflection: embedding mainstream engagement into learning and teaching practice', *Research in Learning Technology*, vol. 20, DOI: 10.3402/rlt.v20i0.19192

McGuigan, A. & Golden, L. (2012) 'Rules of engagement: developing the online tutor', *Research in Learning Technology*, vol. 20, DOI: 10.3402/rlt.v20i0.19183

McNeill, T. (2012) '"Don't affect the share price": social media policy in higher education as reputation management', *Research in Learning Technology*, vol. 20, DOI: 10.3402/rlt.v20i0.19194

Mor, Y. & Craft, B. (2012) 'Learning design: reflections upon the current landscape', *Research in Learning Technology*, vol. 20, DOI: 10.3402/rlt.v20i0.19196

Mor, Y., Warburton, S. & Winters, N. (2012) 'Participatory pattern workshops: a methodology for open learning design inquiry', *Research in Learning Technology*, vol. 20, DOI: 10.3402/rlt.v20i0.19197

Munnerley, D., *et al.* (2012) 'Confronting an augmented reality', *Research in Learning Technology*, vol. 20, DOI: 10.3402/rlt.v20i0.19189

Naamani, C. & Taylor, L. (2012) 'Beauty and the iPod – a story of contrasts and the use of podcasting in vocational education – Nail Technology', *Research in Learning Technology*, vol. 20, DOI: 10.3402/rlt.v20i0.19188

Narayan, V., Davis, C. & Gee, R. (2012) 'Augmented learning – spreading your wings beyond the classroom', *Research in Learning Technology*, vol. 20, DOI: 10.3402/rlt.v20i0.19200

Reinhardt, C. H. & Rosen, E. N. (2012) 'Journal of astonishment – a tool to increase satisfaction with exchange programmes', *Research in Learning Technology*, vol. 20, DOI: 10.3402/rlt.v20i0.19185

Taylor, T. (2012) 'Preparing the foundations for video-based practice-placement support: establishing the role from a students' perspective', *Research in Learning Technology*, vol. 20, DOI: 10.3402/rlt.v20i0.19193

David Hawkridge
*Open University, UK*

Steven Verjans
*Open University, The Netherlands*

Gail Wilson
*Southern Cross University, Australia*

# Augmented learning – spreading your wings beyond the classroom

Vickel Narayan*, Catherine Davis and Robin Gee

*Te Puna Ako, Unitec Institute of Technology, Auckland, New Zealand*

*(Received 19 March 2012; final version received 13 June 2012)*

The dramatic advancements in technology over the last 5 years have created an environment that could support learning that surpasses anything we would have seen, experienced or imagined before. While new technologies offer considerable opportunities for improved learning, their use however has remained as a plug-on to traditional teaching methods. In this article, we discuss the impact of reinvigorating two courses where the use of Mobile Web 2.0 (MW2.0) tools was embedded within the learning process with an aim of enabling learner-generated content and context. Students and staff in this collaborative project, from two different courses, were equipped with iPhone 4s and iPad 2s for the duration of the course ($n = 36$, 16-week semester). A participatory action research method was used to evaluate the project and to scaffold the staff into learning and teaching in the twenty-first century. The pedagogical approach underpinning this project and the design for use of MW2.0 tools are discussed. Examples of artefacts created by the students in the project are outlined and provide an overview of the different contexts students interacted in.

**Keywords:** Pedagogy 2.0; learner-generated content; learner-generated context; social constructivism; Mobile web 2.0

## Introduction

This project was a collaboration between students and staff from two level four courses – Digital Media (offered by Department of Communication Studies) and Moving Images World (offered by Department of Performing and Screen Arts). The Digital Media course focused on exploring the impact of new and emerging forms of media on communication (for example YouTube, Twitter and blog), while the Moving Images course focused on exploring new and emerging technologies for creating "moving images" for communication purposes. These courses have been taught in collaboration with each other for the last 2 years. The teachers, however, through their own experience and reflections, felt there could be more that could be done to help the students who enrolled in these courses. As a result they consulted the academic development unit (Te Puna Ako) to help explore the issues and opportunities.

The researchers held a pre-project planning meeting with the teachers to understand the coverage and requirements of the course, the prevalent teaching methods and the tools that were being used. As a result, three major problematic areas were identified: course facilitation, choice of tools for use in the course and the limited access to specialist equipment needed by the students. While the issues are

*Corresponding author. Email: vnarayan@unitec.ac.nz

ISBN 978-91-977071-4-5 (print), 978-91-977071-5-2 (online)

http://dx.doi.org/10.3402/rlt.v20i0.19200

highlighted separately, it was the complex combination of all three elements that created issues and needed revisiting.

Over the last 2 years the students had used a Spruz site (a social networking platform) and Moodle (a learning management system) as a learning portal and for managing group projects. Students had one 3-hour lab session per week booked for working on group projects and tasks. The students also only had limited access to specialist equipment in the filming studio. Access to resources such as specialist equipment in the filming studio was limited, which was another impediment to the way the course was facilitated. The course teachers were aspiring towards creating an interactive, engaging and collaborative learning environment apart from the lecture sessions, but the lab hours were more about achieving the required skills and knowledge. While the design of these courses was theoretically underpinned by social constructivist pedagogies, this did not translate into practice.

## Literature

The rapidly advancing technologies often "tickle" the educators and other important stakeholders in education (Saettler 1990). Technology in education is mostly viewed as a plug-in or a supplement to traditional teaching methods and practices in the classroom (Amiel and Reeves 2008; Bender 2003; Reeves 1997; Siemens and Matheos 2010). Amiel and Reeves (2008) argue that when we consider technology, we talk of it as a *product* or what it can do. They argue that it is this common perception of the term "technology" that limits its effective use in education. Instead, they propose that rather than looking at technology as a product, to think of technology as a *process*. When technology is viewed as a process, it validates the reasons "why" it is being considered and how it will be used hence pedagogy becomes the focus (Amiel and Reeves 2008).

### *Defining Mobile Web 2.0*

The term Web 2.0 was coined in 2004 by Tim O'Reilly (Anderson 2007) and refers to the second generation of the Internet "or more personalized, communicative form of the World Wide Web that emphasises active participation, connectivity, collaboration and sharing of knowledge and ideas among users" (McLoughlin and Lee 2007, p. 665; O'Reilly 2005; O'Reilly and Battelle 2009).

Mobile Web 2.0 in this study is defined as Web 2.0 tools that are configured/designed to function over mobile devices such as phones, smartphones or tablets (Cochrane and Bateman 2010). The advancement in handheld devices and the ever-growing processing power of these devices has fuelled the growth of Web 2.0 tools (Dabbagh and Reo 2011; TLRP 2008). Mobile handheld devices provide the capability of staying connected with the rest of the world through cellar 3G/4G network. The Web 2.0 tools when used on these devices allow the user to share their experiences with whomever they choose to at ease, thus amplifying the Web 2.0 effect.

Pedagogy 2.0 outlines the potential use of Web 2.0 tools in education which advocates active learner *participation* (communication, collaboration, community and connectedness), *productivity* (learner-generated content, creativity and innovation and distribution/creation of knowledge) and *personalisation* (learner choice, customisation, ownership and self-regulation) as the key to effective use (McLoughlin and Lee 2008a; McLoughlin and Lee 2008c). Pedagogy 2.0 is firmly

grounded in social constructivist, socio-cultural pedagogies (Vygotsky 1978, 1986) and contemporary pedagogies such as connectivism and heutagogy (Blaschke 2012; McLoughlin and Lee 2008a; Siemens 2005) which emphasise the importance of active, collaborative, self-determined and social learning. Pedagogy 2.0 utilises the affordances of Web 2.0 tools such as creation and co-creation of knowledge, communication, collaboration, user empowerment and ubiquitousness to create a virtual environment in which students can learn. (McLoughlin and Lee 2008b, 2008c).

While Web 2.0 tools enable learner-generated content, Web 2.0 tools used on mobile handheld devices enable bridging of different learning contexts (bridging between a teacher controlled classroom (formal) and learning driven by the student outside the classroom (informal context) (Cochrane and Bateman 2010). The ubiquitous nature of mobile devices and connectivity facilitates learner-generated context defined as the learners interaction with the surrounding (virtual online spaces or physical spaces) of his/her choice or the learners interaction with a collection of resources such as digital artefacts, people and other objects curated by the teacher, another individual or a community to further its own learning (Luckin 2008; Luckin *et al*. 2007; Luckin *et al*. 2008a, 2008b).

## Design

All students involved in the project were issued an Apple device for use in the course. The Moving Images (MI) students were issued with iPhone 4s and the Digital Media (DM) students were issued iPad 2s for use. The devices were selected for its appropriateness to tasks the students in the two courses had to perform. The two staff teaching the courses were also issued iPhones and iPads.

Figure 1 outlines the role of the researcher in the project with the students and staff. The researcher spent 3 hours in the first week helping students set up their blog and Twitter accounts. The students were also given an overview of the mobile device they were going to use. This included using the device to take pictures, videos and blogging using the Wordpress application and sending a tweet using the Twitter application. Students were also taken through a tutorial on how to create an Apple account and how to download and install applications on the mobile devices.

The researcher provided 1 hour of technological support to the students on a weekly basis (A in Figure 1) or as needed. Similarly the researcher provided technological and pedagogical support to the staff involved in the project on weekly

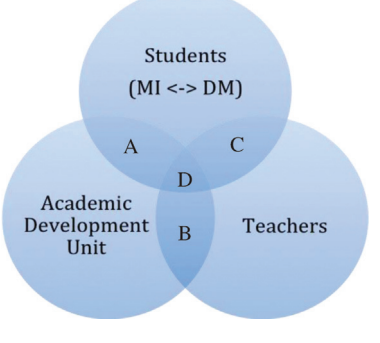



Figure 1. Community driven scaffold for use of mobile devices in learning and teaching.

bases or when needed (B in Figure 1). Pedagogical and technological support to the staff was deemed necessary, as neither staff had used smart devices in education before. This pedagogical and technological knowledge enabled the staff to embed the use of MW2.0 tools in facilitating learning and teaching (C in Figure 1). The researcher's role in supporting and scaffolding both students and staff for the duration of the project ensures that the MW2.0 tools are used effectively (D in Figure 1).

The concept map (Figure 2) outlines the intended use of the MW2.0 tools in the course by the students and teachers. The use of the mobile device in the project is underpinned by social constructivist pedagogies where learners are actively involved in creating new knowledge together, thus learner-generated content is an outcome in the course.

For the MI students, the mobile devices provided a portable studio for taking, editing and sharing videos and pictures. This also gave them the opportunity to practice, refine and master their production skills at anytime and any place. Vastly different from the timetabled weekly slots in the production studio where creativity was confined within the four walls in the room. The DM students also benefited from these arrangements as they got to experience and evaluate the impact of new and emerging types of media on communication as such mobile videos/audios, blog and Twitter compared to reading about these tools to gain an understanding prior to this project.

## Methodology

A participatory action research (PAR) defined as "collective, self-reflective enquiry undertaken by participants in social situations in order to improve the rationality and justice of their own social practices" (Kemmis and McTaggart 1988, p. 5) was used as

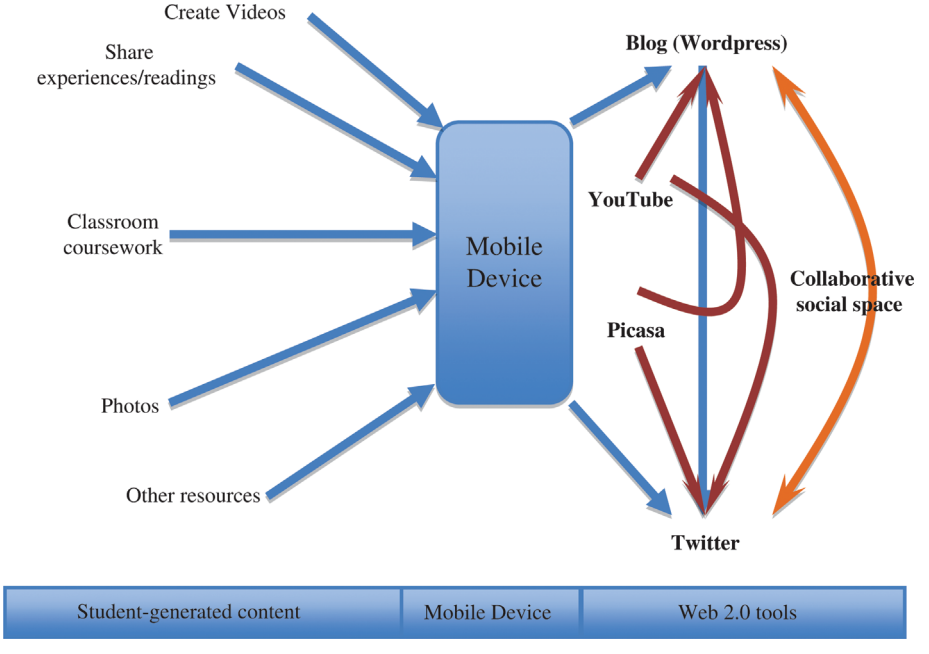



Figure 2. Concept map for the use of MW2.0 tools.

an evaluative method in this study. The collaborative and participatory nature of PAR helps build a community (McNiff 1988) in this case with the students and staff over the duration of the study. The PAR method allows the researchers to work alongside the students and staff as a member of the community in helping improve their pedagogical and technological knowledge and at the same time evaluating the impact of MW2.0 (data collection). The staff teaching these courses were relatively new to the use of MW2.0 in education and were interested in exploring and evaluating the use in this pilot study.

## Data collection

The data in this project were collected at three stages of the project and consisted of:

- A pre-project focus group with the teaching staff focusing on the issues faced with previous students.
- A survey administered at the start of the course to establish what experience students had with MW2.0 tools.
- Data from student blogs, Twitter posts and student created artefacts was also elicited, mainly showing student reflections on their experience in the course. The researcher's secondary role in the project was data collection from the weekly meetings with staff and students. This data were collected to identify how MW2.0 tools were being used.
- A post-project student survey and focus group was conducted with volunteering students. And an end of the project interview with the two staff was conducted. This data were collected to identify student and staff attitude towards the use of MW2.0 in learning and how the MW2.0 tools were used.

## Results

### *Pre-project survey*

The survey conducted at the start of the course provided an overview of the type of devices the students had and Web 2.0 tools they had interacted with prior to joining the course. Figure 3 highlights that 64% of the students ($n = 36$) had access to a desktop computer at home that had Internet connectivity. Eighty-nine per cent of the students had viewed videos on YouTube but only 25% of the students had uploaded anything. Twitter was the highest used social media out of all the social platforms surveyed but mainly for entertainment purposes (following celebrities and major shoe and clothing brands). Only 16% of the students in the class had a blog. The pre-project survey data outlined that students were mainly content consumers and their use of the resources was entertainment focused.

### *Use of MW2.0 tools in the course*

Twitter and blogs were used as primary tool for students and staff to communicate, share resources and ideas. A Twitter hashtag (#commpasa11) was established for use in the course by the students and staff. Student Wordpress blogs were configured to auto-tweet every time the students blogged. A total of 633 tweets were sent by the students and staff during the project with this hashtag. This count excludes any tweet

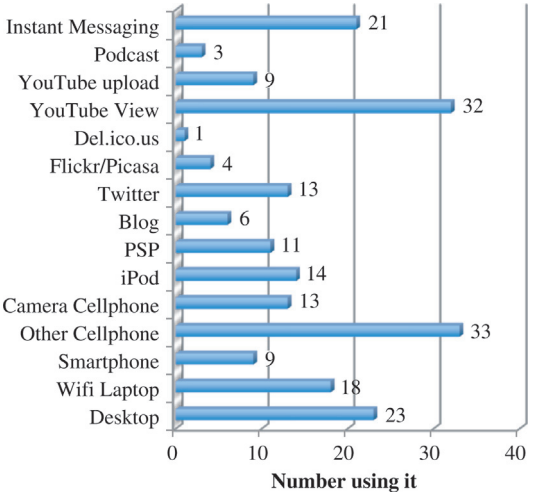



Figure 3. Student devices and use of Web 2.0 tools.

that was sent between students and staff without the hashtag. An analysis of the tweet sent by the staff and students can be found here http://archivist.visitmix.com/vnarayan/1.

Figure 4 provides an overview of how the hashtag was used during the course. Students and staff used the hashtag frequently at the start of the course and the use slowly declined after the first few weeks. One possible explanation for why the use of the hashtag declined after a month could be that the students and staff started following each other effectively forming an online community, an aspect that was encouraged in the course. An analysis of top tweeting student Twitter profiles showed a majority (87%, $n = 15$) of them followed field leaders on Twitter thus widening their learning network.

### *Student ownership, content and context*

This section of this article outlines how and in what context the students made use of MW2.0 tools in their learning. The results also highlight the degree of control the students had in determining how they learned, the location of their learning and the time at which they learned.

The students in this study formed groups of four consisting of members from both courses. The students self-elected themselves in the group after hearing and

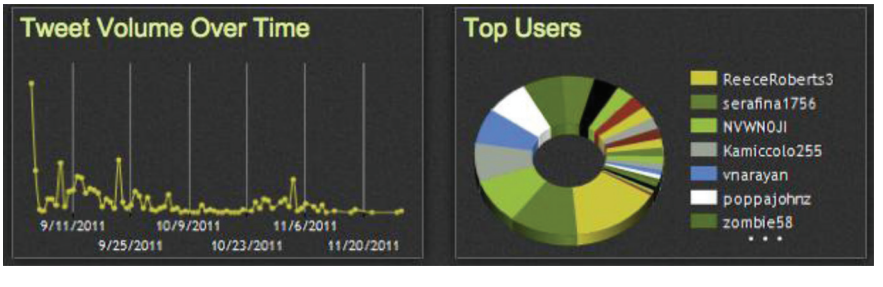



Figure 4. Tweet statistics from the course with #commpasa11 hashtag.

voting on project ideas pitched by the MI students. This ensured that the MI students would get an opportunity to create media as outlined in the course document and the DM students would get to evaluate the impact of using different media (blog, Twitter and any other media the students were interested in) on communication within the group and the wider class community.

As a result, nine groups were formed. The groups worked on nine different projects that they themselves pitched (http://youtu.be/U4Bd1VPh0lo). An overview of five projects, the use of web tools and the contexts the students chose to work in are discussed below.

The five projects nicknamed, (1) The Ghost Story, (2) Transport, (3) Growing up, (4) Wings and (5) Homeless, are events that were captured through the use of MW2.0 tools. The camera found on the iPhone and iPad and other social media possibilities were used extensively in these group tasks. Students having the affordance enabled by MW2.0 chose to document or tell real world stories.

The *Ghost Story*, was filmed in Building 1 of the campus that was built in 1865 and was used as an asylum for psychologically ill people. There are rumours that this building is haunted. The students took to this idea and filmed a small episode featuring students as cast from other groups. The *Transport* project stemmed from the experience of a student during the Rugby World Cup. When thousands of people were left stranded on the train stations and hundreds were stuck in a train attempting to get to the opening ceremony. The group focused their project on the perils of travelling to the campus on a train. The plot for *Growing Up* comes from a sister watching her younger brother grow up in a digital world, where the life of youngsters are surrounded by interactive media mainly video games. The *Wings* project features a student at her study desk at home, struggling to finish the essay she is writing and is in desperate need for inspiration. And the *Homeless* project is an enactment of a life of a homeless, alcoholic and addicted gambler, and her struggles in life.

Table 1 highlights the contexts and content students created during these projects.

### *Post-survey, focus group and staff interview*

Thirteen students took part in the voluntary end of project survey. An overwhelming number of students (92%, $n = 13$) agreed that the use of MW2.0 tools in the course was fun, easy to use, helped them with group tasks. Ninety-three per cent of the students either agreed or strongly agreed that the method and tools used helped increase the quality of learning, was comparatively better then their previous learning experience and made communication and receiving feedback from peers and the lecturers easier.

The eight students who took part in the post-project focus group commented on the usefulness of the MW2.0 tools in their learning and appreciated the opportunity to experience the 3G network and connectivity. They outlined that quick access to information anytime and anywhere, and ability to collaborate, communicate and create as having positive impact in their learning. Students in the focus group also commented that because of MW2.0 tools the issues they had with not having access to specialist equipment was not problematic. In fact in their view, this setup was more productive and effective than the studio model. It allowed them the opportunity to put their understandings into practice whenever he/she wanted, without any limitations of the context they were in. A common feedback from the students in the project was that it was a fun experience and they got to be creative and innovative in their approach.

Table 1. Student-generated context and content.

| Project | Physical context | Virtual context | Project output |
|---|---|---|---|
| Ghost story | ● On-campus building 1 | ● Twitter – a group hashtag (http://archivist.visitmix.com/vnarayan/4)<br>● Foursquare – Geo-tagging rooms with information prior to filming<br>● Storyboarding app on the iPad<br>● Video logs and blog posts | http://youtu.be/FJ4iDL6ekPA |
| Transport | ● Train station<br>● Train<br>● On-campus | ● Facebook group<br>● Texting<br>● Twitter<br>● Blog posts | http://youtu.be/sZs7V7a38RU |
| Growing up | ● Home<br>● Suburban street<br>● School<br>● On-campus<br>● Playground | ● Facebook group<br>● Twitter<br>● Blog posts | http://youtu.be/fbhNarT4Y2c |
| Wings | ● Study room<br>● Suburban street<br>● Diary shop<br>● School play group<br>● Garden | ● Texting<br>● Face-to-face communication<br>● Blog posts | http://youtu.be/3a8A3kHP6mM |
| Homeless | ● Hotel room<br>● City street<br>● Casino<br>● Texting | ● Twitter<br>● Facebook group<br>● Texting<br>● Blog posts | http://youtu.be/9p4sVkQVu-k |

***Staff interview***

Lecturer R reflects on his experience in the project how the students used MW2.0 tools. According to Lecturer R, the quality of student work and communication skills demonstrated were comparatively better than that of the previous students he had taught. R observed that the students who were lacking in confidence in using new tools chose to work with the tools they were confident with, for example texting and Facebook:

> Generally technically confident students took the lead in the class, their projects were more sophisticated and their communication (blogging, Tweeting and posting) was stronger.

Lecturer R's reflection on learning and teaching with MW2.0 tools provides an insight into the level of understanding he has gained in the process. He explains the importance of embedding the MW2.0 tools in the learning process and the importance of the staff modelling the use of the tools and technologies:

> This experience [in the project] has certainly helped me work through ways of integrating these into a broader range of the courses activities along with developing MW2.0 tools

> into a broader range of course activities and at the same time develop strategies to minimize potential problems. One of the important things that came out of this was that these devices are that, just devices, and it is the process of integrating them into learning and teaching that is important. I believe that a key aspect of teaching is modeling. Teachers need to be able to model how technology is integrated into their teaching before students will adopt/accept it as part of their learning.
>
> The Moving Image course will continue to encourage students to use their mobile devices. (Lecturer R-Moving Images)

Lecturer C, who taught the DM course talks about her growth from participating in the project. The PAR methodology used in this project created room for the staff to grow its own knowledge from reflecting on their and their students' experience with the assistance of the researcher. Empowering, supporting and scaffolding staff development are the implicit elements woven into the PAR design of this project:

> I think the most significant thing here was that I was keen to learn and being involved in the project has allowed me to up skill myself. The project gave me opportunities to gain embedded professional development.

Lecturer C outlines one instance where she found MW2.0 tools really useful. Lecturer C was sick at home but was able to still participate in the class activity. The MW2.0 tools enabled her to participate across the context boundary (classroom and home). C also evaluates the use of Twitter in the project against the former Spruz and explains with reasons how Twitter is a better fit for her course then Spruz:

> . . . and the experience I had when I was unwell and Lecturer R carried out a practical filming exercise with students whilst I had contact via Twitter while at home sick.
>
> In addition, for those students who have writing/learning disability, Twitter, with its 140 character limit can be a great benefit for scaffolding although a downside as it is highly public and therefore risky. The hashtag to create a community is really useful here as students can potentially create their own hashtags to develop specific discussions. I think Twitter is far better for this in some ways than a blogging site such as Spruz where conversations seems to become so visually complex and lacks the clarity of a "real life" conversation. (Lecturer C – Digital Media course)

## Discussion

While the use of MW2.0 tools in the course was initially considered as a way to remedy the issues surrounding the lack of access time to specialist equipment for students to use, the design and implementation of its use in this project stretched the initial thinking. In considering the MW2.0 tools only as a remedy for plugging the issues, the staff were situating its use within traditional teaching practices hence failing to capitalise on the pedagogical affordances of MW2.0 tools. The design of this project focused on revisiting the processes (pedagogy) that embedding technology impacts on rather than just considering it as a solution to an existing problem. This added value for both the staff involved and had a positive impact on student learning.

### *Content, context and learner-generated authentic context*

In evaluating the project outcomes against the 3Ps of Pedagogy 2.0 (participation, productivity and personalisation), all the groups chose to focus their work on real

world issues and situations. The contexts they chose to work in were again situation within the real world environment and the varying choice of communicative tools used my students to suit their needs (Table 1) outlines the personalisation (learner choice and self-regulation) element of Pedagogy 2.0. The use of class hashtag on Twitter, a student-generated hashtag for collaborative purposes and student blogs highlighted the participatory (communication and collaboration) aspect of Pedagogy 2.0. The collaboration between students in groups to create the digital episodes, on Twitter and student blogs outlines the productivity (learner-generated content and creativity) element of Pedagogy 2.0.

The outcomes observed are mainly because of how MW2.0 tools were used and appropriated/personalised by the students to meet their needs and enhance their own learning experience, which was enabled by social constructivist pedagogies.

The use of MW2.0 tools encouraged students to be content creators rather than content consumers. Apart from listening to a lecture three times a week, the students through the use of MW2.0 tools were able to remix and remodel the concepts through collaboration with others and apply it to improve their own learning (McLoughlin and Lee 2007). While the ubiquitous nature of mobile devices combined with Web 2.0 tools enabled the bridging of learning context between the classroom and the "real world". It is the ability to enable students to work, learn and create within a context that is conducive to their own learning (learner-generated context) that has been highlighted in this project. Whitworth (2008) argues that when learning is situated in pre-determined learning contexts even when the design is underpinned by social constructivist pedagogies, students may still remain content consumers, where the observed student role is passive (Luckin *et al*. 2011). He further elaborates that the fast developing technologies and collaborative tools empower learners by giving them the ability to create a context for their own learning. This is where the role of a student is that of an active participant and content creator as observed in this study aided by the use of MW2.0 tools.

This is not to say the role of the teacher in student-generated context is unimportant; in fact in this study, the teachers were called upon for support often. Twitter combined with smart devices (iPhone and iPads in this case) acted as a "bridging agent" between student-generated contexts, the peers and teachers as sources for support and scaffold. The top tweeters in both the class hashtag and student-generated hashtags were the teachers. The high participation rate of the teachers in student-generated contexts and other online conservations highlight the support and scaffolding needed by students to progress through the zone of proximal development (Vygotsky 1978).

While more research is needed to explore how learner-generated context impacts on the learner and his/her learning, outcomes of this project have been positive. Student activities and feedback during the course indicated that they were better engaged in the learning process, the use of MW2.0 tools encouraged self-regulation, nurtured a sense of ownership, creativity and innovation in the learner.

### *Issues with MW2.0*

The average age of the students in this project was 20 years, and according to Prensky (2001a, 2001b), these students would fall within the digital natives category – meaning they are proficient in using technology and tools since they grew up being

surrounded by it (Prensky, 2001a, 2001b). In this study, some students did not see any value in having an iPad/iPhone or using any other tool in their learning. The students who regularly attended the weekly technology sessions held by the researcher were observed to be active and effective users. The students who attended only the first session were the students who complained about not seeing any value of using MW2.0 tools in learning. It may be that they know how to use the devices and tools, but knowing how to apply this knowledge to improve your learning is certainly something the ''digital natives'' lacked in this study. The students' inability to apply their technological knowledge effectively for learning highlights the need for embedded scaffold and support in the process by the teachers.

### *Where to from here?*

This pilot study has provided the staff valuable experience and positive outcomes for students in teaching and learning with MW2.0 tools. Currently in 2012 the courses are working with student owned devices and the teachers are considering making a portable device like an iPod a requirement for future enrolments.

## Conclusion

This MW2.0 project has demonstrated an approach to professional development in the use of educational technologies and how it impacted on student learning. The use of MW2.0 tools provided the students with the flexibility and ability to choose a context that was conducive to their own learning. It enabled self-directedness but also collaborative learning, created space for student ownership in the learning process, student-generated context and content. It also provided the staff with an opportunity to reflect and re-evaluate their pedagogical practices and enhance their knowledge and skills about learning and teaching with MW2.0 tools.

## References

Amiel, T. & Reeves, T. (2008) 'Design-based research and educational technology: rethinking technology and the research agenda', *Educational Technology & Society*, vol. 11, pp. 29–40.

Anderson, P. (2007) 'What is Web 2.0? Ideas technologies and implications for education', [online]. JISC. Available at: www.jisc.ac.uk/media/documents/techwatch/tsw0701b.pdf

Bender, B. (2003) 'Student-centered learning: a personal journal', *EDUCAUSE*, vol. 2003, pp. 1–12.

Blaschke, L. M. (2012) 'Heutagogy and lifelong learning: a review of heutagogical practice and self-determined learning', *The International Review of Research in Open and Distance Learning (IRRODL)*, vol. 13, pp. 56–71.

Cochrane, T. & Bateman, R. (2010) 'Smartphones give you wing: pedagogical affordances of mobile Web 2.0', *Australasian Journal of Educational Technology*, vol. 26, pp. 1–14.

Dabbagh, N. & Reo, R. (2011) 'Back to the future: tracing the roots and learning affordances of social software', in *Web 2.0-Based e-Learning*, eds M. J. W. Lee & C. Mcloughlin, Information Science Reference, New York, pp. 1–20.

Kemmis, S. & McTaggart, R. (1988) *The Action Research Planner*, Deakin University, Geelong.

Luckin, R. (2008) 'The learner centric ecology for resources: a framework for using technology to scaffold learning', *Computers & Education*, vol. 50, pp. 449–462.

Luckin, R., *et al*. (2007) 'Learner-generated contexts: sustainable learning pathways through open content', *OpenLearn07 Conference*, Milton Keynes, October 2007.

Luckin, R., *et al*. (2008a) *Learner Generated Contexts: A Framework to Support the Effective Use of Technology to Support Learning* [online]. Available at: http://api.ning.

com/files/Ij6j7ucsB9vgb11pKPHU6LKMGQQkR-YDVnxruI9tBGf1Q-eSYUDv-Mil6uWqX4F1jYA1PUkZRXvbxhnxuHusyL1lRXVrBKnO/LGCOpenContextModelning.doc

Luckin, R., *et al*. (2008b) *Learners' Use of Web 2.0 Technologies in and Out of School in Key Stages 3 and 4*, Becta, Coventry.

Luckin, R., *et al*. (2011) 'Learner-generated contexts', in *Web 2.0-based e-learning: Applying Social Informatics for Tertiary Teaching*, eds M. J. W. Lee & C. Mclouglin, Information Science Reference, New York.

McLoughlin, C. & Lee, M. J. W. (2007) 'Social software and participatory learning: pedagogical choices with technology affordances in the Web 2.0 era', in *ASCILITE*, Singapore, pp. 664–675.

McLoughlin, C. & Lee, M. J. W. (2008a) 'Future learning landscapes: transforming pedagogy through social software', *Innovate Journal of Online Education* [online], 4. Available at: http://innovateonline.info/pdf/vol4_issue5/Future_Learning_Landscapes-__Transforming_Pedagogy_through_Social_Software.pdf

McLoughlin, C. & Lee, M. J. W. (2008b) 'Mapping the digital terrain: new media and social software as catalysts for pedagogical change', *ASCILITE*, Melbourne, pp. 641–652.

McLoughlin, C. & Lee, M. J. W. (2008c) 'The three P's of pedagogy for the networked society: personalisation, participation and productivity', *International Journal of Teaching and Learning in Higher Education*, vol. 20, pp. 10–17.

McNiff, J. (1988) *Action Research: Principles and Practice*, MacMillan Education, London.

O'Reilly, T. (2005) 'What is Web 2.0: design patterns and business models for the next generation of Software', [online]. Available at: http://www.oreillynet.com/pub/a/oreilly/tim/news/2005/09/30/what-is-web-20.html

O'Reilly, T. & Battelle, J. (2009) 'Web squared: Web 2.0 five years', *Special Report for the Web 2.0 Summit* [online]. Available at: http://assets.en.oreilly.com/1/event/28/web2009_websquared-whitepaper.pdf

Prensky, M. (2001a) 'Digital natives, digital immigrants', *On the Horizon* [online], 9. Available at: http://www.marcprensky.com/writing/Prensky%20-%20Digital%20Natives,%20Digital%20Immigrants%20-%20Part1.pdf

Prensky, M. (2001b) 'Do they really think differently?' *On the Horizon* [online], 9. Available at: www.marcprensky.com/.../prensky%20-%20digital%20natives,%20digital%20immigrants%20-%20part2.pdf

Reeves, T. (1997) 'Evaluating what really matters in computer-based education', in *Computer Education: New Perspectives*, eds M. Wild & D. Kirkpatrick, MASTEC, Perth, pp. 219–246.

Saettler, P. (1990) *The Evolution of American Educational Technology*, Libraries Unlimited, Englewood, CO.

Siemens, G. (2005) 'Connectivism: a learning theory for the digital age', *International Journal of Instructional Technology and Distance Learning*, vol. 2, pp. 3–10.

Siemens, G. & Matheos, K. (2010) 'Systemic changes in Higher Education', *Technology and Social Media* [online], 16. Available at: http://www.ineducation.ca/article/systemic-changes-higher-education

TLRP (2008) 'Education 2.0? Designing the web for teaching and learning', in , ed. N. Selwyn, Teaching and Learning Research Programme, London.

Vygotsky, L. S. (1978) *Mind and Society: The Development of Higher Psychological Processes*, Harvard University Press, Cambridge.

Vygotsky, L. S. (1986) *Thought and Language*, MIT Press, Cambridge, MA.

Whitworth, A. (2008) Learner-Generated Contexts: Critical theory and ICT education, 6th Hellenic Conference on ICT Applications in Education, Limassol, Cyprus, pp. 62–70.

*Research in Learning Technology*
Supplement: ALT-C 2012 Conference Proceedings


# Video for peer feedback and reflection: embedding mainstream engagement into learning and teaching practice

Lindsay Jordan*

*Centre for Learning and Teaching in Art and Design, University of the Arts London, High Holborn, London, UK*

*(Received 12 March 2012; final version received 30 June 2012)*

This paper discusses the benefits and challenges of video as a tool for supporting and enhancing peer feedback and reflection. The analysis draws on key arguments from relevant literature in combination with the author's own experiences of producing and using video recordings of peer feedback sessions, presentations and personal reflections, and on learners' experiences of the same, gathered through feedback interviews. A number of potential benefits are presented, including the exposure of additional and alternative perspectives, the assistance of focus and recall, increased impact and greater flexibility of learning. Several challenges are also explored, such as privacy of and access to recordings, participant anxiety, technical challenges and access to hardware. Strategies are offered for capitalising on the benefits while addressing the challenges. It is concluded that thoughtful use of video in the curriculum can augment the existing multiple benefits of reflection, enquiry and/or evaluation. In the specific context of teacher education, it is argued that the embedded use of technologies such as video in professional development courses can help to develop the digital literacy of teaching staff.

**Keywords:** effectiveness; ethics; staff development; handheld devices; peer feedback

## Introduction

The teaching and learning context of this paper is the Academic Practice Provision (APP), a portfolio of units offered by the Centre for Learning & Teaching in Art & Design (CLTAD) at the University of the Arts London (UAL). The APP allows participants to gain credit towards an initial teaching qualification – the Post-graduate Certificate ("PG Cert") – and further qualifications up to a full Master's degree. The majority of APP participants are practicing teachers working across a variety of art and design disciplines, and the extent of their own teaching experience generally ranges from 2 to 30 years.

The design of the units that make up the APP is informed by established pedagogic principles (such as constructive alignment and reflective practice), and emerging priorities such as open practice and the development of digital literacies. The use of video was introduced to participants with the aim of not only supporting peer feedback and personal reflection, but also to provide teachers with positive experiences of using these tools so that they are encouraged and empowered to use these methods where appropriate in their own teaching practice.

*Corresponding author. Email: lindsay.jordan@arts.ac.uk

ISBN 978-91-977071-4-5 (print), 978-91-977071-5-2 (online)


http://dx.doi.org/10.3402/rlt.v20i0.19192

**Methods used**

This paper discusses the use of video for the recording of peer feedback sessions and the presentation of reflective assignments. To set the scene, a brief summary of the wider and historical use of video in education will precede a review of the literature around the role of peer feedback in learning and the factors contributing to productive reflection. A theoretical basis for the use of video in these contexts will be proposed. To conclude the review of literature the issue of digital literacy, and its relevance in this context, will be explored with reference to recent studies. The use of video for the recording of peer feedback (e.g. http://www.vimeo.com/18707631) and the presentation of reflective assignments (e.g.: http://www.vimeo.com/24828893) will then be discussed with reference to this body of literature, and drawing on the author's own experience and on feedback from participants on the APP.

**Review of relevant literature**

***The use of video in education***

The use of video among the general population has risen dramatically over the last few years with the advent of video-sharing tools such as Youtube (www.youtube.com) and Vimeo (www.vimeo.com), faster internet speeds and the increasing capability of mobile devices to capture good-quality moving image. As general use of video rises across a broad range of applications, its prevalence in specific professional and educational contexts has also increased. The use of video for presenting educational content is now widespread; from the popular Technology, Entertainment, Design (TED) series (www.ted.com) to both commercial and open initiatives such as Lynda software screencasts (www.lynda.com) and The Khan Academy math tutorials. Video has also been used for many years as a tool for teacher training commonly for recording the teaching of micro-sessions in order to enhance feedback (Allen and Ryan 1969).

This paper, while also situated in the context of teacher education, looks not at video as a tool for recording teaching, but for recording feedback exchanged among learners. The fact that the learners in this context also happen to be teachers is largely incidental, although relevant in terms of wider aims and potential impact.

***The role of peer feedback in learning***

*Developing transferable skills in self-regulation*

Nicol and Macfarlane-Dick (2006) argue that "formative assessment and feedback are still largely controlled by and seen as the responsibility of teachers" (p. 200). However, the authors go on to demonstrate that learners are fully capable of assessing their own work and that the Higher Education sector needs to do more to ensure that learners develop transferable self-regulation skills. McConnell (2002) supports this view, pointing out that peer assessment allows learners to develop skills that they can use to assess their own learning and that (citing Boud 2000), "equipping learners with such skills should be a key aspect of the so-called learning society" (p. 89).

*Meaningful, actionable feedback*

Ivanic *et al*. (2000 cited in Nicol and Macfarlane-Dick 2006) argue that learners need to construct their own understanding of feedback (e.g. through dialogue) in order to

act upon it. Eliciting feedback in an open, discursive peer-group situation provides the opportunity for learners to take away feedback that is both meaningful to them and immediately actionable.

*Motivation and demotivation*

Crooks (1998) proposes that co-operative peer assessment that is well designed and prepared for can not only facilitate learning and motivation, but also help to develop interpersonal skills and relationships between students.

### *The role of video in reflective learning*

In *Becoming a Critically Reflective Teacher* (1995), Stephen Brookfield states that becoming aware of who we are and what we do is "a puzzling and contradictory task ... we find it very difficult to stand outside ourselves" (p. 28). Brookfield's description of this as "the pedagogic equivalent of trying to see the back of one's head while looking in the bathroom mirror" (p. 29) is worth noting as a video camera is in fact a very effective way of – both figuratively and literally – viewing the back of one's head. Seeing ourselves on video for the first time challenges comfortable and familiar ideas we hold about ourselves, and can therefore be an unpleasant experience. In Brookfield's view, assumption-searching behaviour (such as videoing oneself) "is often deliberately avoided for fear of what it might lead to" (p. 29). In other words, as long as we can remain unaware of something that needs our attention, we can avoid attending to it.

Amulya (2004) defines reflection as "an active process of witnessing one's own experience in order to take a closer look at it, sometimes to direct attention to it briefly, but often to explore it in greater depth" (p. 1). A video recording of an event allows us to examine an experience after we have gone through it. Amulya emphasises, as others before her have done (notably Schön's ideas on reflection-on-action (1991) and Kolb's (1985) on experiential learning), how fundamental this practice, along with examination before and during an experience, is to learning.

### *"Good Enough" philosophy and learning technologies*

Educational developers have a responsibility to encourage teachers to innovate; to try something that is new to them, or in a new context. Something that particularly resonates with this is the "Good Enough" philosophy, which has been effectively explained by Martin Weller (2010) and in 2009 by Robert Capps in Wired magazine (www.wired.co.uk) with specific reference to the Flipcam. Essentially, "Good Enough" philosophy is about sacrificing a little output quality for cost and convenience pay-offs. "Good Enough" technologies are relatively easy to set up and learn to use, and low in financial cost. The need for training courses, requests to central services and budget-holder authorisation are all barriers to innovation, which requires opportunities for casual experimentation. Weller's and Capps' ideas can be taken further to suggest that those who introduce staff to these technologies have a responsibility to demonstrate outcomes that are easily achievable. With video, this means using the simplest and most accessible tools available

(e.g. Flipcam, smartphone), free video hosting tools, minimal editing, and avoidance of the more professional-looking transitions, titles and other effects. In the case being discussed here, the technology is being used not only to enabling learners' own reflection and learning, but also to demonstrate how a particular tool can be useful for this aspect of teaching and learning, and to encourage experimentation.

### *Staff development for digital literacy*

While Bawden (2008) claims that digital literacy is "a topic whose terminology is very confused", there is still significant support for Paul Gilster's (1997) simple description of digital literacy as the current form of literacy itself, the ability to deal with information in today's dominant and emerging formats. Kress (2003) talks about the "new dominance of the image ... [and] the medium of the screen" (p. 1) over the prior dominance of writing and books. Dobson (2011) extrapolates from Kress's argument that the English curriculum should include learning how to communicate in these different modes. The year 2005 (2 years after the publication of Gunther Kress's Literacy in the New Media Age) saw the launch of Youtube (www.youtube.com), through which over 3 billion videos are viewed every day, with users uploading the equivalent of 240,000 full-length films every week. It can now be argued that moving image – that is video – is the current dominant format for information, or what Dobson (2011) terms "semiotic, meaning loaded forms".

With this in mind, Kress' (2003) and Dobson's (2011) arguments can be extrapolated further to suggest that curricula, including curricula in learning and teaching development, should include learning to communicate ones ideas and actions through moving image.

A JISC (2011) briefing paper in support of grant funding for digital literacy development states that "teaching practice is critical to the development of learners' own attitudes and capabilities," that is teachers who use current technologies appropriately with their students will be supporting the development of students' literacy. In the same vein, we can propose that professional development programmes that require teachers to use current technologies appropriately will support the development of teachers' digital literacy. Unsurprisingly, this arises not only within the JISC's arguments for supporting teaching staff in digital literacy development: "Interventions in CPD ... can have a long-term impact on professional practice and consequently on the learning experience of future students" (p. 4), but also in the concluding recommendations for enhancing the digital literacy of teaching staff: "Professional development frameworks are a valuable tool for embedding new expertise and practice" (p. 25).

The Learning Literacies in a Digital Age report commissioned by the JISC (LLiDA 2009) concluded that "digital literacies are developed and progressed most effectively when technologies are integrated into authentic activities that fulfil educational or scholarly goals" (Messages and Implications). Westerman and Barry (2009), in their evaluation of the HEA-funded DEBUT project, which took an holistic rather than a skills-based approach to digital literacy development, also found that staff valued a situated, contextualised approach in learning to use digital tools.

## Discussion of the benefits of using video for reflection and feedback

### *Exposure to alternative perspectives of ourselves and others*

Video offers an opportunity to view or review our actions and/or words from outside. In the same way as returning to an earlier blog post can enable a solution or an alternative path to become apparent, so can reviewing a video of ourselves reflecting on an experience or problem. As one APP participant articulated:

> revisiting . . . recordings is useful as I can continue to analyse what I said in that instance and assess its relevance as time passes and contexts change.

Watching oneself on video is not necessarily a pleasant experience, as proposed within the earlier discussion of Brookfield's (1995) ideas about reflection. It provides a great deal of feedback, and it is the richness of this feedback that can make for uncomfortable viewing, or cause people to be unwilling to be recorded in the first place. However, for those who tend to worry unnecessarily about their performance, the feedback from a video recording can be reassuring:

> I have a tendency to worry about what I have said after the event, but recordings will either confirm that I have nothing to worry about or highlight points that need changing. (APP participant)

A video recording is, in one way at least, less fallible than our own memory, which, as Brookfield (1995) points out, distorts events according to the aspects we choose to augment and diminish. A video recording presents a version of an event that is less susceptible to this kind of adjustment, and can therefore mitigate against both "catastrophising" and complacency.

In reviewing a feedback exchange after the event, we can view it more objectively and with more time to think about what is being said. The reviewing of feedback is an activity that key theorists on reflection and experiential learning such as Amulya (2004), Schön (1991) and Kolb (1984) would support. During a live interaction, our focus will be on a range of other things – for example the noting down of idea from peers and tutors, or simply relief that the presentation is over. If we have the opportunity to watch a peer or colleague voicing their suggestions over again, we may take away something completely new. As one participant points out:

> Quality recorded material won't exclude anything. When I am watching a live presentation, I can switch off or mishear certain points or attach a skewed meaning. Revisiting recordings is useful in overcoming this.

Another participant who took copious notes during a peer feedback session that was being recorded said:

> I went back and watched the video a few weeks later, and realised how much was missing from my notes. Not only were there great suggestions being given that I just hadn't registered at the time (I was too busy writing!); there were also things I'd misinterpreted as I hadn't been able to capture the nuances in what people were saying.

### *Focusing the mind*

> Being spontaneously recorded visually and/or aurally is always a useful exercise for me as I am forced to "engage brain before opening mouth" in the same way I would in front of a group of strangers – hence I am more conscious about what I am saying. This in

> turn helps me remember what I've said and continue to mentally process it after the event. (APP participant)

While it may be assumed that increased self-consciousness generally has a negative impact on performance, the alternative perspective of fear as an emotion that will make the experience more memorable, and hone one's performance rather than hamper it, is interesting and helpful. The challenge is how to introduce this alternative perspective to those who only perceive a negative impact on their performance. One way of addressing this can be to introduce the recording of feedback sessions as a personal reflection tool, rather than something shared and owned by the whole group. Where the teacher takes responsibility for uploading videos, they should offer to set access passwords according to the learner's choice:

> I am used to being recorded but there may still be an element of embarrassment while doing this, however technology now enables us to confront our "inner demons" in private. (APP participant)

### *Freedom from the constraints of space and time*

In many cases video has been employed within the APP as an alternative to face-to-face interaction where participants have been unable to attend in person. While in many ways face-to-face – or at least synchronous – interaction is preferable (as discussed later on), on occasion the asynchronous approach has offered the affordance of a wider audience and greater range of feedback sources. One particular example was a participant who benefited from feedback from individuals beyond his tutor group who were doing related research.

The dispersal of learners is one of the biggest challenges facing post-compulsory education. Through the above example we can begin to see how this kind of activity could enhance the experience of an entire cohort of dispersed learners. However, as explained later on, the use of such tools should be planned for and embedded into the design of a course in order to ensure the learner experience is enhanced, rather than diminished by distance.

Any event that only exists in the physical world is exclusive to those who are in a certain place at a certain time. An example worth noting is a video produced by the author (Jordan 2009; http://goo.gl/eV5kS) for a conference display of "virtual posters". The videos were projected onto a wall as delegates networked. Very few delegates were actually watching the videos, and as the sound was muted they would not have gained much from doing so. However, posting the video up to a blog and linking to it from Twitter resulted in numerous "mentions", conversations and invitations to speak at other events. As yet, there is no way of tagging the physical interactions in space that compares to our ability to find, follow and amplify online memes.

### *Visual impact*

The visual stimulus of video adds impact to a recording. When one considers the extent to which certain videos have "gone viral", compared with audience figures for popular audio recordings, it is clear that there is something that renders video significantly more attractive to the viewer. An important factor is the thumbnail

image, which usually displays a single frame from the video. This acts as a "taster" to draw viewers in (or equally, put them off). Clicking "play" on a video does not require the same leap into the unknown as it would do for an audio clip. It is perhaps worth bearing this in mind when using audio, as an illustrative still image can be a valuable accompaniment.

Having visual information in addition to audio also offers usability benefits:

> At first I didn't see the point of having a video recording as opposed to just the audio. But using the video I realised how much easier it was to find the exact place I needed. (APP participant)

The practical downside of using video is that file sizes tend to be much larger than other media, so downloading and uploading require a reliable, fast internet connection. On the upside, recordings can be scanned efficiently, and as with diagrams, models and other visual aids, more information can be communicated per unit of time. Also, as another APP participant suggests: "Seeing the expressions on people's faces really helps make sense of the conversations". In combination, these factors can make videos a more palatable information format than audio.

## Discussion of the challenges of using video for reflection and feedback

### *Reassuring the camera-shy: ethical considerations*

In the author's experience, responses to the suggestion of being recorded are usually neutral and sometimes negative; very rarely overly positive. It may be the case that people are reluctant to show enthusiasm for being recorded in case they appear narcissistic. This may contribute to teachers' perceptions that being recorded is not something that learners want.

There is some excellent information and advice on the JISC Digital Media website (http://goo.gl/Igd1z) which the author found useful in putting together an information sheet for participants as part of the preparation process for being recorded (Jordan 2010). This information sheet was deliberately written in informal language and went through several modifications with the increase in availability and clarity of information from the UK Intellectual Property Office (2009), particularly information relevant to Performers' Rights and online publication. On the flipside of the sheet, there are a number of questions designed to capture feedback on the usefulness of the information sheet itself. Feedback from APP participants indicated that the majority felt comfortable about being videoed having read this information.

In putting together this information sheet, one aim was to ensure participants were well-informed about the potential scope of the audience for any recording, while being reassured that relevant issues had been considered, their rights as performers would be respected and that videos could be password-protected or taken offline if required. Another aim was to ensure that selected videos could be used to enhance the learning experience of others, and to disseminate the outcomes of these practices, without the need to seek approval from individuals every time.

### *Loss of the affordances of face-to-face dialogue*

In the previous section the example was given of a course participant who felt he benefited from peer feedback on his recorded project proposal. Another example

where video was employed to mitigate against a participant's unplanned absence had a very different outcome; the participant felt that the feedback discussion that was recorded in response to his proposal video was too focused on "a throwaway remark" given at the start of the presentation and ignored the main points. Had the discussion taken place with the participant in the room, he would have been able to correct their interpretation and refocus the discussion. Nonetheless, the experience provided the stimulus for sustained reflection on the feedback process, which was evidenced in the participant's online research journal. After explaining how the misunderstanding arose, he wrote "I don't mean to criticise the observations or my peers at all, I just found it very interesting that I could be so misunderstood, which is . . . something for me to reflect upon."

### Gaining technical experience

A little experience may be required in order to get a "good enough" result with video. Concern about the intrusiveness of the camera may discourage the interruption of recordings to close a window, affix a tripod, adjust lighting or replace batteries. With more experience comes confidence and with it (usually) better recordings.

Video recording drains battery power quickly on a smartphone, and a Flipcam battery will only last for an hour's recording. Also, one is likely to spend up to twice the recording time transferring, editing and uploading files, so it is important to aim to record only what is needed. The ability to predict more accurately when to start and stop recording may develop with experience.

### Access to hardware

Flipcams were employed for the majority of video recorded on the APP. While the quality of mobile phone video footage is usually "good enough", mobile phones typically have no tripod fixings and have to be held in the hand, which may be impractical or more intrusive for the subject. However, as the picture quality from mobile phones improves, they gain an edge over dedicated video devices like the Flip and the Kodak Zi8 because people tend to have their phones with them most of the time. Smartphones also offer the opportunity to capture video and upload directly to the web. As mobile connectivity and WiFi coverage improves, and it becomes easier to upload large files, the instant USB connection offered by the Flip and similar devices becomes less relevant. The retirement of the Flipcam range in April 2011 indicates the pace of this trend.

## Conclusions

The intended learning outcomes of the APP at UAL focus on reflection, enquiry and/or evaluation. The use of self-reflection and the acquisition of feedback from peers – two of Brookfield's (1995) four lenses – are fundamental in achieving these outcomes.

It can be argued that video allows the augmentation of the existing, multiple benefits of these practices. Valuable, rich feedback is captured in its entirety, allowing learners to benefit fully and engage at greater length with the dialogue that enables the making of personal meaning and the transmission into specific action points

(Nicol and Macfarlane-Dick 2006). Learners are also led to evaluate how they themselves perform in a dialogic feedback situation, and assess what may be done in future in order to get more from the experience. As the effectiveness of these peer feedback events is increased, the reliance on the tutor to provide feedback is lessened, in turn promoting self-efficacy in the evaluation of practice.

There is also a "hidden curriculum" at work here. The embedding of these technologies within CPD programmes for staff has been researched by the HEA (Westerman and Barry 2009) and recommended by JISC (2011) as an appropriate approach to developing teachers' digital literacy. Several APP participants have begun to use video effectively with their own students, an outcome that was anticipated by the author and the progress of which is being followed with interest.

There are challenges and barriers to using video, which can be effectively addressed with a little research, experience and ongoing reflection. Hardware challenges are becoming less significant as personal gadgets become more efficient and increasingly capable of fulfilling multiple purposes.

It has been shown that the use of voice, particularly where augmented with moving image, can support learning in many ways. There are affective aspects; the way audio and video can help us to connect with people and emotions, and more practical benefits connected with the richness and reliability of information capture. In terms of the tools and techniques required to achieve a useful outcome, the predominant trends are changing rapidly and are likely to continue to do so. Therefore, it is vitally important that we use whatever is readily available, aim for nothing more than a "good enough" result and encourage our students and colleagues to do the same.

**Acknowledgements**

I would like to thank Ellen Sims and the other APP tutors for contributing their ideas, supporting mine and being generally enthusiastic about the effective use of learning technologies. Most importantly, I would like to thank the APP participants for their ongoing willingness to provide me with thoughtful, constructive feedback. Without their support this paper could not have been written.

**References**

Allen, D. W. & Ryan, K. (1969) *Microteaching*, Addison-Wesley, Boston, MA.

Amulya, J. (2004) *What is Reflective Practice?*, Center for Reflective Community Practice, Massachusetts Institute of Technology, Cambridge, MA.

Bawden, D. (2008) 'Origins and concepts of digital literacy', in *Digital Literacies; Concepts Policies and Practices*, eds Lankshear, C. & M. Knobel, Peter Long, NY, USA, pp. 17–32. Available at: http://sites.google.com/site/colinlankshear/DigitalLiteracies.pdf

Boud, D. (2000) 'Sustainable assessment: rethinking assessment for a learning society', *Studies in Continuing Education*, vol. 22, no. 2, pp. 151–167.

Brookfield, S. (1995) *Becoming a Critically Reflective Teacher*, Jossey-Bass, San Francisco, CA.

Capps, R. (2009) 'The good enough revolution: when cheap and simple is just fine', *Wired magazine*, [online] Available at: http://www.wired.com/gadgets/miscellaneous/magazine/17-09/ff_goodenough

Crooks, T. J. (1988) 'The impact of classroom evaluation practices on students', *Review of Educational Research*, vol. 58, no. 4, pp. 438–481.

Dobson, S. (2011) 'Review of Gunther Kress' Literacy in the New Media Age', Seminar.net; *International Journal of Media, Technology and Lifelong Learning*, vol. 7, no. 1. Available at: seminar.net/index.php/vol-7-issue-1-2011

Gilster, P. (1997) *Digital Literacy*, John Wiley, New York.

JISC. (2011) *Developing Digital Literacies: Briefing Paper in support of JISC Grant Funding 4/11*, [online] Available at: http://www.jisc.ac.uk/media/documents/funding/2011/04/Briefingpaper.pdf

JISC Digital Media Resources. Available at: http://www.jiscdigitalmedia.ac.uk/crossmedia/advice/copyright-and-other-rights-for-creating-time-based-media-resources/

Jordan, L. (2009) 'Engaging students in the curriculum through the use of blogs; how and why?', *Proceedings of the Fourth International Blended Learning Conference*, University of Hertfordshire, Hertfordshire. Available at: http://www.herts.ac.uk/fms/documents/teaching-and-learning/blu/conference2009/Lindsay_Jordan.wmv

Jordan, L. (2010) *Video and Audio Recordings; Frequently Asked Questions*, [online] Available at: http://goo.gl/q1ePK

Kolb, D. A. (1985) *Experiential Learning: Experience as the Source of Learning and Development*, Prentice Hall, London.

Kress, G. (2003) *Literacy in the New Media Age*, Routledge, London.

LLiDA (2009) *Learning Literacies in a Digital Age*, [online] Available at: http://caledonianacademy.net/spaces/LLiDA/index.php?n=Main.MessagesAndImplications

McConnell, D. (2002) 'The experience of collaborative assessment in e-learning', *Studies in Continuing Education*, vol. 24, no. 1, pp. 73–92.

Nicol, D. J. & Macfarlane-Dick, D. (2006) 'Formative assessment and self-regulated learning: a model and seven principles of good feedback practice', *Studies in Higher Education*, vol. 31, no. 2, pp. 199–218.

Schön, D. A. (1991) *Educating the Reflective Practitioner: Towards a New Design for Teaching and Learning in the Professions*, Jossey-Bass, San Francisco, CA.

The Khan Academy. Available at: www.khanacademy.org

UK Intellectual Property Office. (2009) *Performers' Rights*, [online] Available at: http://www.ipo.gov.uk/types/copy/c-otherprotect/c-performer.htm

Weller, M. (2010) 'The lamb formula: good enough?', *The Ed Techie*, [online] Available at: http://nogoodreason.typepad.co.uk/no_good_reason/2010/11/the-lamb-formula-good-enough.html

Westerman, S. & Barry, W. (2009) 'Mind the gap: staff empowerment through digital literacy', in *Transforming Higher Education through Technology Enhanced Learning*, Higher Education Academy, HEA, York, UK, pp. 111–134. Available at: http://www.heacademy.ac.uk/resources/detail/ourwork/learningandtech/transforming_he_through_technology_enhanced_learning

# A tale of one city: intra-institutional variations in migrating VLE platform

Ian Glover[a]*, Anna Campbell[b], Farzana Latif[c], Leona Norris[d], James Toner[e] and Connie Tse[f]

[a]*School of Engineering and Mathematical Sciences, City University London, London, UK;* [b]*Schools of Arts and Social Sciences, City University London, London, UK;* [c]*School of Health Sciences, City University London, London, UK;* [d]*Cass Business School, City University London, London, UK;* [e]*City Law School, City University London, London, UK;* [f]*School of Informatics, City University London, London, UK*

*(Received 11 March 2012; final version received 25 May 2012)*

City University London committed in 2009 to make Moodle the Virtual Learning Environment (VLE) at the core of a new Strategic Learning Environment (SLE) comprised of VLE, externally facing website and related systems such as video streaming and virtual classrooms. Previously, the WebCT VLE had been separate from most of the other systems at the institution with very limited connections to other tools. Each of the schools within the institution was able to pursue their own strategy and timeframe for the migration and embedding of Moodle within their subject areas, within an absolute limit of 2 years. This paper outlines the approaches taken by the various schools, highlighting similarities and differences, and draws out common aspects from the project to make recommendations for institutions seeking to undertake similar migrations.

**Keywords:** mainstreaming; large scale LT; effective solutions; long term value; VLEs; case study; change; learning platforms; migration

## Introduction

City University London is a multi-disciplinary institution based around Islington, London, has strong ties with business and industry, particularly in the nearby City of London, and has an above UK-average proportion of students studying for Postgraduate degrees (around 55%). The university has a diverse population with over 21,000 registered students from 156 countries and over 2100 staff from 70 countries. The university contains seven nominal schools, each containing its own departments, and though these are mainly based around the central site, there are three that are located in other parts of London.

The university has used WebCT, under the name CitySpace, as a Virtual Learning Environment (VLE) for a number of years; however, in 2009, as the time to renew the licence arrangements came closer, it was decided to completely review the provision of e-Learning systems within the institution. From the subsequent investigation, Moodle was chosen because it offered the best balance of flexibility combined with maturity and feature set. This decision was the result of a complete rethinking/re-imagining of how best to electronically support both staff and students in their

*Corresponding author. Email: ian.glover.1@city.ac.uk

ISBN 978-91-977071-4-5 (print), 978-91-977071-5-2 (online)

http://dx.doi.org/10.3402/rlt.v20i0.19190

learning, teaching and research activities. The result was the development of a concept of a Strategic Learning Environment (SLE), providing access to online collaboration tools, VLE, email and intranet/extranet, with the ability to move seamlessly between each of them, and to easily integrate other tools in future (Quinsee and Bullimore, 2011).

In late 2009, each School appointed a new staff member to perform change management activities related to the move, such as assisting in the migration of materials from CitySpace to the new Moodle-based system, producing training materials, training staff, etc. The aim was to have all online teaching taking place with Moodle by September 2011. Within this broad, two-year timescale each school was able to choose their own migration strategy, including resource allocation, training strategies, support mechanisms and content migration plans. A multi-board structure for the SLE initiative was created, and Figure 1 shows the seniority and relationships of the four project boards: Governance looking at long-term strategy; Strategy and Governance Board (SLEG) involved in shorter-term strategy, pedagogy and serving as the main conduit for information passing around the different boards; Technical Implementation Group (TIG) involved in the technical implementation of the project; and Migration Implementation Group (MIG) looking at day-to-day support and migration progress. These boards include representatives of all of the major stakeholders in the project, including senior academics, information services, library, school learning technologists and students. Individual users of the SLE and schools as a whole were able to input into Practical and Strategic-level boards. This ensured that staff not directly involved within the boards had the ability to help

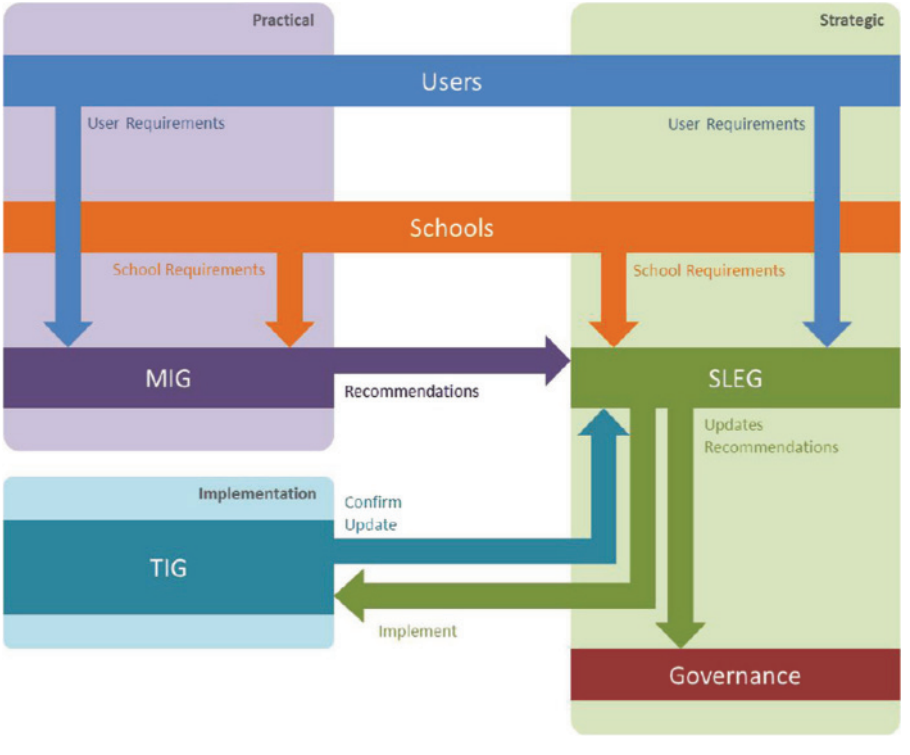



Figure 1. Project board relationships.

drive the direction of the project according to their own needs, and those of their school.

During the timeframe for the implementation of the SLE, there were other major educational development projects being undertaken, such as the JISC-funded PREDICT curriculum design project (http://www.city.ac.uk/about/education/ldc/sle/predict) and a pedagogic review of all first year modules across the institution and a review of the university's physical learning spaces. The timing of these projects has been particularly useful for the SLE because it has thrown a light on the pedagogical practices of the institution as a whole, and created opportunities to embed the use of learning technologies to address limitations of the current practice.

## School specific experiences

The following are case studies for the seven schools written by the relevant change manager.

### *Cass business school*

Cass is the second largest School within the university and has a range of Masters (MBA), Specialist Masters (MSc) and Undergraduate programmes, which each required tailored approaches for implementation.

To further add to the complexity, the School also used two VLEs; CitySpace for the majority and CassLearn (Teletop) for the MBA programme and MSc Management. The uptake of CitySpace within the School was sporadic and the system generally unpopular, while CassLearn had a loyal following and was used more effectively.

Therefore, the implementation had four objectives:

(1) Bring everyone across to a single system with consistent functionality, look and feel, while still maintaining the uniqueness of each of the programmes.
(2) Raise the quality of the content and increase staff adoption from users of CitySpace.
(3) Match and expand upon the functionality of CassLearn.
(4) Embed Moodle as a key teaching and learning tool within each of the programmes.

#### *Implementation*

In consultation with key stakeholders, it was decided to initially run a small pilot with a single Specialist Masters module to set up and evaluate the system. This was then followed by a staggered rollout over two years, which became the starting point for embedding Moodle as a key teaching and learning tool within each of the programmes.

Stage 1 rolled out to the first and second year Undergraduate programmes, increasing consistency in the student experience across modules through the establishment of a set of Minimum Requirements for each module. These allowed for clear roles and responsibilities to be determined for academic and administrative staff, along with a suite of processes around use of the system within the programme and the wider school. One-to-one training and supporting materials were provided,

which was personalised to their roles and aligned with the Minimum Requirements. Alongside the training, an informal support network was established in Stage 1 with participating staff, which provided the basis for a community of practice to be established in Stage 2.

Stage 2 encompassed the remaining third year Undergraduate programme, as well as the MSc and MBA. The outcomes from Stage 1 became a base model that was then improved on and adapted to suit each programme area.

*Reflection*

Minimum Requirements became an underpinning theme for the implementation. Successfully introduced by the Undergraduate programme, they were updated for each programme to reflect feedback from the first implementation stage. Staff adoption rates were significantly increased over CitySpace through their introduction, along with the use of one-to-one training sessions.

The most beneficial aspect of the process was that each stage of implementation allowed for continuous improvement of the system. The School is currently undertaking an evaluation of the entire process and the next stage will be to look to further embedding the SLE into teaching and learning practice and raising the quality of educational content.

***City Law School***

City Law School (CLS) is split across two campuses, with an academic campus providing undergraduate and conversion qualifications and a professional campus providing postgraduate and professional qualifications.

*Implementation*

The first task was to evaluate the current use of technology in the school and to understand previous experiences and school culture. All stakeholders impacted by the SLE were identified and categorised. A stakeholder map was used to highlight their interests and areas of the project that impacted them, which then inputted into the communications plan. Next, programme directors, academic staff and professional staff were consulted in order to understand their current and future needs and identify programme-specific innovation possibilities and time constraints.

A standard look-and-feel for modules was created, with input into the design and functionality provided by school staff, in order to provide a sense of ownership of the migration project. A basic feature package of file structure, quiz, scheduler and online marking was promoted to help implement a suitable training programme and create a foundation level of usage. Establishing a minimum standard encouraged staff to explore and interact with the technology, and provided students with a consistent experience, allowing them to focus on their learning when using the SLE, rather deal with idiosyncracies.

Learning content is updated annually so there was no migration of materials from CitySpace, though a bank of online questions was transferred. The rationale for this exception was that it was easier to update the existing questions in Moodle rather than starting from scratch.

Implementation was split into four stages, giving the flexibility to make adjustments between stages according to the needs of the specific programmes and institutional decisions. This enabled "lessons learned" to feed into subsequent stages and tangible milestones to be used to promote the progress of the project and its realisation.

By the end of this process, each programme had a minimum basic Moodle offering, along with multiple pilots of various advanced tools. Subsequently, to help with dissemination and encourage staff, the main innovators in the school were asked to present what they had achieved using the technology and the associated benefits at a "Teaching and Learning" day. This encouraged further interest in the possibilities available. This engagement and peer-motivation is a very important aspect of the process of realising the envisioned project outcomes/benefits.

*Reflection*

The implementation of the SLE in CLS has been successful not only in delivering direct improvements, but also has encouraged staff to experiment with their technological and pedagogical practices. This was a major achievement as it underlined the value of the change. The key to success was in understanding the various stakeholders' viewpoints and managing communications effectively, producing tangible benefits that helped drive the project forward. The project is on-going but a solid platform has been achieved to further incorporate technology into achieving realisable learning benefits for the student.

***Schools of Arts and Social Sciences***

Schools of Arts and Social Sciences (SASS), although conjoined for many administrative purposes, has very different characteristics. Social Sciences had some basic engagement with CitySpace; but Arts, up to 2009, had no Education Technology support and staff rarely used CitySpace.

*Implementation*

A Schools SLE Committee (SSLEC) was created to make decisions on the project for SASS. This met once a month and comprised of the Associate Dean of Education, Head of IT for the schools, school registrars and educational technologists. Approval by the committee was required for any departments/programmes wanting to move to SLE before September 2011. The SSLEC decided to refuse to migrate content from CitySpace as there was a desire to introduce staff to new ways of interacting with their students.

Schools of Arts and Social Sciences (SASS) conducted voluntary pilots in January 2010 for a whole course (PG Translation Studies) and some individual modules. Translation Studies was a new programme and went straight onto Moodle. Other lecturers chose to use Moodle due to the additional tools available. Crucially, the lecturers involved in all of these modules actively sought to use Moodle, were open to experimenting and comfortable if things went wrong.

The plan was to expose as many subject areas and staff to the system as early as possible, whilst also managing the resources required and the impact of any failure of the new system. This meant that some subjects, e.g. Economics, were intended to

have a staggered migration with different year groups moving in different semesters; however, most of the subjects intended to move all of their modules at the same time, either for September 2010 or 2011.

This plan was devised in order to:

- Stagger the staff and student Moodle training and support through the academic year.
- Avoid final year undergraduates needing to learn to use a new system.

However, most academic staff did not want to use two systems simultaneously. CitySpace was buggy and slow, frustrating users, and with the pilot being so successful, this created an incentive to academic staff to move onto Moodle. Department staff readily agreed to the requirements and most courses moved over to Moodle in September 2010. The Educational Support team scheduled "Introduction to Moodle" workshops (1.5 hours) and one-to-ones with staff members to get them started.

*Reflection*

This approach led to early engagement with the SLE by both academic and administrative staff; this engagement would have been unlikely if content had simply been migrated.

The move to Moodle was rationed to stagger support needs and this was like having a limited edition product – the exclusivity caused envy and increased the desirability of the SLE. This led to positive engagement by academic and administrative staff. Staff training is now on more advanced topics and encourages further exploration of the possibilities of the tools.

***School of Engineering and Mathematical Sciences***

School of Engineering and Mathematical Sciences (SEMS) comprises four main subject areas, along with a few, more specialist groups for research and postgraduates. The areas have generally been very autonomous and so there is little consistency in the use of learning technologies. A further issue in the engagement with learning technology is the inherently conservative nature of the disciplines, meaning there was little motivation to try these "new" tools. Another factor in this lack of engagement was that the school had never had any dedicated e-learning support and so educational technology had not been widely understood.

At the same time that the SLE project started, the main administrative functions of the school was merged with those of the School of Informatics, causing further concern amongst staff that everything was changing and creating some additional resistance to this further "enforced" change.

*Implementation*

The low engagement with CitySpace meant that a slow introduction of the SLE was required, due to the need to both prove the advantages of using learning technologies to staff as well as providing the skills to use them. For this purpose, there were initial "awareness" sessions that were used to highlight the introduction of the SLE and

how it was likely to impact on their work; these were a success though they did not allay all fears.

A pilot module in each of the subject areas was hosted on Moodle in the spring of 2010 and, though this necessarily used the most enthusiastic staff, the results suggested that Moodle could be a useful tool in all of the subject areas.

The implementation plan was to add all first year undergraduate modules to Moodle for September 2010 and all other modules following in September 2011, with a few exceptions moving early. Throughout the spring and summer of 2010 a phased training programme for staff was delivered and focussed on four key areas of the system: a basic introduction; assignments; quizzes; and grading. These four hour-long sessions formed the core, mandatory training for staff using Moodle, with a further four in-depth sessions available for interested staff. Following consultation, training was based on subject area rather than mixed groups.

*Reflection*

Unlike most of the other schools, the implementation of the SLE was less a migration and more an introduction of a whole new concept and way of working. This lack of use meant that the main push within the school over the two years was to get people at least using the VLE at a basic level. As more staff were trained and started using the system, it became possible to introduce further tools and technology that might benefit their students. The vast majority of staff and students are very pleased with the SLE and the success of the project has made most of them much more receptive to introducing appropriate further learning technology and pedagogical change into their practice. As an example, the school is now the biggest user of the recently introduced blogging platform – something that would not have been likely were it not for the successes of the Moodle part of the project.

***School of Health Sciences***

School of Health Sciences (SHS) is the largest school within the university, and is uniquely challenging because some programmes have intakes throughout the year, meaning teaching takes place through the traditionally quiet summer.

*Implementation*

School of Health Sciences' (SHS) strategy was to transfer all first year undergraduate modules in September 2010 and all other modules by September 2011. The complexity of the school with its many intakes made this phased implementation approach necessary; however, there were exceptions where programmes following the more typical academic structure migrated completely in 2010. This was due to the overwhelmingly positive feedback they had received from students on pilot modules, indicating a strong preference for Moodle.

To support staff with the move to Moodle, group training sessions were delivered to staff from across the entire school. Awareness of the SLE varied, so generic example modules and pilot modules were presented to staff, but it became apparent that digital literacy varied significantly, making it very difficult to pitch the sessions at a level where everyone felt both challenged and supported. Additional one-to-one support, FAQs and video guides were developed to support the use of the SLE. Later,

departmental training sessions were offered and similar levels of digital literacy ensured that the pace of learning was easier to manage. In order to promote the SLE, regular e-mails were disseminated across the school and presentations were delivered to departments, particularly those with lower levels of experience with using learning technology. In September 2010, all first year undergraduates were monitored to ensure academics were engaging with Moodle. Where academics were not engaging, desk-side support was offered, helping reinforce the benefits and uses of the SLE.

To help raise awareness of the SLE, a group of Technology Champions with representatives from different departments was established. These champions were selected because they were known for their use of educational technology or self-nominated.

Reactions towards Moodle varied dramatically. A significant factor in this was the school's decision to migrate no content other than quizzes from CitySpace. There were a number of times where people would express concerns regarding the limited time available. Offering examples and explaining how long things would take to develop, and using the champions as advocates, often soothed these worries. Now that the SLE is embedded within the school, most academic staff agree that it has been a positive change for themselves and the students, and has prompted them to consider the pedagogical approaches they take.

*Reflection*

Engaging with champions provided staff with the opportunity to evaluate current teaching and the way that CitySpace was being used; it helped staff to understand and influence how the SLE could be used to enhance teaching, so that the SLE was used optimally (Latif 2011). Champions also helped in promoting the SLE, identifying requirements, developing templates and establishing initial training needs within departments. However, using champions did not provide a means of identifying those who may resist using the SLE, or of highlighting reasons for this (e.g., digital literacy), partly because the group was highly motivated and, therefore, dedicated to overcoming challenges that they faced.

The introduction the SLE within SHS is considered a success. The school is now dedicated to adopting methods to continuously engage academics and encourage optimal use of the SLE. This has led to the development of online case studies, dissemination of digital literacy resources, and the introduction of minimum standards. Furthermore, academics are now supporting each other with the pedagogic use of the SLE.

***School of Informatics***

School of Informatics (SoI) had been delivering all its modules via CitySpace for seven years and was the school most engaged with learning technology, with most staff quite comfortable with using online technologies and keen to learn how best to exploit these technologies.

*Implementation*

School of Informatics (SoI) piloted Moodle in February 2010 with two modules that were selected by the school e-Learning team for the following reasons:

- Staff and students were keen to experiment.
- High demand for multimedia.
- Significant variation in required features.
- Module leaders very experienced in using CitySpace.

After the pilots, a draft policy based partly on the experience and feedback from the pilot was formulated to establish procedures in using Moodle.

School of Informatics (SoI) had around 300 active modules in CitySpace at the time of the migration and decided to go for a "big bang" strategy of migrating all of these simultaneously. This was to avoid the confusion and extra re-sourcing inherent in maintaining two VLEs in parallel, and to raise awareness and interest, thereby encouraging staff engagement with the SLE. Following the same process as used for CitySpace, all module content was migrated.

Initial feedback was overwhelmingly positive, especially in comparison to CitySpace. Comments highlighted the user-friendliness and the variety of features available in the SLE. There were some negative comments; however, these applied to specific issues and/or user requirements or preferences.

Intensive Moodle training was offered to staff during summer 2010. This followed a top-down approach: department heads and managers were approached individually regarding the migration and training. They sent training invitations to their staff, for whom small group (3–10 people), hands-on training was arranged by the department/team. Three main topics were selected as a training sequence – introduction, assignments and quizzes – each designed to build on the last. Training guides were available to participants and were adapted to the requirements of each group. Follow-up consultation was by informal one-to-one or email sessions.

*Reflection*

The migration is considered a great success by academics, students and senior managers. By the start of the 2010 academic year, all staff had accessed and updated their teaching materials in Moodle and although initially some students were not enrolled on their modules, the problem was corrected quickly.

To ensure that all academic and administrative staff are capable of delivering their modules via Moodle effectively, training was aimed at the key features. This helped reduce the psychological and technical barrier of the change and, as a result, most staff are now fully engaged.

## Commonalities and differences

The flexible approach allowed for by the overall project strategy meant that there were some significant differences between the implementation methods selected by different schools; however, there were also common approaches that developed organically, based on school culture and the staff involved in each school. Table 1 shows some of the approaches of the migration and highlights where schools used similar approaches.

The migration took place during a period of significant institutional change, with three different Vice-Chancellors being in office during the two-year period and major structural changes being implemented in most schools, along with investigation into the curriculum design process and revalidation of many programmes by the relevant

Table 1. Engagement and migration strategies by school.

| | Staff training | | | Student training | Minimum standard | Phased introduction | User champions | "Scaffolding" template | Transfer materials |
|---|---|---|---|---|---|---|---|---|---|
| | Groups | online | 1 to 1 | | | | | | |
| Cass | | X | X | X | X | X | | X | |
| CLS | X | X | X | | X | X | | X | |
| SASS | X | X | X | X | X | X | | X | |
| SEMS | X | X | X | | | X | | X | X |
| SHS | X | X | X | X | | X | X | X | |
| Sol | X | X | X | X | | | | X | X |

professional bodies. The uncertainty created by these, and other, changes had the potential for a serious, negative impact on the project; however, the opposite has been the case, with support for the project at senior levels being consistently strong.

This project was a large undertaking and there were significant differences between schools, both in their existing use of learning technology, and, as a result, in their implementation strategies. This would generally be an undesirable situation for a project of this nature; however, the absolute deadline and importance of the SLE to the institution ensured that the project received the necessary focus and resources. This ensured that a suitable migration strategy was devised for each school, whereas a single strategy is unlikely to have yielded comparable results. Ultimately, this devolved nature meant that there were significant differences in the implementation strategies chosen by different schools, and, combined with other variations such as culture, size and staff digital literacy, make it difficult to draw direct comparisons between schools. However, common aspects have been identified which could help inform other institutions performing similar migrations.

### *Staff "buy-in"*

One critical success factor was that of creating a sense of inclusion amongst the staff who would be using the system. This could be something relatively minor, such as involving them in designing the course templates, through to involving them in the migration plan.

### *Exclusivity sells*

Schools using a phased implementation typically found that staff who were not using Moodle in the first phase heard how good it was compared to the old system and wanted to move early. In some cases this was allowed, but in all cases the engagement level of the "excluded" staff was higher once on Moodle than among the same group on CitySpace.

### *Train early, train often*

To enable staff to make the best use of the SLE as soon as they migrated, it was essential that they received training as early as possible, along with follow up sessions and materials when appropriate. Training strategies varied according to the needs

and resources of each school but this tailored approach worked better than a single approach across the whole institution.

***Make use of early adopters***

Using the early adopters to encourage their colleagues is a highly effective method of engagement. The techniques used varied between schools, including Champions, exemplar modules, and encouraging discussion between early and later phase staff, but the effects were positive in each case. This approach is supported by Rogers' (2003) Diffusion of Innovations model, in which change is assisted by using those undergoing the change as change agents.

***Use the opportunity to engage staff in pedagogic discussion***

Many of the academics at the university have no formal qualifications or training in educational topics, and often simply replicate methods that were used when they were students. Meeting with every academic during the change process provided the opportunity to dissect discuss their practice and suggest changes. These would typically be based on the best practices from the literature, such as encouraging discussion rather than maintaining traditional didactic methods (Chickering and Gamson 1991), introducing peer assessment (van Zundert *et al*. 2010), or supporting situated learning (Lave and Wenger 1991) by shifting learning from the formal classroom.

***Support training in the academics' usual context***

The training provided by most schools utilised an experiential learning approach (Rogers 1969) by ensuring that the content of the sessions was made relevant to the tasks of the group or individual. This included using real modules during the training, by surfacing the aims of the trainee(s) and making sure the training directly addressed those aims, and by conducting the training in staff members' offices, where they would ultimately be using the system.

***Encourage scaffolding of knowledge through templates***

Each school created its own unique template for their modules, within the overall style of the whole VLE. As well as providing a distinct "identity" for each school, these also encouraged staff to scaffold the information provided within the module to support the learning outcomes rather than simply supporting thematic development in the abstract, or directly mirroring the teaching timetable (Yelland and Masters 2007).

***Link into other major projects***

Working with other large projects provided alternative routes to adoption and prevented people feeling that many different changes were being imposed at once – different changes can appear to be simply different strands of a larger project. The focussed attention to pedagogical practices within the university during

implementation boosted the introduction of the SLE, allowing the project to exert greater influence than might otherwise have been the case.

## Conclusion

The project was a major success, despite the scale of the required changes to existing practice. This success, in part, is due to general enthusiasm shown by the staff and students for the benefits of the SLE. It was essential that they, as the ultimate users of the system, be enthusiastic about the potential impact on their work and studies. The largest contributor to this enthusiasm, however, was the huge improvement offered by the SLE compared with the old CitySpace.

A side benefit of the project was that it forced a reassessment of many of the administrative functions of the institution and resulted in greater consistency where formal processes existed and in their introduction where there were none. This has meant that the project has also benefited many parts of the institution not directly involved in teaching and learning.

By focussing on the concept of the SLE rather than simply Moodle, it has been relatively straightforward to introduce new tools and technologies to support learning and teaching. Recent examples include an institutional blogging platform and a reading list and resource management tool. By introducing them as SLE initiatives, and using some of the same engagement techniques, the goodwill from the initial implementation has transferred to the new systems and people are interested in being a part of these future developments because they have previously seen tangible benefits.

The introduction of this new learning platform represented an opportunity to engage with staff in discussions about their existing practice and provide information on different techniques they might try in their teaching and assessment approaches. For many staff members, this was the first time that they had discussed educational theories and principles, resulting in some significant changes to their practice.

Anecdotally, the reaction from staff and students to the SLE is strongly positive, with many comments about how the toolset enables students to work in new ways. Encouragingly, this reflects one of the project aims, which was to move away from the didactic model of *teaching* to a collaborative, student-led model of *learning*. Formal research is currently underway to produce a detailed assessment of the impact of the SLE of student learning and staff processes, with the results intended for publication.

## References

Chickering, A. & Gamson, Z. (1987) 'Seven principles of good practice in undergraduate education', *AAHE Bulletin*, vol. 39, no. 2, pp. 3–7.

Latif, F. (2011) 'Designing, planning and implementing learning technologies through engaging teachers', Presented at *ALT-C 2011* Abstract. [online] Available at: http://altc2011.alt.ac.uk/talks/22233

Lave, J. & Wenger, E. (1991) *Situated Learning. Legitimate peripheral participation*, University of Cambridge Press, Cambridge.

Quinsee, S. & Bullimore, A. (2011) 'Creating the strategic learning environment at City University London', *Campus-Wide Information Systems*, vol. 28, no. 4, pp. 275–288.

Rogers, C. R. (1969) *Freedom to Learn*, Merrill, Columbus, OH.

Rogers, E. M. (2003) *Diffusion of Innovations,* 5th edn, The Free Press, New York.
van Zundert, M., Sluijsmans, D., & van Merriënboer, J. (2010) 'Effective peer assessment processes: Research findings and future directions', *Learning and Instruction*, vol. 20, no. 4, pp. 270–279.
Yelland, N. & Masters, J. (2007) 'Rethinking scaffolding in the information age', *Computers & Education*, vol. 48, no. 3, pp. 362–382.

# Confronting an augmented reality

Danny Munnerley[a,b]*, Matt Bacon[b], Anna Wilson[b,d], James Steele[a], John Hedberg[c] and Robert Fitzgerald[a]

[a]*INSPIRE Centre, University of Canberra, Canberra, ACT Australia;* [b]*Teaching and Learning Centre, University of Canberra, Canberra, Australia;* [c]*School of Education, Macquarie University, Sydney, Australia;* [d]*Physics Education Centre, Australian National University, Canberra, Australia*

*(Received 11 March 2012; final rersion received 31 May 2012)*

How can educators make use of augmented reality technologies and practices to enhance learning and why would we want to embrace such technologies anyway? How can an augmented reality help a learner confront, interpret and ultimately comprehend reality itself? In this article, we seek to initiate a discussion that focuses on these questions, and suggest that they be used as drivers for research into effective educational applications of augmented reality. We discuss how multi-modal, sensorial augmentation of reality links to existing theories of education and learning, focusing on ideas of cognitive dissonance and the confrontation of new realities implied by exposure to new and varied perspectives. We also discuss connections with broader debates brought on by the social and cultural changes wrought by the increased digitalisation of our lives, especially the concept of the extended mind. Rather than offer a prescription for augmentation, our intention is to throw open debate and to provoke deep thinking about what interacting with and creating an augmented reality might mean for both teacher and learner.

**Keywords:** augmented reality; immersive learning; cognitive dissonance; variation theory; constructionism; international; moving learners; pioneering uses; enthusing learners; mainstreaming

## Introduction

As a relatively new and rapidly developing technology, applications for mobile devices and web cameras that augment reality with digital objects are being taken up as potential educational tools by the usual vanguard of technophiles and early adopters. In the rush to adopt new technologies, there has been limited consideration of how augmenting reality might enhance the *process of learning itself* – that is, little consideration of why we might want to embrace such technologies more broadly, beyond the opportunities for mobility and flexibility. In the literature, there is little empirical work when compared with the volume of narrative studies (Dünser, Grasset, and Billinghurst 2008). However, the traditional response to develop experimental designs where augmented reality (AR) is tested against other educational approaches also presents challenges when analysing the impact of technology on educational outcomes (see Ross, Morrison, and Lowther 2010, p. 19). In this gap,

*Corresponding author. Email: danny.munnerley@canberra.edu.au

ISBN 978-91-977071-4-5 (print), 978-91-977071-5-2 (online)

http://dx.doi.org/10.3402/rlt.v20i0.19189

there is a danger of educational applications being driven by what is technically possible, and by the interests and agendas of the early adopters, rather than what is pedagogically desirable, or empirically defensible. The risk of such a fragmented approach to AR implementation may be to make it harder for academics and teachers to incorporate augmentation into their learning and teaching practices, and it may even alienate the less technically minded, with AR left seeming as yet another flash-in-the-pan, short-lived technological toy, accessible only to those with technical know-how and high levels of IT literacy and competence.

In this article, we discuss how the idea of augmenting reality with varied perspectives links to existing theories of education and learning. In particular, we focus on ideas of cognitive dissonance and variation, although it is important to note connections with constructivist approaches, activity theory and the concept of visual learning. We argue that AR offers an inherently student-centred approach to the design of curricula and learning activities. AR technologies enable learning to be immediately linked to a database of reference materials and not to require rigidly structured learning sequences, followed in the same order at the same time by all students. Such flexibility should help facilitate transfer of learning into new contexts with little additional requirement for constructed learning activities. We also discuss connections with broader debates brought on by the social and cultural changes wrought by the increased digitalisation of our lives, especially the concept of the extended mind inherent in networked learning approaches.

We start by defining what we mean by AR, with the intention of freeing it from specific technologies and hence opening it up for integration in a broader philosophy of education. We stress that augmented realities, unlike virtual realities, are not substitutions for physical reality; not approximations to reality; but the layering of perspectives and experiences to augment and enrich reality. We then discuss what opportunities AR opens up, and how those opportunities might be exploited within a given (constructivist) approach to learning and teaching. Finally, we consider existing applications of AR, trends in AR research and possibilities for uses of this technology in education.

## What is AR?

We embrace a broad definition of AR, using the term to describe real-time views of a physical, real-world environment whose elements have been augmented, enhanced, enriched or diminished by computer-generated sensory input, such as sound or graphics as a layer or projection.

Early uses of AR focused on the use of web cameras to display rendered 3D graphics when a particular object or image marker was viewed through them. Even now, this conception of AR pervades much of the literature. In their recent analysis of the success of the Horizon Reports' forecasts concerning the uptake and impact of new technologies on education, Martin *et al*. describe AR as "basically merg[ing] information or images with video streamed from a webcam" (Martin *et al*. 2011). They acknowledge that this goes "a step beyond data mashup" (Martin *et al*. 2011) but offer no explanation of how or why it might be an improvement. In this view, AR is distinct from virtual reality mainly in that it "uses real-world images in real time" (Martin *et al*. 2011). Another recent article, describing an application of AR in an educational context, defines it as "the technology of adding virtual objects to real scenes through enabling the addition of missing information in real life" (El Sayed,

Zayed, and Sharawy 2011). As with the previous definition, the focus here is on providing additional *information*, in this case of a type that might be missing or inaccessible to students in the physical world, such as anatomy education where it requires a fair amount of effort, expertise and expense to teach (Blum *et al*. 2012).

Outside the educational context, the term has grown to include any actions that augment or expand the physical environment, whether viewed through mobile devices or projected onto real surfaces. There is no need for such augmentation to be limited to the provision of visual information; there are rich opportunities to provide access to alternative visions and vistas and to alternative imaginations with a wide variety of sensory inputs. There is also a wide scope for providing more engaging and interactive experiences through live feedback of visual analytics/simulation data or parametric/generative modelling.

Augmented reality may also be defined as the product of any activity that creates new dimensions to the physical spaces we usually inhabit. Technologies for augmenting reality allow us to insert virtual objects in real spaces, openly accessible to anyone with access to what is now mainstream hardware. With a web-enabled phone or tablet, hidden layers, suspended in the virtual dimensions within real space, become visible. The fact that these new layers can be accessed with consumer-level mobile devices means that they offer a uniquely open way to enrich environments and offer multiple, flexible learning opportunities.

Augmented reality offers opportunities to expand the boundaries of formal learning spaces to create new dimensions in mobile learning and to increase connectedness of learners in multiple contexts. From simple systems where a tagged artefact reveals hidden images when viewed through a fixed web camera to interactive environments accessible from mobile devices allowing for communication and co-design. AR is already being embraced across many disciplines (Lee 2012). There is a real imperative for the education discipline to explore ways of using AR to enhance student learning and develop a deep understanding of the augmented learning processes.

## Recognising and confronting a changed reality

Our conception of what AR means, and what it can offer to learning and teaching, is rooted in a broader context of change: changes to the world we inhabit and to the ways in which we interact with it.

One obvious way in which our world has changed is the changed status of information and knowledge. Over the last two decades, we have seen a vast increase in the volume and accessibility of information available to society. From a world in which specialist knowledge was precisely that – the domain and property of the specialist, out of the reach of the majority of the population – and where possession of such information conferred value on the possessor, we have entered a world where more academic, technical, literary, personal and scientific knowledge is available through websites than ever before. Ownership and location of knowledge has become blurred, spread over a distributed network that is increasingly independent of the individuals responsible for initial knowledge creation and information upload. In this sense, knowledge and knowledge production processes are increasingly being democratised.

It is not just the availability of information that has changed, but also the ways we access and interact with it. What would previously have constituted cognitive processes that we might unquestioningly locate in the brain are being increasingly

extended via our embrace of the digital environment. We expect to be able to find the answer to any question, immediately, at the touch of a finger on a screen. We use our mobile devices to save us memorising information such as phone numbers. We store and retrieve memories of music and TV on YouTube; we store, retrieve and share more personal memories on sites such as Facebook and Flickr. The idea of an extended or networked human mind, which incorporates interactions with elements of the environment, and is not restricted to the boundaries of flesh and bone, was first introduced by Clark and Chalmers almost 15 years ago (Clark and Chalmers 1998); its relevance has only increased since then, as more and more of our intellectual functions are outsourced to computers and computer networks.

Learning processes themselves may change in response to such a changed environment. Our cognitive processes, indeed our very perceptual apparatus, may need to be reconceptualised as we adapt ourselves to the new tools now available. We are swimming in a sea of facts, opinions and assertions, buffeted by eddies of chatter and communication. Until now, our interactions with these data have been simple extensions of our historical approach, developed in an era when we had only limited data to interact with: we conduct a targeted search, on narrow, defined terms, looking for knowledge objects that conform to pre-existing expectations or specifications. We know what we are looking for, and search until we find it, excluding those results that do not fit the bill. But is this the right way for us to interact with our increasingly rich knowledge environment?

We may draw a comparison with the methods of scientific research. Our traditional, Popperian conception of research is that the scientist forms a hypothesis, then designs and performs a specific experiment to test it. The experiment is designed to control for variables that might confound the analysis; the scientist carefully records the relevant data. Irrelevant data (the humming of electronic modules, the sound of cooling fans, the smell of singed dust) are not recorded. But is this what really happens? Increasingly, as CPU, disk and readout speeds have allowed for more and more data to be recorded, experiments in nuclear and particle physics, for example, have tended to collect and record all data. Where possible, an approach known as Total Data Readout (Lazarus *et al*. 2001) has replaced the previous pre-selection or triggering processes, processes that reduced the volume of data to be recorded by the application of logical criteria to determine whether the data were relevant or not. Thus, a typical nuclear physics experiment might now generate hundreds of terabytes of data, recording everything that has been detected by the experimenter's system, and decisions about what to look for (and hence what is most relevant) are made later. Such an approach allows for the unexpected, for serendipitous discoveries of previously unanticipated processes and phenomena. While the sounds and smells associated with the experiment may not yet be recorded, the assumption that we know in advance what is relevant and interesting is increasingly itself becoming irrelevant in the light of our increased capacity to record *everything*. Similar to the light field camera, we may subsequently choose to refine, refocus or reorient ourselves, accessing new perspectives and finding new ways of interacting with the data long after the occurrence of the generating phenomenon.

Can our approach to learning evolve along similar lines? We seek ways of simultaneously interacting with multiple elements of the physical and digital environments, and of integrating those elements in new and creative ways. And it is here that AR may provide us with new tools and ways of seeing. When we augment reality, we add alternative perspectives: whether physically alternative, or those generated by

the imaginations of others. The notion of the extended mind (Clark and Chalmers 1998) can itself be extended from its initial domain of memory and non-occurrent beliefs to extended perspectives and perceptions. AR offers simultaneous access to multiple perspectives, some of which have been externally generated, but which are incorporated by the viewer into a single, integrated perception of the object or phenomenon being observed. It thus has the power to generate collective memory, a shared story or meta-narrative. This capacity to connect individual stories, blending them into a shared network of experience, opens up new channels for generating mutual understanding and educational liberation.

**Connections with theories of learning**

Our conception of the way in which AR helps us to confront reality aligns with an essentially student-centred conception of learning. An AR is a flexible space, containing learning opportunities that the learner can grasp at will. Learning is liberated from traditional spaces such as classrooms, lecture theatres and labs and instead envelops the student wherever they are. Learning opportunities can be present at home, in the workplace, on public transport – and can be taken up or passed over. As more interactive applications of AR are developed, students can become critics and co-creators, leaving behind a record of their learning tied to the virtual artefact they have experienced. Our emphasis on accessing multiple perspectives resonates with two key pedagogical concepts – cognitive dissonance and variation theory.

First introduced by Festinger, Riecken and Schachter (1964), cognitive dissonance encapsulates the idea that people have a strong motivational drive to reduce the dissonance resulting from simultaneously holding conflicting cognitions by altering those existing cognitions or adding new ones to create consistency. The term is often linked to a constructivist theory of learning (Piaget 1950; Posner *et al.* 1982). The educational power of this idea comes when the learner's efforts to create consistency are directed in a way that leads to achieving a more correct or sophisticated understanding. A whole literature has developed concerning identification and correction of students' misconceptions (for example, Gilbert and Watts 1983; Pfundt and Duit 1994). Many of the interventions designed to address misconceptions make explicit use of cognitive dissonance – for example, it appears in Mazur's Peer Instruction technique (Mazur 1997), in which students are required to defend their answers to questions to their peers, before the correct answer is revealed and discussed. In a meta-analysis of such interventions, Guzzetti and co-authors found a common element of strategies that were effective in producing conceptual change was the use of procedures that produced conceptual conflict (Guzzetti *et al.* 1993).

Variation theory also provides an interesting framework from which to view the opportunities presented by AR. Connected with the qualitative research methodology of phenomenography, variation theory puts discerning differences between alternative understandings at the heart of learning.

In the presentation of variation theory, Mazur (1997) suggests that the most advanced form of learning leads to qualitatively changed ways of experiencing or conceiving of something. If, as they suggest, learning is a process by which we come to experience something differently, we must have become aware of or gained access to that variation. (Bowden, Bowden, and Marton 1998).

Suppose you were brought up in an environment (an alien planet) in which everything were brown. Under such circumstances, you would have no concept

*brown*, since *brown* is defined through its differences with other colours. Indeed you would have no concept of *colour*, only of tone or shade. When shown the existence of other colours – whether in person or in photographs – you experience an awareness of variation that you did not previously have. According to variation theory, it is this experience of variation that facilitates or even constitutes learning. In this way, variation theory suggests that teaching interventions, which allow students to discern variations and differences, promote effective learning. We attest that AR technologies offer a new and immensely flexible means to do this.

## How is AR being used?

Outside education, perhaps the biggest focus for augmenting reality is augmenting locations. Information about places, what's around you, what used to be in the space, timetables for travel etc., are all now being built into the virtual spaces in real environments and accessed with a mobile device.

Augmented reality is unlike virtual reality, which seeks to create an alternative environment and so must attain a level of sophistication and immersion that requires specialist hardware and software, AR technologies seek to integrate the real and the virtual worlds together using mainstream devices. Allowing the virtual to co-habit or co-exist with the real reduces the need for complex hardware and software, so that reality augmentations rely on freely available web services that run on multiple platforms.

Augmented reality technologies have developed along two lines: *geo-location* and *artefact-based*. Geo-located AR works on the principle of defining a physical map reference or Point of Interest (POI) and then allowing the creator to add virtual assets (text, 3D and video) onto that POI. When a user, with the appropriate application installed on their mobile device, explores a space the POIs are revealed and the content can be accessed. POIs can be set anywhere in the world, by anyone, at any time regardless of their physical location.

Mobile web services are available for creating geo-location-based "layers" or "channels", meaning that it is becoming increasingly easy to create and distribute content. Geo-located content is growing quickly as the social web provides ever more ways of posting and locating personal media online.

Artefact-based AR works by tracking physical "markers" or "patterns" located on particular objects. A camera is used to track the marker, which the AR code then uses to display, for example, pre-built objects, animations and interactions. Markers can include barcodes and QR codes, however recent developments in image recognition and mobile technology allow for any image to be used as a marker as long as it is pre-defined in the AR code.

Augmented reality has been embraced in the world of advertising and marketing for its potential to make additional information available to customers. What started out as a simple marketing device has become a way for a company to project its brand image wherever its products are (for example, Smirnoff's recent use of artefact-based AR centres around limited edition bottles), or to provide additional information or guidelines about products (e.g. Lego's use of artefact-based AR to provide images of structures that can be made from their kits). This illustrates how technologies can provide new and potentially richer, multi-modal methods for remote communication.

Augmented reality is increasingly being used in architecture and design to envisage how a building or objects could look, or how it looked in the past. For example, an AR

approach to the rebuilding of Christchurch after the devastating earthquakes in 2011 makes community engagement a central part of the design process. Researchers at the University of Canterbury have designed an AR application that allows the user to see both original and proposed replacements of damaged or demolished buildings in the city (Tadros 2011) thus allowing community input into the proposed locations of new buildings. When rebuilding historic buildings, digital models can be produced from archives, artefacts and expert knowledge, then placed at the site for assessment and critique by other experts and users, thus leading to improved models that pull together the knowledge of many to better reproduce the original, lost building.

One of the most striking developments in the use of AR has been its uptake in the visual arts, where its potential for playful subversion has been recognised and exploited. In a powerful demonstration of this potential, a group of artists used a geo-location-based approach to "hijack" New York's Museum of Modern Art (MoMA), inserting their own virtual exhibition throughout the museum's physical spaces and even creating an entire virtual seventh floor to the six storey building (Porter 2010). The exhibits were visible only to visitors with a mobile device, and included images of the Berlin Wall and a desert path suspended above the real-space sculpture garden.

Striking though this use of AR technologies is, its purpose was to communicate to an audience and to encourage them to consider the space around them (and the restrictions placed on the physical objects presented in that space). The communication was essentially one-way, hopefully prompting deep responses but not directly engaging the audience in shared criticism, debate or acts of co-creation.

We are thus now seeing elements of subversion, opportunism, transformation of spaces in the developing uses of AR. More importantly, we're seeing the creation of a virtual space within and completely integrated with real space, but (potentially) out of the control of the owners of the real space. This provides a strong contrast with "traditional" ideas of separate, real and virtual worlds, where *virtual* indicates a copy or simulation of the real world, rather than an expansion or enrichment of it. Augmentations are real things in themselves, a mixed reality (Milgram *et al*. 1995) of created and creative objects that enhance and enrich rather than copy or replace. Augmenting reality with the intention of integrating all spaces, increasing connectedness offers a glimpsed potential of what it might mean for us to become "realer than real" (Massumi 1987).

**Potential for AR in educational contexts: why we need to ensure uses are grounded in a philosophical/pedagogical framework**

Educational users of AR need to harness the potential for confronting, subverting and transforming realities and for creating shared narratives evident in the non-educational uses described above. AR offers several special pedagogical opportunities:

(1) Mobility
(2) Visualisation (which may be manipulated by the viewer)
(3) Alternative perspectives
(4) Comparison/contrast of multiple perspectives
(5) Integration of multiple perspectives

Current research into uses of AR in education has mainly focused on 1 and 2 – that is, the provision of flexible learning opportunities through delivery of information to

handheld devices, and the visualisation of information or perspectives that might otherwise not be available to students, either because of physical or financial constraints. It is now time to focus on 3–5, but to do so with consideration of the overarching purpose, that is to create an increasingly student-centred learning experience in which the student connects, integrates, constructs and deconstructs his or her own meanings from his or her own experiences.

Some recent developments in higher education illustrate precisely why such an awareness/emphasis is essential if the potential of AR is not to be become just another passing fad. A good example comes from the increased focus on interactivity, particularly in traditionally content-focused disciplines such as the hard sciences. Without an understanding of the purpose of interactivity and curriculum design, efforts at increasing interactivity run the risk of being limited in their impact on student learning. Thus Mazur's Peer Instruction is reduced to multiple-choice clicker questions, with the game-show feel of the real-time audience response system replacing the intended provocation of cognitive dissonance through the confrontation of a student's prior understanding with an incompatible alternative. In one Australian university, iPads are handed out to first year science students as repositories for electronic texts, and in another to investigate the question of whether having an iPad in itself enhances student learning. Thus simulations are seen as enhancing student learning despite evidence that, at least in some cases, they have simply provided an animated visual that may be rote-learned instead of an equation.

Where individual teachers incorporate their uses of technology within a curriculum design approach informed by a belief in a particular theory of learning, great things may be achieved, but such development will inevitably be patchy, unpredictable and *ad hoc*. We call for a unified approach from the community as a whole. If developments are presented within a broader framework of how learning happens, they are much more likely to be exploited in ways that encourages deep learning. We need to focus on the learner; on what is happening when a more sophisticated understanding is developed, and what ingredients are required to help that happen.

Augmented reality technologies can be used to augment reality to promote reflection, integration, a questioning attitude, critical thinking and well-established learning goals in many traditional pedagogies. AR can provide additional depth and richness, or prompt learning characteristic of the more sophisticated outcomes such as those assessed by the SOLO taxonomy (Biggs and Collis 1982), which has been influential in guiding pedagogical practice for two decades. For example:

- *Providing additional information on an object*, such as relating to its origins the processes used to create it, or its impact on the environment: a mobile device could itself be labelled with information on the different elements and compounds used to make its components, together with their origins and histories.
- *Providing access to physically inaccessible views of an object*, whether closer or more distant, from above or below, or from any other perspective that has the potential to render the object unrecognisable or strange. Radical perspective changes could be used to challenge students' senses of familiar objects, and to encourage them to reflect on how their "usual" view may not be that shared by others.

- *Augmenting senses*, such as object visualisation, possibly using infra-red or ultra-violet, or creating a journey through subsequent layers to the microscopic level. By providing new ways of seeing not available to unaugmented human senses, we can challenge students to reflect on the constraints on their own ways of seeing, and on how those constraints affect their interpretations of what they observe.
- *Combining and comparing multiple views*, simultaneously layering into a new dimension of change. By creating a third dimension spanning variation in parameters such as time, or visible frequencies, we hope to encourage awareness of similarities and differences.
- *Confronting the alien or unexpected* by exploring the reactions and responses, opinions and beliefs of others.
- *Creating a shared narrative of learning* or a pedagogical autobiography by explicit reflection on how being confronted with the memories, associations, beliefs and understandings of others transform the student's own individual understanding of a particular event, phenomenon or concept.

These variations can be accompanied by questions to prompt students' reflections, observations, and comments to evidence their own learning. Each variation focuses on higher-order thinking skills and learning outcomes such as integration, relation-building and creation. Each also offers opportunities for learners to confront their own beliefs, to juxtapose those beliefs with those of others and to create richer, more nuanced understandings in the process. These contributions can be combined to create a true learning commons, where the physical record of a space and the ideas generated within it are combined to create a multi-layered history of a multi-dimensional space. AR can thus provide opportunities for private contemplation or reflection, but also interaction, contestation and contribution: a multi-modal way to confront the full richness of reality.

## References


Biggs, J. B. & Collis, K. F. (1982) *Evaluating the Quality of Learning: the SOLO Taxonomy (Structure of the Observed Learning Outcome)*, Academic Press, Watham, MA, USA.

Blum, T., *et al*. (2012) 'Mirracle: an augmented reality magic mirror system for anatomy education', *Virtual Reality (VR) 2012 IEEE. IEEE Virtual Reality Conference 2012*. IEEE, Costa Mesa, CA, pp. 115–116.

Bowden, J. A., Bowden, J. & Marton, F. (1998) *The University of Learning*, Psychology Press, Hove, UK.

Clark, A. & Chalmers, D. J. (1998). 'The extended mind'. *ANALYSIS* vol 58: no. 1, pp. 7–19.

Dünser, A., Grasset, R. & Billinghurst, M. (2008) A survey of evaluation techniques used in augmented reality studies. In *ACM SIGGRAPH ASIA 2008 courses*, Association for Computing Machinery, NY, USA, p. 5.

El Sayed, N. A. M., Zayed, H. H. & Sharawy, M. I. (2011) 'ARSC: augmented reality student card', *Computer Education*, vol. 56, pp. 1045–1061.

Festinger, L., Riecken, H. W. & Schachter, S. (1964) *When Prophecy Fails: A Social and Psychological Study of a Modern Group that Predicted the Destruction of the World*, Harper & Row, NY, USA.

Gilbert, J. & Watts, D. (1983) 'Concepts, misconceptions and alternative conceptions: changing perspectives in science education', *Studies in Science Education*, vol. 10, pp. 61–98.

Guzzetti, B. J., *et al*. (1993) 'Promoting conceptual change in science: a comparative meta-analysis of instructional interventions from reading education and science education', *Reading Research Quarterly*, vol. 28, pp. 116.

Lazarus, I., *et al*. (2001) 'The GREAT triggerless total data readout method', *IEEE Transactions on Nuclear Science*, vol. 48, pp. 567–569.
Lee, K. (2012) 'Augmented reality in education and training', *TechTrends*, vol. 56, no. 2, pp. 13–21.
Martin, S., *et al*. (2011) 'New technology trends in education: seven years of forecasts and convergence', *Computer Education*, vol. 57, pp. 1893–1906.
Massumi, B. (1987) Realer than real. Available at: www.anu.edu.au/hrc/first_and_last/works/realer.htm
Mazur, E. (1997) *Peer Instruction: A User's Manual*, Prentice Hall, Old Tappan, NJ, USA.
Milgram, P., *et al*. (1995) *Augmented Reality: A Class of Displays on the Reality-Virtuality Continuum*, Telemanipulator and Telepresence Technologies. SPIE, Bellingham, Washington, USA, pp. 282–292.
Pfundt, H. & Duit, R. (1994) *Bibliography, Students' Alternative Frameworks and Science Education* [Bibliographie, alltagsvorstellungen und naturwissenschaftlicher Unterricht], Institute for Science Education, Kiel.
Piaget, J. (1950) *The Psychology of Intelligence*, Routledge, London, UK.
Porter, E. (2010) 'Is that a dagger I see on my iPhone?', *The New York Times*, 21 October 2012, p. 4.
Posner, G. J., *et al*. (1982) 'Accommodation of a scientific conception: toward a theory of conceptual change', *Science Education*, vol. 66, pp. 211–227.
Ross, S. M., Morrison, G. R. & Lowther, D. L. (2010) 'Educational technology research past and present: balancing rigor and relevance to impact school learning', *Contemporary Educational Technology*, vol. 1, no. 1, pp. 17.
Tadros, E. (2011) 'Technology key to rebuilding Christchurch', *The Sydney Morning Herald*, 16 June 2011, p. 5.

# A profile of the future: what could HTML 5 do for HE by 2015?

Lee Griffiths*, Rick Ogden and Rob Aspin

*Department of Computer Science, University of Salford, Salford Manchester, UK*

*(Received 14 March 2012; final version received 29 May 2012)*

HTML 5 is the most significant update of HTML in the last 10 years since XHTML was introduced. It promises a vastly improved user experience, increased browser features, cross compatibility and the ability to provide semantic content. In this paper we discuss the near future position for Higher Education in terms of technological transform, the proposed capabilities of HTML 5, and how they may change and how virtual learning environments are implemented in the future. We offer a set of education-based scenarios and how the emerging standard could benefit them. Finally we conclude with possible implementation timescales.

**Keywords:** tags HTML 5; system wide improvements; mobile devices; learning platforms; handheld devices

## Higher Education in the near future

Higher Education (HE) across the world is undergoing fundamental change, driven primarily by the volume of students entering HE and financial constraints imposed by funding bodies. Reports by governmental and non-governmental organisations in the US, UK and Australia (A Test of leadership: charting the future of U.S. higher education 2006; Blass, Jasman, and Shelley 2010; Comrie 2011; Review of Australian higher education 2008; The future of higher education: How technology will shape learning 2008) all cite the necessity for inclusion and accessibility to educational material to be key in improving quality and effectiveness of the educational service provided by HE in the future.

It is recognised that institutions need to overhaul their processes (Willets 2010) and become edgeless (Comrie 2011) in order to improve their accessibility and overcome factors such as time available for study and financial support. If done well, this will undoubtedly drive student success (Griffiths 2011), in an environment where there is already, or will soon be, no government funding (Blass, Jasman, and Shelley 2010). Predictions suggest that in the UK at least the student population will remain constant for the next 15–20 years (The future size and shape of the higher education sector in the UK 2009) and thus demand for the service is expected to remain fairly constant.

Most, if not all institutions deliver material on- and off-campus using a Virtual Learning Environment (VLE) to provide extended support for traditional teaching or distance learning. The predominant VLE technologies are Blackboard and Moodle and in their most typical form are used more to manage course delivery than

*Corresponding author. Email: l.s.griffiths@saford.ac.uk, r.ogden@salford.ac.uk, r.aspin@salford.ac.uk

ISBN 978-91-977071-4-5 (print), 978-91-977071-5-2 (online)

http://dx.doi.org/10.3402/rlt.v20i0.19199

to offer a wider range of learning experience to students. Both systems (and other off the shelf VLEs) utilise server-side delivery of content wrapped in a XHTML presentation layer thereby acting more as dry and non-interactive document repositories protected by institutional security than creative learning experiences.

These tools need to change in order to deliver rich user experience (UX) wherever they are used and on whatever platform they are accessed through as we see on social media platforms such as facebook and twitter. Currently XHTML-based systems provide interaction using plug-in adaptations such as Java or Adobe Flash based tools, but these do not always provide a consistent or acceptable experience across different configurations of operating systems (OS) and browser platform. If VLEs are a way to smooth the edges (Comrie 2011) of an institution for the future then they need to be technically adapted to ensure inclusion and collaboration: HTML 5 promises these possibilities. This is exemplified by the most prominent providers of cloud-based services and devices (Google, Microsoft and Apple), who are already embracing the anticipated capabilities of HTML 5 in the user interfaces of their products.

HTML 5 is the next version of the HTML specification which includes new elements and capabilities which will greatly enhance the UX and add new functionality to browsers without the need for plug-in technology such as Adobe Flash. This means that compatibility and access issues will all but disappear, and access to powerful application-like online learning should be consistent regardless of user platform and device. Educators should be able to deliver the same rich experience to students without having to worry about the technology with which it is consumed.

## HTML and HTML 5

Following its inception in 1992, HTML was extended by adding more elements for layout, styling and interaction as it became more popular and led by user requirements and demands. In addition, server side languages grew to provide dynamic, data-driven content. By 1997 HTML 4 was initially released; however, documents were becoming increasingly inconsistently authored across the web, so a more structured technical approach was called for. The W3C (World Wide Web Consortium) started developing XML in 1996 and created a far more structured markup language.

While the W3C were working on XHTML 2.0, in 2004 the Web Hypertext Application Technology Working Group (WHATWG) started working on HTML 5. HTML 5 started to adopt some extra elements for a more semantic approach to web content. In 2009 the W3C stopped working on XHTML 2.0 and joined the WHATWG in development and standardisation of HTML 5 and worked towards completion of the standard by July 2012.

It must be understood that HTML 5 is not just a new version of HTML document markup but also a significant improvement to the language's UX capabilities. It will offer markup and functionality for the construction of complex web applications including video, audio, geolocation and natively rendered scalable vector and 3D graphics. This means that websites will quickly become powerful web applications comparable in capability and performance as a natively installed application but without platform dependencies. This concept is not new and Java was developed to provide many of these capabilities during the mid-1990s, offering

a rich UX in the browser. However, performance was a problem in the early days and developers wanting an improved UX opted for Macromedia's Flash tool which was optimised for the platform it was running on.

### Web applications

Websites are quickly overtaking native application technology as the way to deliver an "installed" application UX. Whilst XHTML-based websites have often been used to present dynamic content, delivered from databases, they require significant development to make the UX interactive. HTML 5 provides a standard Application Programming Interface (API) to access device features (such as accelerometers and touch events). Using this, developers can now create websites which act, and react, in a similar manner to traditional desktop applications. Prior to HTML 5 it was not possible to achieve this fully due to lack of interactive ability and standardisation.

### Semantic web content

HTML 5 promises a fundamental restructuring of information on the Internet by allowing websites to internally mark their content areas explicitly with elements such as <header>, <section> and <article>. Figure 1 shows a comparison between content markup for XHTML and HTML 5, and demonstrates how information meaning can be more clearly identified at the markup level using HTML 5. Whilst the XHTML version is structured as a document into sections, the sections represented by  elements are literally meaningless.

This is an important change to the way that information on websites will be found by search engines, as authors can now define the content more clearly.

Adoption of HTML 5 elements should result in an emerging semantic web as HTML 5 markup practices are adopted by developers and users should more easily find the content they are looking for. For academic information management this should significantly improve the effectiveness of the research process for students. A VLE whose content is created with HTML 5 markup should be much easier for its embedded search engine to index and if open access, global search engines to probe and rank.

```
<div>
  <h1>This is an XHTML page</h1>
</div>
<div>
  <div>
    <h2>article 1 title</h2>
    <p>article 1 content</p>
  </div>
  <div>
    <h2>article 2 title</h2>
    <p>article 2 content</p>
  </div>
 </div>
<div>
 <p>Copyright &copy; UoS</p>
```

```
<header>
  <h1>This is an HTML5 page</h1>
</header>
<section>
  <article>
    <h1>article 1 title</h1>
    <p>article 1 content</p>
  </article>
  <article>
    <h1>article 2 title</h1>
    <p>article 2 content</p>
  </article>
</section>
<footer>
  <p>Copyright &copy; UoS</p>
</footer>
```

Figure 1. Comparison of basic site markup in XHTML and HTML 5.

## Future VLE scenarios based on HTML 5

In this section we review how the most important new features of HTML 5 are currently supported by VLEs, how they are intended to work via an API and how they might be used in future learning scenarios.

### Dynamic applications

The communications protocol used by web sites is HTTP which operates a Request and Response mechanism. The client web browser requests data from a web server and the web server responds with data. The client must typically wait until all the data are sent before it will get a response from the server and this creates a poor UX. A recent improvement to this issue was to use a request in the background (asynchronously) using a technique called Ajax (Asynchronous JavaScript and XML). When adopted it transformed the way that websites could be used as it enabled data to be sent to and received from the server without refreshing the entire page. The most commonly used versions of Blackboard, the predominant VLE, do not make significant use of Ajax and are known to deliver a poor UX to students and staff as a result. Whilst improving some aspects of the UX, one of the problems with using Ajax in a web page is that it makes simple browser navigation awkward, as navigation activities tend to traverse between whole page content. HTML 5 now has a history API which allows the web application to use the history features within the browser, meaning that the users can now use browser implemented back and forward buttons to sensibly control sub-elements of a page modified using Ajax. A further significant problem with Ajax previously was that it did not support file upload well, however, the associated functions as specified by HTML 5 now support multiple file uploads and progress monitoring. Thus it is now possible to create a cross platform drag-and-drop file upload facility, ideal for gesture-based interfaces such as tablet devices. Overall it will offer the opportunity to create a more effective and interactive VLE; it will enable easier navigation through pages and content and therefore allow quicker creation of content by academics and submission of work by students.

### Notifications

Many applications deliver information to users which is both important and time-sensitive. Traditionally notifications from web applications are delivered as a result of refreshing page or element content and are therefore only near real-time or not at all. The new notifications API in HTML 5 allows a web site to deliver timely notifications to the client using the underlying OS notification methods (Web Notifications 2011). These are not modal alert boxes as seen in the traditional sense, but instead can appear without disrupting the UX. For example, while a user is active on a VLE the system could be performing Ajax requests in the background to have notification messages appear, even if the web browser is running in the background of the desktop. In practice the notifications API could be used for real-time reminder alerts so that students are aware of upcoming events such as deadlines or lectures. It can also be used for real-time peer-to-peer communication. This communication could be a broadcast from the tutor to all students who are enrolled on their module and active online, or it could allow students to have real-time communication with each other without third party plug-in technologies or software. Notifications can be

interactive, as the W3C has specified events which can trigger when the user interacts with the notification such as clicking on it or closing it.

**Media**

Prior to the HTML 5 specification there was no standard way of distributing media online, so Adobe Flash has typically been used to provide an acceptable cross platform solution. However Flash has its limitations: (1) it has accessibility issues, as content cannot easily be read by screen readers; (2) it requires a third party plugin and (3) it is known to be resource intensive for providing relatively simple functionality. The latter is an important issue with the shift towards mobile computing, causing vendors such as Apple and Microsoft to declare that they will not support it on their mobile platforms (Jobs 2011; Metro style browsing and plug-in free HTML 5 2011). This has since meant that Adobe have officially withdrawn its Flash support for all mobile devices as of late 2011. Accessing media from a non-mobile ready VLE is virtually impossible. However interactive learning tools created using Flash are abundant and the migration away from it will be long and slow towards HTML 5-based content. See the Graphics processing section later.

HTML 5 has new elements specifically for media delivery, the <audio> and <video> elements (4.8.6 The video element HTML 5 2011). Multiple source files can be used within the media elements to allow the browser to play one which encoding it supports. Most mobile devices now support these elements allowing media to be played on the widest range of platforms. These elements also have events which allow for accessible, external and automatic control of the media and will be used for delivery of course media content across many more platforms than previously ensuring wider inclusion to learning material.

**Geolocation**

Geolocation (the ability to identify a geographic position) is not widely supported by current VLE implementations yet, although easily extensible and open systems such as Moodle and Elgg make including this feature relatively easy.

The Geolocation API in HTML 5 allows websites and web applications to geographically locate where the client is. Whilst this has been cited, but perhaps misrepresented as a possible security issue by the media (Wakefield 2011), the benefits to the user are significant. The potential for security issues is well understood and ultimately the responsibility of the browser implementation (De Ryck *et al*. 2011). The Geolocation implementation is not guaranteed to return accurate or correct information due to its reliance on the client software providing the location-specific data.

There are two ways of obtaining this data, either through a single look-up which will return an immediate location or by "watching" the location. The location "watch" feature has the advantage in that it allows the tracking of the client (such as when it moves) and also allows for refinement of the accuracy of the coordinates returned.

From an educational perspective there are many examples of the use of Geolocation in art, science and professional education (Herrington *et al*. 2010) with social media services like YouTube being mashed with GoogleMaps and VLE content. There is also a strong prediction that it will be an important part of

emerging educational paradigms (Johnson *et al*. 2011) particularly when used in augmented reality scenarios (Pemberton and Winter 2009) or field trips. On an administrative level, an embedded Geolocation feature of a Managed Learning Environment (MLE) could offer searches for location sensitive content such as class timetables or physical proximity to learning resources.

**Offline abilities**

On mobile platforms data connections can be unreliable, particularly when on the move. This can cause problems for web applications which continually carry out background requests to keep the current user's actions synchronised with the server. With HTML 5 offline caching, the client can be sent a "manifest" file which contains references to all the files needed for a particular web application to work offline. While offline, complex data may need to be stored ready to be sent back to the server. This can be stored in a client-side database and accessed through JavaScript. This allows semi-permanent storage of data which can either be used entirely offline or synchronised to the server when the client goes online. For users this will create the benefit of seemingly unhindered access to content if they are on a mobile data network such as may be experienced on a field trip.

**Graphics processing**

Current VLE systems have little native support for advanced, interactive graphics. This is disappointing, but confirms the primary issue with the way many VLEs are used, as document repositories, rather than compelling learning experiences. This is counter to most pedagogues, such as Visual Auditory Kinesthetic (VAK), where learning is seen as requiring many differing modalities of communication, with visual and kin-aesthetic seen as particularly important for establishing comprehension of knowledge. As with any web page construct, additional functionality can be incorporated with the use of third party plug-in tools, such as Adobe Flash and Microsoft Silverlight. These tools are commonly used to create interactive learning environments, typically in the form of simple 2D "platform" games, such as key stage 1 counting trainers. However, complex concepts can also benefit from visual communication, where as part of an interactive "game" students can be confronted with virtual worlds that present either impossible scenarios or new perspectives. This approach can be highly pedagogical and cost effective (Kapp and O'Driscoll 2010); however, the limitations of plug-ins, limited API and inability to exploit available graphics hardware (neither Flash or Silverlight provide hardware acceleration of 3D graphics) mean that such approaches cannot be performed within a web-based learning environment with the same level of fidelity as can be achieved within a native application. This coupled with the incompatibility of these tools with some browser platforms (e.g. Flash is unavailable on iPhone/iPad) means that these plug-ins are neither adequate for complex visual learning environments, nor widely available enough for edgeless, anytime-anywhere learning to take place. A subtle, but perhaps pertinent, point is that accessibility for a person with physical or cognitive disability may be better provided for as graphics capability improves or can be tailored to an individual's needs (Zielke, Roome, and Krueger 2009).

HTML 5 formally introduces a Canvas support for 2D and 3D graphics, in which advanced graphics programming is enacted within a subset of the HTML document

language: webGL. Furthermore, because this is part of the standard for HTML 5, it is available on any browser supporting the standard no matter what the OS or platform, thereby ensuring that embedded graphics will operate effectively on all devices, be they desktop, net-book, tablet or phone.

**Issues with HTML 5 adoption**

As with all emerging technologies, there are issues with backwards compatibility. Older web browsers will not support the features of HTML 5 and so developers must make sure they implement graceful degradation so that users do not experience errors and non-working features. HTML 5 has only recently been finalised meaning that even the most advanced browser such as Chrome, Firefox 12, Safari 5.1 and IE 9 & 10 may not fully implement all the features. This is a problem that can linger for many years and so to ensure inclusion, organisations delivering HTML 5-based software must make the minimum requirements clear to students accessing off campus. Equally large organisations often take several years to update their standard browser offerings for staff and students so a committed strategic plan needs to be in place now to ensure sensible migration timescales.

An organisation using a well-built, interactive, HTML 5-based system could experience higher traffic to their web servers, because it is likely that students would use it more than traditional "document repository" VLE solutions because of the increased efficacy. Organisations may need to consider server performance and bandwidth to allow for HTML 5 web applications to work to their full potential as a result. Any publicly facing server is vulnerable to attack and this is not limited to an HTML 5 application, but the features it provides means that there is likely to be more data that needs securing than a current XHTML-based VLE.

An HTML 5-based VLE would not necessarily require a wholesale upgrade of all learning content within an existing VLE, but would require a fundamental change to way the underlying technology delivers its content. This would mean a new version of the organisation's VLE or shift to an alternative VLE would be required. License fees for systems such as Blackboard vary, they are not small, and are often based on numbers of users. The cost and logistics of upgrading would be very significant and mostly consumed in staff and student training as has been seen when institutions change Blackboard versions or switch from one product to another.

Tools in a VLE built using technology that could be superseded with HTML 5, predominately Flash-based simulations or Java applications, would benefit from being rebuilt in HTML 5. However the knowledge-base of Flash and Java currently far outweighs the availability of tools capable of developing sophisticated HTML 5 applications. The HTML 5 development process is currently very labour intensive, although Adobe have released a preview of their Flash-like animation tool cable of HTML 5 output – Adobe Edge and Microsoft Visual Studio 11 will create applications based on HTML 5 and JavaScript so this problem will lessen over the next few years.

There is no doubt in the commercial software and web industry that HTML 5 is a move in the right direction with most digital agencies now developing for HTML 5 instead of XHTML and this is evidenced by the sectors' current recruitment drive.

## Conclusions

The HTML 5 specification was due for completion in mid-2012, and new technologies become fashionable quickly these days. Historically new versions of the most popular browsers tend to be adopted over a 2–3 year period from introduction but this rate of adoption appears to be accelerating given the increasing global saturation of Internet usage and drive to improve the UX.

HTML 5 can easily support the scenarios described but will only do so if it is adopted properly. As the majority of websites and web applications are currently coded in XHTML, the migration to HTML 5 will take time but all indications are that the HTML 5 is strongly supported by the web industry. Developers creating new websites and web applications should be encouraged to use the emerging standard and adopt a genuinely semantic and standardised approach to their solutions. The truly semantic web will only work when everyone adopts the concept and technology and there is no going back. Until then it will require early adopters such as Google and Apple to lead the way as they are, showcasing examples of what can be achieved using HTML 5 and CSS 3 and their latest browsers.

In education we need to help drive this change by promoting the values of a single standard and to demand that those who provide our technological solutions (e.g. internal IT services) devise strategies to adopt HTML 5 versions of the applications they manage. HTML 5 provides the technological tools to help HE shape itself and migrate towards the edgeless future predicted by academics, Governments and other organisations. HTML 5 is not a fad and is usable now so organisations need to be making strategic decisions about its adoption if they are to maintain an edge in the fragile HE market.

We envisage the first apparent advantages to users to be developments in the UX and device compatibility but the long-term gains will be general accessibility, information retrieval and application sophistication. This will help HE adopt the recommended extensions to delivery to implicitly enable distance learning modes in order to improve learning in the modern society.

## References

4.8.6 The video element HTML 5. (2011) 'W3C working draft', *World Wide Web consortium*, [online] Available at: http://www.w3.org/TR/HTML5/video.html

A Test of leadership: charting the future of U.S. higher education. (2006) *A report of the Commission Appointed by Secretary of Education Margaret Spellings*, US Department of Education, Washington, DC.

Blass, E., Jasman, A. & Shelley, A. (2010) 'Visioning 2035: the future of the higher education sector in the UK', *Futures*, vol. 42, no. 5, pp. 445–453.

Comrie, A. (2011) 'Future models of higher education in Scotland: can collaborative, technology-enhanced learning offer solutions?', *Campus-Wide Information Systems*, vol. 28, no. 4, pp. 250–257.

De Ryck, P., *et al*. (2011) 'A security analysis of next generation web standards'. Technical report, in *European Network and Information Security Agency (ENISA), July 2011*, eds G. Hogben & M. Dekker. Available at: www.enisa.europa.eu/activities/application-security/web-security/web-standards?searchterm=a+security+analysis

Griffiths, L. (2011) 'Flexible learning in an inflexible society', *In Proceedings of the 11th IEEE International Conference on Advanced Learning Technologies (ICALT)*, IEEE Computer Society, Athens, USA, pp. 274–276.

Herrington, J., *et al*. (2010) 'New technologies, new pedagogies: mobile technologies and new ways of teaching and learning', *The faculty of education*, University of Wollongong [online] Available at: http://ro.uow.edu.au/newtech

Jobs, S. (2011) 'Thoughts on flash' *Apple*, [online] Available at: http://www.apple.com/hotnews/thoughts-on-flash/

Johnson, L. *et al*. (2011) *The 2011 horizon report*, The New Media Consortium, Austin, TX.

Kapp, K. M. & O'Driscoll, T. (2010) *Learning in 3D, Adding a new dimension to enterprise learning and collaboration*, Pfeiffer, San Francisco, CA.

Metro style browsing and plug-in free HTML 5. (2011) 'MSDN', [online] Available at: http://blogs.msdn.com/b/b8/archive/2011/09/14/metro-style-browsing-and-plug-in-free-HTML5.aspx

Pemberton, L. & Winter, M. (2009) 'Collaborative augmented reality in schools', *In Proceedings of the 8th International Conference on Computer Supported Collaborative Learning (CSCL2009)*, Rhodes, Greece, pp. 109–111.

Department of Education, Employment and Workplace Relations. (2008) *Review of Australian higher education: final report*. Department of Education, Employment and Workplace Relations, Canberra.

The future of higher education: How technology will shape learning. (2008) Economist intelligence unit, The New Media Consortium. Available at: www.nmc.org/pdf/future-of-higher-ed-(NMC).pdf

The future size and shape of the higher education sector in the UK: threats and opportunities. (2009) Universities London, UK.

Wakefield, J. (2011) 'HTML 5 new target for cybercriminals', *BBC news report 2 December 2011*, [online] Available at: http://www.bbc.co.uk/news/technology-16005053

Web Notifications. (2011) 'W3C Working Draft', *World Wide Web consortium*, [online] Available at: http://www.w3.org/TR/notifications/

Willets, D. (2010) 'Universities need radical overhaul, says David Willetts – minister of state for universities and science', *BBC news report 10 June 2010*, [online] Available at: http://www.bbc.co.uk/news/10278662

Zielke, M. A., Roome, T. C. & Krueger, A. B. (2009) 'A composite adult learning model for virtual world residents with disabilities: a case study of the virtual ability second life Island®', *Journal of Virtual Worlds Research*, vol. 2, no. 1, pp. 1–21.

*Research in Learning Technology*
Supplement: ALT-C 2012 Conference Proceedings


# Improving student success using predictive models and data visualisations

Alfred Essa* and Hanan Ayad

*Desire2Learn Inc, Kitchener, Canada*

*(Received 12 March 2012; final version revised 13 June 2012)*

The need to educate a competitive workforce is a global problem. In the US, for example, despite billions of dollars spent to improve the educational system, approximately 35% of students never finish high school. The drop rate among some demographic groups is as high as 50–60%. At the college level in the US only 30% of students graduate from 2-year colleges in 3 years or less and approximately 50% graduate from 4-year colleges in 5 years or less. A basic challenge in delivering global education, therefore, is improving student success. By student success we mean improving retention, completion and graduation rates. In this paper we describe a Student Success System (S3) that provides a holistic, analytical view of student academic progress.[1] The core of S3 is a flexible predictive modelling engine that uses machine intelligence and statistical techniques to identify at-risk students pre-emptively. S3 also provides a set of advanced data visualisations for reaching diagnostic insights and a case management tool for managing interventions. S3's open modular architecture will also allow integration and plug-ins with both open and proprietary software. Powered by learning analytics, S3 is intended as an *end-to-end solution* for identifying at-risk students, understanding why they are at risk, designing interventions to mitigate that risk and finally closing the feedback look by tracking the efficacy of the applied intervention.

**Keywords:** predictive models, data visualisation, student performance, risk analytics

## 1. Introduction

The need to educate a competitive workforce is a global problem. In the US, for example, despite billions of dollars spent to improve the educational system, approximately 35% of students never finish high school. The drop rate among some demographic groups is as high as 50–60%. At the college level in the US only 30% of students graduate from 2-year colleges in 3 years or less and approximately 50% graduate from 4-year colleges in 5 years or less (Bill and M. G. Foundation 2010). A basic challenge in delivering global education, therefore, is improving student success. By student success we mean improving retention, completion and graduation rates. In this paper we describe a Student Success System (S3) that provides a holistic, analytical view of student academic progress.[1] The core of S3 is a flexible predictive modelling engine that uses machine intelligence and statistical techniques to identify at-risk students pre-emptively. S3 also provides a set of advanced data visualisations

*Corresponding author. Email: Alfred.Essa@Desire2Learn.com

ISBN 978-91-977071-4-5 (print), 978-91-977071-5-2 (online)

http://dx.doi.org/10.3402/rlt.v20i0.19191

for reaching diagnostic insights and a case management tool for managing interventions. S3's open modular architecture will also allow integration and plug-ins with both open and proprietary software. Powered by learning analytics, S3 is intended as an *end-to-end solution* for identifying at-risk students, understanding why they are at risk, designing interventions to mitigate that risk and finally closing the feedback look by tracking the efficacy of the applied intervention.

## 2. Related work

Student Success System (S3) draws and builds upon work in risk analytics in education and health care. In this section we begin by describing how predictive modeling has been applied in health care and education. We also describe methodological limitations to current risk modelling approaches (e.g. Signals Project at Purdue University) in learning analytics. Current approaches to building predictive models for identifying at-risk students are stymied by two serious limitations. First, the predictive models are one-off and, therefore, cannot be extended easily from one context to another. We cannot simply assume that a predictive model developed for a particular course at a particular institution is valid for other courses. Can we devise a flexible and scalable methodology for generating predictive models that can accommodate the considerable variability in learning contexts across different courses and different institutions? Secondly, current modelling approaches, even if they generate valid predictions, tend to be black boxes from the standpoint of practitioners. The mere generation of a risk signal (e.g. green, yellow, red) does not convey enough information for designing meaningful personalised interventions. The design of S3, both from an application and research perspective, is intended to overcome these limitations.

### *2.1. Risk analytics in health care*

The use of risk analytics in health care provides an instructive example of how segmentation strategies and statistical models can lead to substantial cost savings and Return on Investment (ROI). Risk analytics is also the first step in designing personalised interventions and therefore optimizing the quality of health care delivery.

The starting point of predictive models in health care delivery is a well-known phenomenon: a small percentage of subscribers in health care plans account for a disproportionately large percentage of health care costs. Typically, 20% of the population accounts for 80% of the costs. The middle 60% of the population accounts for another 15% of the costs. Finally, the remaining 20% of the population accounts for only 5% of the costs.

Predictive models gained popularity in health care delivery initially as a strategy for managing costs. Since then analytics is being used to deliver personalised care, thereby improving the quality of health outcomes. Subscribers are first segmented into risk pools using predictive analytics. Then each pool is managed using a different intervention strategy.

- **Risk Pool 1:** the chronically ill, who need personalised and well-integrated care services
- **Risk Pool 2:** the newly diagnosed, who have an immediate need for disease specific information and timely and cost-effective options

- **Risk Pool 3:** the well, who need information on well-being, staying well and avoiding disease

Because of the cost dynamics, an accurate predictive model alongside a well-designed intervention strategy can translate into substantial ROI. As members of Risk Pool 3 in effect pay for the claims of other members and are the major source of profitability for health care plans, retaining them is critical for financial success and viability. Similarly, as members of Risk Pool 1 require constant access to services and treatment across multiple modalities, assigning a case-worker, with the ability and knowledge to negotiate and navigate on the patients behalf, can turn out to be an effective financial strategy despite the initial cost overhead.

Predictive modelling of health populations has traditionally focused on identifying the determinants of disease within anonymous populations using large-scale models. The models are then applied to segment subscribers into risk pools. Members in each risk pool receive their appropriate set of health care services or interventions. Health care is evolving now so that analytics is beginning to be used to deliver a "just-in-time" personalised approach, where predictive models and interventions are customised not just to the group but also individually for each patient. With S3 we offer a similar model of risk stratification and personalised intervention.

### *2.2. Predictive models in education*

In education predictive models for identifying at-risk students were pioneered by John Campbell and the Signals Project at Purdue University (Campbell, DeBlois, and Oblinger 2007). Similar work has been underway at a variety of institutions, including Capella University, University of Phoenix and Rio Salado College (Gilfus Education Group).

The Course Signals system and recent research studies provide strong evidence that student e-learning activities (i.e. behaviours in online environments) are predictive of course success. Regression modelling such as logistic regression has been applied to build course-based predictive models. Such models incorporate the most significant Learning Management Systems (LMS) variables such as total number of discussion messages posted, total number of mail messages sent and total number of assessments completed. The models are also supplemented with Student Information System (SIS) data, such as whether a student is taking other courses at the same time, their grades in previous courses and their current Grade Point Average (GPA).

Macfadyen and Shane have discussed the *limitations* of this approach in terms of its overall generalisability and interpretation. In particular, the generalisability of such models can be limited by the sample courses used for model fitting, or by focusing on fully online courses within one institution (Macfadyen and Dawson 2010). In addition, these approaches generate a risk indicator (high-risk, medium-risk and low-risk) or prediction but fail to provide any additional data that would allow the practitioner to devise a meaningful intervention. Imagine a physician having access to a health prediction system that indicates that a particular patient is at high-risk, medium-risk or low-risk of illness and that the prediction is 70% accurate. Such a system would be useful but highly limited because the "black box" predictive model does not provide practitioners the ability to take action in terms of designing personalised interventions.

The limitations of this modelling strategy, in terms of generalisability and interpretability, critically hinder the wide-ranging deployment of discovered models to educational institutions in a meaningful way. Hence, it limits the potential benefits that institutions can draw from their data through the development of predictive analytics capabilities for modeling learner success. S3 relies on a predictive modelling strategy that aims at closing this gap. We focus on providing a generalisable modelling strategy that is well suited for supporting the wide-ranging needs of educational institutions and for taking full advantage of predictive analytics. S3 provides an adaptive framework and a stacked-generalisation modelling strategy, whereby intelligent data analysis can be applied at all levels and graciously combined to express higher-level generalisations.

### *2.3. Challenges and opportunities*

A core problem in current approaches, as applied in Course Signals-type systems, is that a single hypothesis/model that best fits a collection of course data is chosen from the space of all possible hypotheses, and then applied to make predictions across different courses in different programmes and institutions. There are potential sources of bias in this solution. This methodology is expected to work well when courses on which the model is applied have a relatively consistent instructional model with the courses used to discover the best-fit model, but otherwise lead to a risk of systematic errors in predictions, i.e. relatively high bias.

A second key problem is that current predictive modelling systems do not provide diagnostic information. For example, Course Signals generates a prediction that indicates the identified level of risk; however, there is no direct insight into the specific causes, thus making a recommended remediation difficult to specify. Furthermore, the system does not incorporate human insight that can be leveraged via model tuning, if needed.

To enable an effective synthesis of machine intelligence and human insight, S3 provides an interpretable model and data visualisations. Another issue with a Signals-type model is that ignores or takes a narrow treatment of a key aspect of learning, namely social learning or learning network analysis. Research is beginning to show that a student's peer interactions, in the right context, can stimulate and accelerate learning. Social network analysis can be utilised to provide insights into the student learning community and the patterns of peer interactions. In S3, a social network analysis and visualisation is incorporated to capture and explain the social learning aspect.

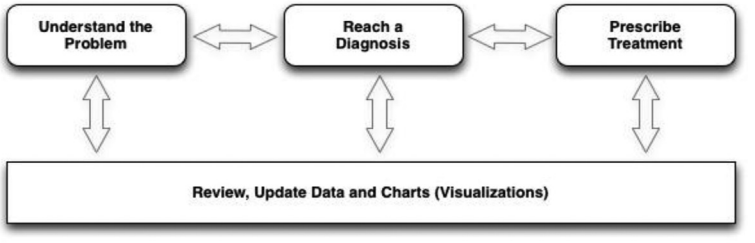
In S3, to overcome these limitations, we have implemented an ensemble strategy whereby a domain-specific decomposition allows for the development and integration of specialised models and algorithms that are best suited for different aspects of learning. In particular, in S3, the proposed decomposition provides an abstraction of learning behaviour into semantically meaningful units.

The ensemble idea provides an adaptive framework that integrates multiple models. Prediction ensembles provide a powerful and flexible paradigm for enhancing the relevance and generalisability of predictive analytics. It can also be viewed as enabling a collaborative platform, whereby institutions can plug their own proprietary model as part of the ensemble. Thus, it enables an open, community-driven R&D platform for the application of predictive models to advance learning analytics as well as institutional analytics capabilities.

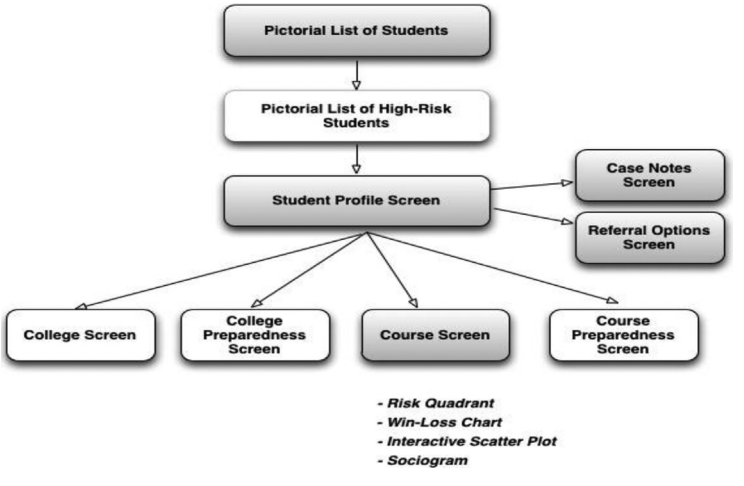
## 3. Student Success System

### *3.1. S3 functional overview*

The workflow for S3 is analogous to the workflow in a typical patient–physician relationship. As a first step, the physician tries to understand the problem. Next, the physician tries to reach a diagnosis. Next, the physician prescribes a course of treatment or makes a referral. At any point, the physician might review additional data or "charts" to round out the picture of the patient. Finally, the system behind the scenes records the intervention with the purpose of establishing a feedback loop.

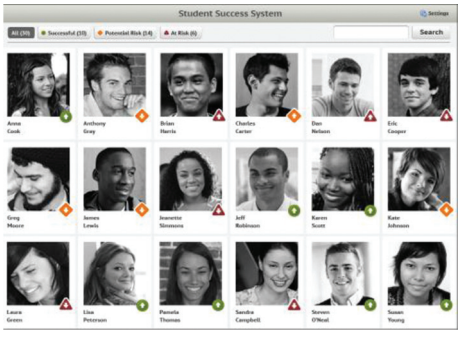



The basic screens in S3 provide a similar workflow. First, upon login to S3 an advisor or instructor (roles in S3) is presented with a pictorial list of his/her students. Associated with each student is a risk indicator: green indicates not at-risk, yellow indicates possibly at-risk and red means at-risk. The advisor or instructor can immediately click on a particular student or view the screen showing the list of students in a particular category (e.g. high risk).



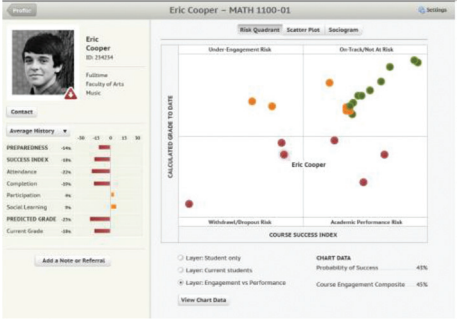

Associated with each student is his/her Student Profile Screen. The Student Profile Screen serves as a gateway to other screens, which collectively provide a comprehensive view of student academic progress and risk factors. The Notes Screen provides case notes associated with the student while Referral Screen provides all the relevant referral options available at the institution.

**Pictorial List of Students:** The primary screen of S3 displays a pictorial list of students along with a risk indicator: green, yellow and red. An up or down arrow indicates the projected trajectory of either improvement or decline.

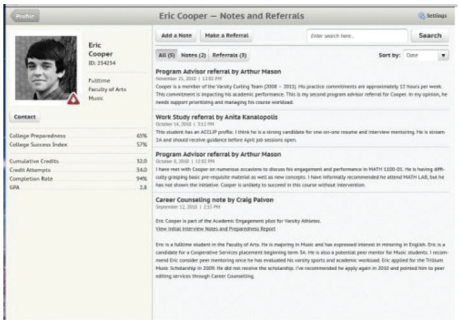



**Student Profile Screen:** The Student Profile Screen is the primary screen associated with each student in S3. It is intended to provide an at-a-glance view of a student's profile and risk factors.


**Course Screen:** By clicking on Math in the Student Profile Screen we pull up Eric Cooper's performance charts and predictions for Mathematics. An explanation of the visualisations is provided in the Section 3.2.




**Notes Screen:** The Notes Screen provides a running case history of the student's interactions with various advisors, faculty and counselors. It can be regarded as a case management tool. We can imagine scalable versions of S3 would integrate with an enterprise CRM tool to provide deeper case management functionality.



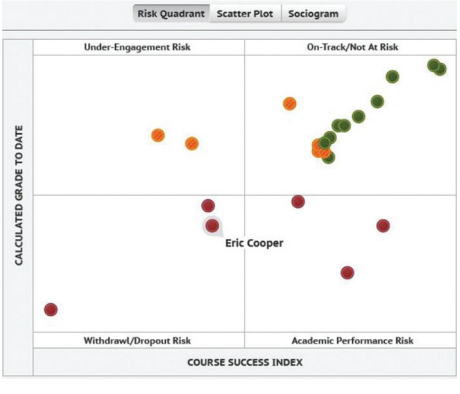

**Referral Screen:** The Referral Screen lists all relevant referral options at the institution. In addition, a communication pathway (e.g. email) is provided from within the screen rather than having to step outside the context.

In summary, the basic screens of S3 provide a synoptic view of a student's academic progress and the ability through single click interactions to isolate areas of risk or potential risk. Once we have seen that a student is projected to be at-risk, what kind of insights can we derive from the data and patterns as a basis for designing an intervention strategy? A key feature of S3 is the set of data visualisations.

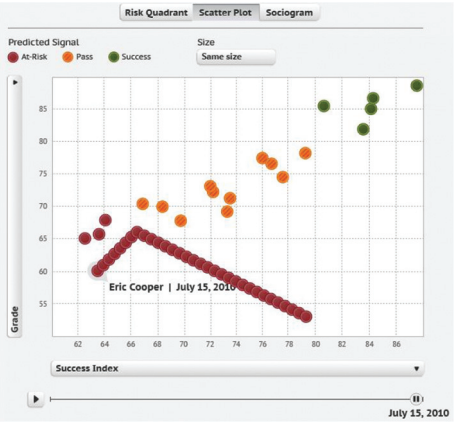
### *3.2. S3 Visualisations*

As the user of the S3 navigates through the various success indicators, the underlying models and data are presented in an intuitive and interpretable manner, going from one level of aggregation to another. Furthermore, at the course level we present dynamic and interactive chart that allow the user of the S3 to interact with the data and to explore and understand its patterns and characteristics. Some sample visualisations in S3 are displayed below:

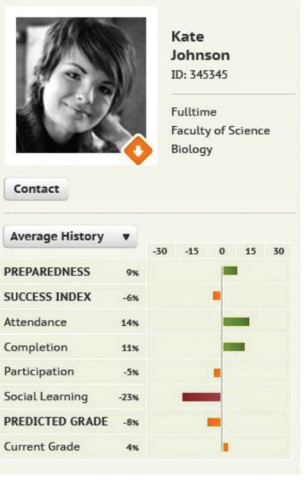
**Risk Quadrant.** At a course level each point represents a student in the class. The top right quadrant contains all students who are on-track and not at-risk. The bottom right quadrant contains students who are academically at– risk, meaning that they are projected to receive a D or F in the course. The bottom left quadrant contains students who are likely to Withdraw or Dropout. Finally, the top left quadrant contains students who are under-engaged, meaning that the students are projected to succeed in the course but their pattern of under-engagement might be a cause of concern for other reasons.



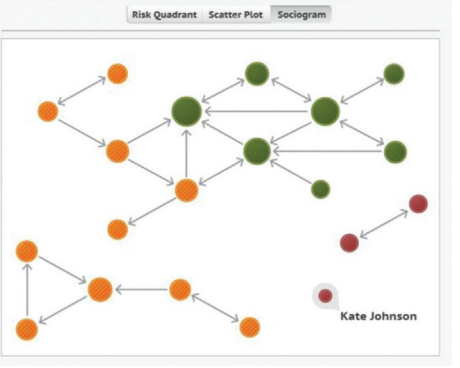
**Interactive Scatter Plot.** A user of S3 is able to explore the data that make up the predictive model by selecting the success indicators associated with each domain and visualise patterns such as cluster structures and relations between different indicators and measures of performance. The chart is also dynamic in the sense that data can be animated to visualise paths/trails depicting changes in learner behaviours and performance over time.




**Win-Loss Chart.** This chart shows at a glance how the learner compares to peers along the overall indicator and each of the sub-indicators. Options to compare to learner own history along these indicators are also presented.

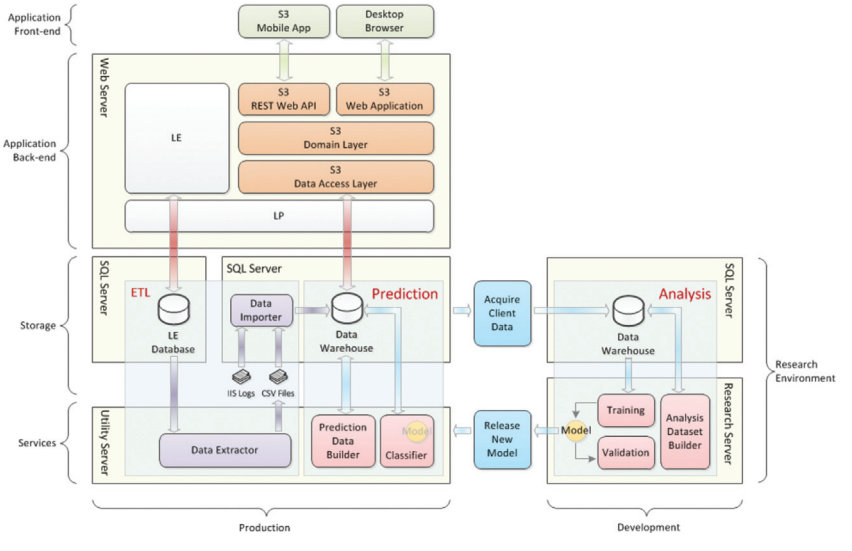



**Sociogram.** The chart shows patterns of communication or collaborations among learners. It is depicted as a network with nodes representing learners and link representing interactions. Size, colours and link width are used to indicate relevant variables. Furthermore, statistical and topological measures are used to describe patterns, cluster structures and other characteristics, and to evaluate the health of individual social learning and of the overall learning community. As part of the analysis of this domain, text mining, cognitive and learning theory are applied to extract relevant factors of learning success and to identify at-risk learners.




## 4. S3 architecture

The practical implementation of a system such as S3 in an enterprise requires multiple layers of integration and infrastructure. The overall design is consistent with a standard Business Intelligence (BI) or Analytics environment where data from operational source systems are aggregated and stored using Extraction, Transformation, Lead (ETL) processes into a data warehouse or series of Data Marts. The primary sources of data for S3 are LMS, Web Logs and SIS. But the architecture of S3 allows for ingestion of data from other data sources. Although it is beyond the scope of this paper to describe, S3 architecture follows an open, modular approach to allow maximum flexibility and integration of components.




The S3 architecture involves multiple components that serve different purposes. The above diagram illustrates the various components, their dependencies and interactions, and the data flow between them. The application itself is a web application that has a typical layered architecture. In addition to providing access to desktop browsers, it also provides access to mobile devices through a REST API.

The application uses the Analytics data warehouse for storage of its data. It integrates with the rest of the Analytics architecture, which involves synchronising data from the Learning Environment through an ETL process. In production, a classifier service will be used to make predictions of student success based on live student data. The classifier service relies on a predictive model that has been produced in development based on historical data. In order to produce this predictive model, a process by which historical data are acquired from clients is employed. An analysis process is performed on the historical data, in which a training algorithm produces a predictive model capable of predicting student success.

The application front-end is offered in two versions: a web browser and a native mobile version. The web browser version utilises an Model-View-Controller (MVC) web framework, including standard MVC controls. The native mobile version will be offered initially for the iPad. The mobile app will communicate with the S3 back-end through a REST API.

S3 visualisations will utilise the same mechanism for rendering charts on the client in both the web version as well as the mobile version. The client in both cases will host the chart on a web page (web view in case of mobile). Client-side JavaScript representation of the chart will be sent down from the server to the client, where the client will invoke a function to render the chart inside the web page/view.

The application back-end has a typical layered architecture. The front-end facing layer consists of two components: an MVC web application layer for serving the desktop web version of the application, and a REST API layer for serving the mobile app. Both the MVC web application and the REST API depend directly on the S3 domain layer.

The domain layer is where the domain entities and business logic lies. The domain layer is also responsible for enforcing security through authorisation rules. The domain layer depends directly on the S3 data access layer for storage and retrieval of data. The domain layer manages translation between data layer Data Transfer Objects (DTOs) and domain entities. The data access layer is responsible for Create, Read, Update and Delete (CRUD) operations against the database. This layer depends directly on LP data access framework, as well as stored procedures defined in the database.

The predictions made by the S3 classifier rely on student data collected from LE. LE data are synchronised to the Analytics data warehouse on a nightly basis through an ETL process. This part of the system is already established and is being used for reporting purposes. A data extraction service extracts relevant data from the LE database and stores them into Comma-Separated Values (CSV) files in a predefined location on the filesystem. A data importer component then imports the extracted data, along with IIS web logs, into the data warehouse.

Predictions are made based on a classification model that has been generated in development. A Prediction Data Builder service builds the input data used for prediction by transforming existing data in the data warehouse into a format suitable for classification. The prediction data are stored back in the data warehouse. A classifier service then goes through the prediction input data and produces the predictions. The classifier service uses a model that has been generated during development.

Data analysis is performed at development time, not in production. Analysis is done on historical data acquired from certain clients. An Analysis Dataset Builder component builds the input data used for training and validation by transforming historical data in the data warehouse into a format suitable for analysis. The analysis dataset is stored back in the data warehouse. A training component then performs

predictive modelling by learning the association of the input data to the actual output data. The output of the training component is a predictive model. A validation component then validates the model by evaluating the accuracy of predictions made on test data. The purpose of the validation component is to make sure that prediction accuracy is suitable for use in production. Once the predictive model is produced and validated, it is incorporated into the classifier component to be released in the next version of S3.

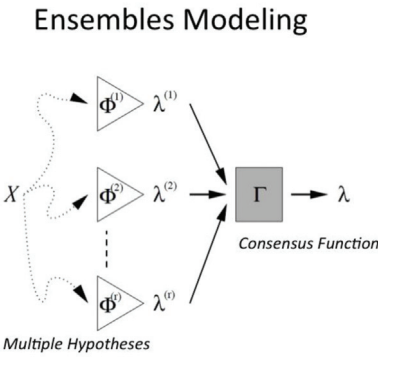
## 5. S3 modelling strategy

It is beyond the scope of the paper to describe our modelling techniques in detail. Here we provide an outline. Current approaches to building predictive models in learning analytics are faced with two serious limitations. The first limitation is the ability to generalise across different learning contexts. It is erroneous to assume that a predictive model developed for a particular course at a particular institution will be valid for a different course at the same institution, let alone at another institution. Current predictive models in learning analytics are mostly one-off and cannot be extended easily from one context to the next. The second limitation in current approaches is the ability of practitioners to interpret the results of a prediction with the aim of deriving insights or designing interventions. Current models are either black boxes or obscured in technical jargon.

### *5.1. Ensemble modeling*

Our proposed solution is to apply an ensemble method for predictive modelling using a strategy of decomposition into semantic units, where each unit has meaning in a learning context. Decomposition provides a flexible technique for generalising predictive models across different contexts. Decomposition into interpretable semantic units, when coupled with data visualisations and case management tools, allows practitioners to extend predictions towards designing personalised interventions, thereby building the missing bridge between prediction and action.

Ensemble methods are designed to boost the predictive generalisability by blending the predictions of multiple models. For example, stacking, also referred to as blending, is a technique in which the predictions of a collection of base models are given to a second-level predictive modelling algorithm, also referred to as a meta-model. The second level algorithm is trained to combine the input predictions optimally into a final set of predictions.

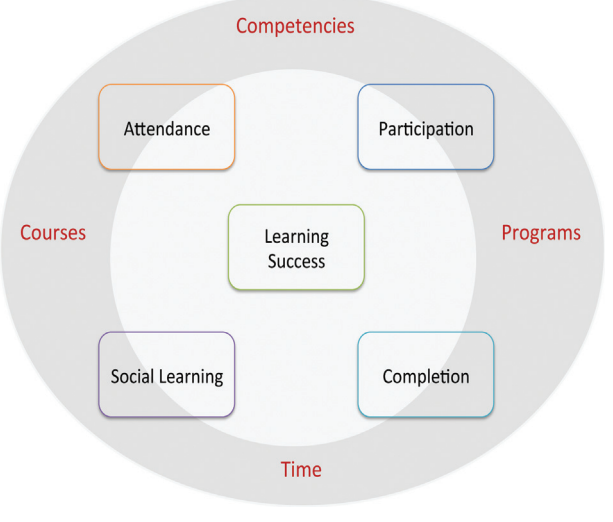


In general, ensuring that a predictive modelling algorithm matches the properties of the data is crucial in providing meaningful results that meet the needs of the particular application scenario. One way in which the impact of this algorithm-to-application match can be alleviated is by using ensembles of predictive models, where a variety of models (either different types of models or different instantiations of the same model) are pooled before a final prediction is made. Intuitively, ensembles allow the different needs of a difficult problem to be handled by models suited to those particular needs. Mathematically, classifier ensembles provide an extra degree of freedom in the classical bias/variance trade-off, allowing solutions that would be difficult (if not impossible) to reach with only a single model (Oza and Tumer 2008).

Stacking, data fusion, adaptive boosting and related ensemble techniques have successfully been applied in many fields to boost prediction accuracy beyond the level obtained by any single model (Polikar 2006). S3 represents a particular instance of the ensemble paradigm. It employs aspects of data fusion to build base models for different learning domains. Furthermore, the system utilises a stacked generalisation strategy. A best fit meta-model takes as input predictors the output of the base models and optimally combine them into an aggregated predictor, referred to as a success indicator/index. In this type of stacked generalisation, optimisation is typically achieved by applying Expectation Maximization (EM) algorithm.

A large data arising from learner-produced data trails, ubiquitous learning and networks of social interactions are giving rise to the new research area of learning analytics. These diverse and abundant sources of learner data are not sufficiently analysed via a single best-fit predictive model, as in the Course Signals system. Instead, the discovery and blending of multiple models to effectively express and manage complex and diverse patterns of the e-learning process is required.

The idea is that data from each learning modality, context or level of aggregation across the institution can be used to train base predictive models, whose output can then be combined to form an overall success or risk-level prediction. Applications in which data from different sources with different input variables are combined to make a more informed decision are generally referred to as data fusion applications.



Hence, the data fusion model is useful for building individual predictive models that are well suited for sub-domains of an application. In the context of S3 these models correspond to each data tracking domain and represent different aspects of the learning process. That is, each model is designed for a particular domain of learning behaviour. An initial set of domains are defined as: Attendance, Completion, Participation and Social Learning.

## 6. Conclusion

In this paper we have outlined a holistic ensemble-based analytical system for tracking student academic success. The core idea of the S3 synthesises several strands of risk analytics: the use of predictive models and segmentation to identify academically at-risk students, the creation of data visualisations for reaching diagnostic insights and the application of a case-based approach for managing interventions.

There are several fundamental limitations in current approaches to building predictive models in learning analytics. The first limitation is the ability to generalise across different learning contexts: how can we build predictive models that generalise across different courses, different institutions, different pedagogical models, different teaching styles and different learning designs? A second limitation is the ability to interpret the results of a prediction for the purpose of decision and action: how can a non-technical practitioner (e.g. an advisor) design meaningful interventions on behalf of an individual learner when the underlying mechanism of prediction is either a black box or obscure?

S3 applies an ensemble method for predictive modelling using a strategy of decomposition. The units of decomposition have the added property that they are semantically significant in a learning context. Decomposition provides a flexible mechanism for building predictive models for application in multiple contexts. Decomposition into semantic units provides an added bonus, namely the ability to extend our predictions towards reaching diagnostic insights and designing personalised interventions.

## Note

1. S3 is in development by Desire2Learn Inc. A beta version of the software will be demonstrated at the Alt-C conference. The production version will be available in January 2013.

## References

Bill & Melinda Gates Foundation. (2010) Next generation learning (pdf, 8 pages). *Technical report, Bill & Melinda Gates Foundation*, Seattle, USA.

Campbell, J. P., DeBlois, P. B. & Oblinger, D. G. (2010) 'Academic analytics: a new tool for a new era', *Educause Review*, vol. 42, no. 4, pp. 40–57.

Gilfus Education Group. (2012) Academic analytics – New eLearning diagnostics, [online] Available at: http://www.gilfuseducationgroup.com/academic-analytics-new-elearning-diagnostics

Macfadyen, L. P. & Dawson, S. (2010) 'Mining lms data to develop an "early warning system" for educators: a proof of concept', *Computers & Education*, vol. 54, pp. 588–599.

Oza, N. C. & Tumer, K. (2008) 'Classifier ensembles: select real-world applications', *Information Fusion*, vol. 9, no. 1, pp. 4–20.

Polikar, R. (2006) 'Ensemble based systems in decision making', *IEEE Circuits and Systems Magazine*, Third Quarter, pp. 21–45.

# Preparing the foundations for video-based practice-placement support: establishing the role from a students' perspective

Teri Taylor*

*School of Health, Community and Education Studies, Northumbria University, Newcastle upon Tyne, UK*

*(Received 12 March 2012; final rersion received 11 June 2012)*

Currently, many placement-based health programme students within the UK are supported through face-to-face visits from university staff. Whilst cited in literature as being of value, the face-to-face nature of this contact is not supported. Alternatives including video-based communications methods offer the potential for cost effective, environmentally responsible support. However, in order to establish the fitness for purpose of alternative approaches, the content and purpose of current support needs to be understood. This project aimed to investigate student perceptions of the ideal content and purpose of clinical support visits, and alternatives to the current face-to-face approach. Fifty-six Physiotherapy undergraduate students responded to questionnaires with a further nine participating in a follow-up focus group. Participants emphasised the value of the visit in guiding learning, ensuring progression and resolving arising issues, and highlighted concerns over alternative approaches. Focus group participants discussed the importance of personal and professional confidence in directing requirements for support, and went on to propose a menu of options for methods of communication. Whilst limited in some applications, video technologies may be one of the options. Overall, however, this project supports the need for consideration of individualised learning journeys within curriculum planning.

**Keywords:** addressing institutional problem; saving money; problem solving

## Background/literature

Within many health-related Higher Education programmes in the UK, it is common practice for students to be supported during placement periods through visits from university academic staff (Northumbria University 2008/9; University of Bradford 2007; University of Brighton 2009/10). As journeys may be in excess of 50 miles to visit one student, these visits, particularly in large programmes, represent a significant cost in both travel and staff time. Governing bodies throughout health care (such as the Chartered Society of Physiotherapy and the Royal College of Nursing) suggest visits to be good practice in ensuring quality placement experiences. However, government targets for carbon emissions (Great Britain 2008) and the financial constraints placed upon Higher Education (Higher Education Funding Council for England 2008) necessitate further research to support the benefits of face-to-face visits to students or to find alternative means of delivery.

*Corresponding author. Email: teri.taylor@northumbria.ac.uk

ISBN 978-91-977071-4-5 (print), 978-91-977071-5-2 (online)

http://dx.doi.org/10.3402/rlt.v20i0.19193

This project builds upon an earlier pilot project (Taylor 2009) that investigated the feasibility of using video-based communications for supportive dialogue between practice-based students, clinical educators and academic staff. Whilst experiencing a number of logistical issues, the project demonstrated the potential for this form of student support and highlighted participants' positive perceptions of the process. However, questions of fitness for purpose of the medium and the true value of the clinical visit perceived by students and clinical staff were raised. In order to evaluate fitness for purpose of alternatives to face-to-face contact, it was necessary first to understand the student experience and identify the activities that would need to be facilitated via an alternative means.

### *Student support*

Support for students whilst undertaking placement-based learning is advocated throughout the literature (Andrews *et al.* 2005; Hutchings, Williamson, and Humphreys 2005; Levett-Jones and Bourgeois 2011). However, little literature exists on how to support such a period of practice (Neill and Mulholland 2003). Whilst visits to students within placement may be the "norm" in many institutions, there is the question as to whether or not face-to-face placement visits offer value for money (Martin 2005).

Both Burns and Patterson (2005) and Martin (2005) discuss the value of clinical visits for the purpose of focusing the learning experience, balancing the needs of the students with those of the service and patients and offering an opportunity for seeking clarification or information. Whilst acknowledging that the insights and knowledge of the tutor are vital to the student-placement experience, these authors leave the face-to-face nature of clinical visits largely unexplored. Hence, though the importance of the tutor in facilitating relationships is not in question, the methods by which this is achieved needs further exploration.

### *Institutional perspective*

Whilst affirming that a student-centred approach to placement support is paramount, Henderson, Heel, and Twentyman (2007) also discuss the benefits of clinical visits in building and maintaining partnerships between clinical and educational institutions. Their research has focused upon the development of specific roles for this purpose, leading to a more streamlined, collaborative and structured approach. Their findings support earlier studies (Gore and Mitchell 1992; Martin 2005; Swinehart and Meyers 1993) that suggest clinical visits aid in cementing working relationships, ensuring placement quality and maintaining academic staff contact with "coal face" changes in policy. Whilst raising important points, the author questions whether trying to fulfil so many roles within a placement visit may overcomplicate what is essentially a student-support process. By focusing placement visits upon the student experience, alternatives to face-to-face methods are easier to evaluate for fitness for purpose.

### *Student perception*

Unfortunately, few studies specifically address student perceptions of the value of the clinical visit. Thus, it is questioned whether, to date, students have been appropriately

involved in planning for change. Gillespie (1997) undertook research into the perceptions of Occupational Therapy students regarding the value of clinical visits during a 3 year undergraduate programme. Findings of the study highlighted students' perceptions of value in supporting and recognising them during placement periods, and in providing the opportunity to address issues arising in a timely manner. However, the age of the study raises questions of validity within current institutional student-support structures.

Literature suggests value of the clinical visit in facilitating support and communication and in cementing institutional partnerships. However, the face-to-face nature of current practice lacks a clear evidence base, and apparent confusion over the purpose of clinical visiting further limits the potential of research into alternative approaches. Whilst an earlier project has supported using video-based communications for this purpose, there is a need to further consider the student voice in planning and to clearly identify the purpose and role that this medium may be asked to fulfil.

## The project

This study focuses upon mid-placement support for undergraduate physiotherapy students. However, as clinical visits are common in many other programmes and institutions, this study may be of interest to a wider audience.

### *Aim*

To evaluate the perceptions of student participants regarding the value, purpose, ideal content and delivery of clinical visits.

### *Objectives*

The objectives of the study were as follows:

- To establish participant perceptions of the purpose of the clinical visit.
- To identify ideal visit content from the participant perspective.
- To investigate participant opinion regarding alternative methods of providing support during placement periods.

## Methodology

### *Study design*

This study was undertaken as an evaluative phase (Robson 2002) of a larger Action Research cycle, which aimed to evaluate alternative, non-direct forms of contact with students during practice placements. Reason and Bradbury (2001, p. 1) describe action research as, "... a participatory, democratic process concerned with developing practical knowing ... seeking to bring together action and reflection, theory and practice, in participation with others, in the pursuit of practical solutions ...."

This methodology has been successfully used in similar practice areas (Henderson, Heel, and Twentyman 2007) where action research has been advocated

as a means of exploring issues through collaborative critical reflection, thereby "empowering each other to take actions to achieve the set goal agreed upon ..." (Kemmis 2007). As this study aims to establish changes to practice, involvement of, and "buy in" by, stakeholders are essential in ensuring engagement with change. As face-to-face placement visits may no longer be feasible within financial, time and environmental constraints faced by institutions, the perceptions of key stakeholders in the process are vital in establishing a legitimate alternative approach which does not compromise quality.

Year 2 and 3 students undertaking the Undergraduate Physiotherapy degree were approached as participants as being representative of those Physiotherapy students with the most placement experience. With large numbers of students in each year (Year 3 = 48; Year 2 = 52), initial questionnaires facilitated data collection from a large sample with a subsequent focus group used to clarify and explore issues in more depth (Robson 2002). Ethical approval was gained, and fully informed consent was received from all participants prior to data collection. Guarantees of confidentiality, anonymity of questionnaires, freedom of refusal to either participate or withdraw from participation and the freedom to refuse to discuss particular questions were given to all participants.

### *Questionnaires*

Table 1 outlines the development, distribution and data analysis methods used when issuing questionnaires to the study sample. Care was taken to reduce potential bias in

Table 1. Questionnaire design and distribution.

| | | |
|---|---|---|
| Questionnaire development | Questionnaires aimed to investigate the perceived purpose of clinical visits, the current and ideal content of these visits and the potential to support students in alternative formats | |
| Pilot | The questionnaire was piloted with five students and three staff members (not involved in the overall study), for validity and clarity prior to use | |
| Distribution | Year 2 – Distributed within a lecture, returned to module tutor within 2 weeks of distribution | Year 3 – Distributed via email for return within 2 weeks of distribution. Due to delays for ethics, Year 3 students were undertaking placement during data collection, hence email distribution |
| Response rate | 83% ($n = 42$) | 27% ($n = 13$) |
| Questionnaire Section 1 content | Closed questions – demographic data (Buckingham and Saunders 2004) | |
| Section 2 | Likert scale responses. Questions asking indication of levels of agreement with statements relating to perceived value of mid-placement, face-to-face visit (Ruane 2005) | |
| Section 3 | Open questions and additional qualitative responses combined with tables giving examples of responses – questions exploring perceptions of purpose and ideal content of mid-placement visit | |
| Section 4 | Likert scale responses indicating agreement or otherwise, with suggestions for alternative approaches to successful (student is progressing well and passing the placement) and failing placements (student is at risk of not passing the placement at the final assessment) | |

accordance with guidance on the wording and structure of questionnaires (Bowling 2002; Ruane 2005).

### *Focus groups*

A focus group was used to follow up on questionnaire results. Participants from both year groups were asked to indicate interest in participating, with a volunteer sample of nine participants taking part as a result. Table 2 outlines the approach to this focus group.

Limitations of this project included the potential for bias created through researcher involvement in the focus group. However, as an insider researcher (Senge 1998) and placements coordinator for Physiotherapy, the author had considerable prior understanding of the complexities associated with the support of Physiotherapy students during placement learning. This was felt to offer more advantages than disadvantages to progression of discussions. Care was taken to ensure that the researcher remained neutral whilst facilitating discussions, offering no opinion and avoiding the use of leading questions (Buckingham and Saunders 2004).

### *Data analysis*

Differences in distribution between Year 2 and Year 3 students are felt to account for the difference in questionnaire return rates (Year 2 = 82% response, Year 3 = 27% response). Whilst raising issues of bias associated with non-respondents (Buckingham and Saunders 2004), comparison of responses from Year 2 and 3 students did not suggest marked differences in trends, though individual sections of the questionnaire were not statistically compared.

Questionnaire data were entered on to a Microsoft Excel spread sheet with qualitative comments also listed on a separate worksheet. Excel was used to analyse the data, producing descriptive statistics (see Figures 1–5 and Table 4). Questionnaire results were also subject to thematic analysis and were used to inform focus group discussion; major themes arising included the following:

- Concerns over changing from a face-to-face to alternative form of placement support.
- Differences between successful and failing placements and the impact upon alternatives to face-to-face support methods.
- Content areas perceived to be important for mid-placement support.

These were used to initiate exploration of unclear issues and majority opinions within the focus group.

Table 2. Focus group details.

| | |
|---|---|
| Timing | Two weeks following closing date for questionnaire responses |
| Participants | Nine participants (all female, with five Year 3 students and four Year 2). The researcher as facilitator |
| Location and duration | Clinical Skills Centre of the school duration – 1 hour 15 minutes |
| Data collection | Focus group content recorded for transcription. Researcher took notes re: key emerging themes and points raised (Kumar 2005, p. 124). |

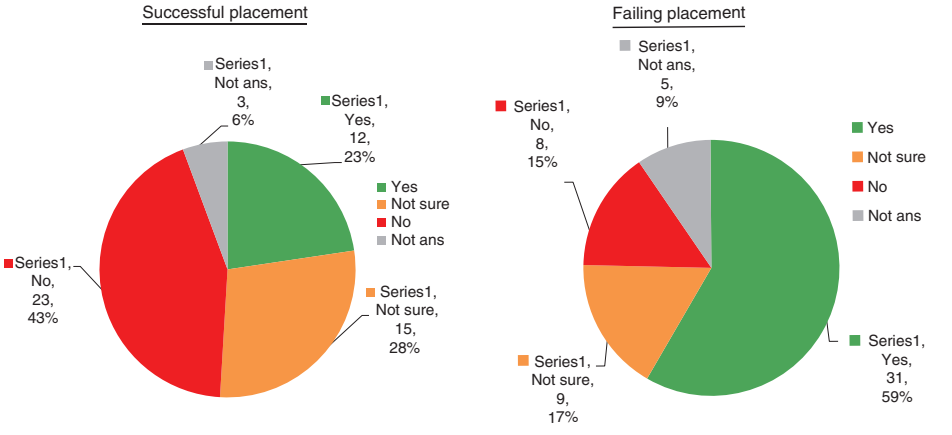



Figure 1. To attend university for half a day, approximately half way through the placement.

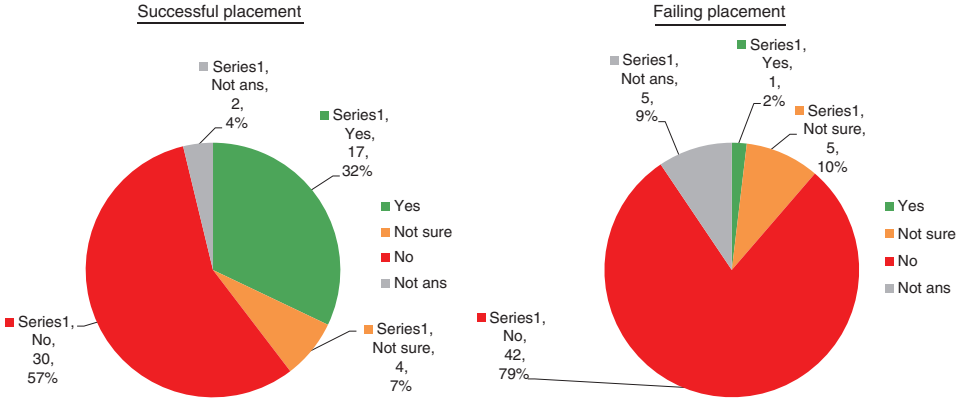



Figure 2. To communicate with an academic member of staff via the telephone only.

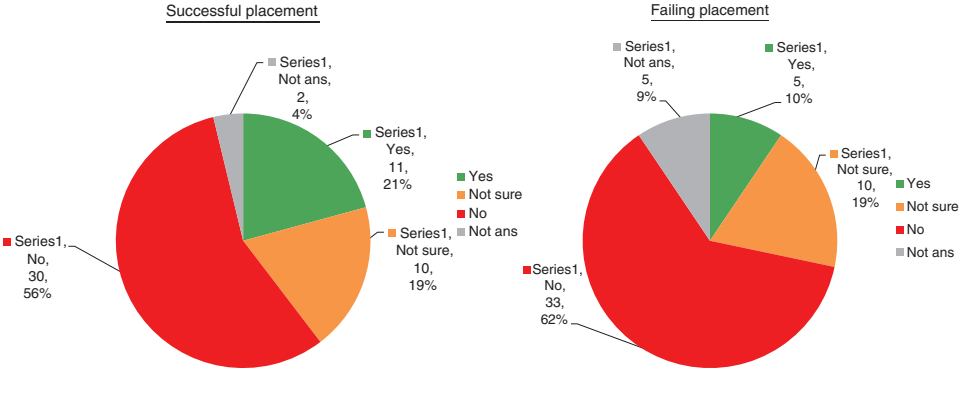



Figure 3. To communicate with the visiting tutor via a video link approximately half way through the placement (with training provided prior to the link).

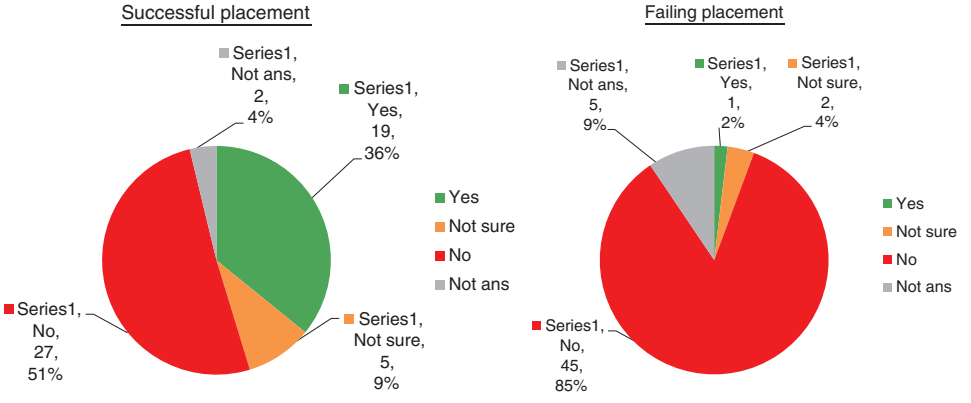



Figure 4. To communicate with an academic member of staff via email only.

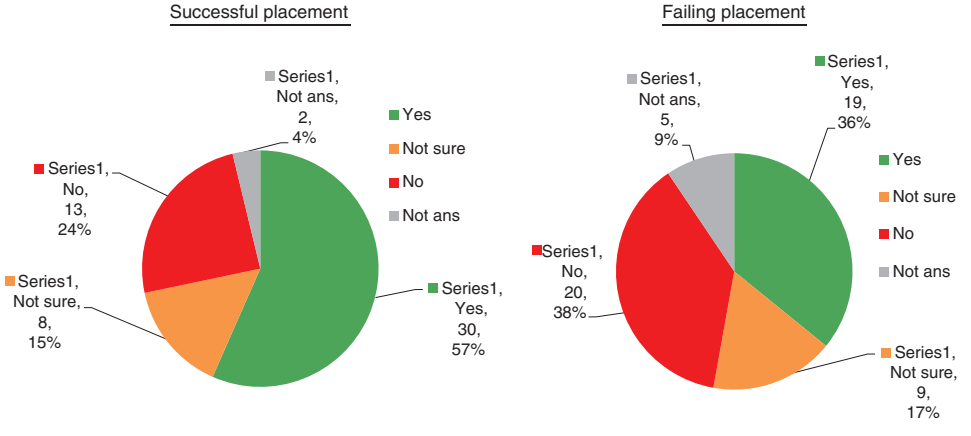



Figure 5. To attend a "drop in" session where the tutor is available on site at a specified time if required.

The focus group transcript was subject to manual thematic analysis, and participants unanimously agreed that the themes generated were a true reflection of discussion.

## Results

Results arising from data analysis have been grouped with reference to project outcomes: alternatives to current placement contact; visit content and purpose of visits. Each of these areas is discussed below.

### *Alternatives to current face-to-face mid-placement contact*

Students were asked to consider alternatives to the current mid-placement, face-to-face visit from a member of the academic team, for both successful and failing placements. Results for this area are shown in Figures 1–5.

Overall, there appeared to be a split in opinions relating to altering practice for successful placements. On average, 57% of the student responses were either positive

or unsure about alteration of practice to: attending university-based meetings; communication via telephone; communication via email; communication via video link or attendance at a drop in session. However, this average was reduced to 41% when considering the failing placement.

### *Focus group*

Participants were asked to consider their reasons for preferences/concerns over potential alternative formats of placement support. The group was split between those who were confident in their skills and progress and those who were not. Table 3 shows how opinions differed between participants in the two year groups.

Participant perceptions echoed the researcher's professional experience that students confident in their clinical skills were often happier with less direct contact and support from the University.

Lengthy discussions focused upon the differing requirements of successful and failing placements. Three participants stated that during a successful placement, any contact, including telephone, email or video link, that provided a "prompt to undertake paperwork" was enough. Three participants strongly felt that this was not the case and that, being unsure of their own skills; a face-to-face visit provided an appropriate level of "hand-holding". The remaining three participants were unsure regarding this issue. One participant commented that:

> I'm not a very confident person and as you know, I like to make sure that what I'm doing is right ... the visit from the tutor is really important and I would not like to not have it ... I need to know that I'm doing ok and the more people who tell me the better.

Participants concluded that students had individual support needs that depended upon progress within the placement, the relationship with the educator and their own levels of personal confidence:

> I think that's right ... I'm not confident so I like someone to hold my hand ... it might be a pain and I know that I can be ... but it makes me feel better to know that someone I know is coming to see me.

Another participant agreed, stating that:

> I agree, there are some students who aren't comfortable with placements or aren't very confident people... I'm happy with a phone call, but I'm quite confident and I suppose that if I weren't, I would prefer to see someone than chat with them on the phone... it's not so personal.

Table 3. Division of opinion within the focus group regarding levels of confidence in clinical skills.

| Numbers of students from each year group | | Level of confidence with clinical skills expressed during discussion |
|---|---|---|
| Year 3 | Year 2 | |
| 3 | 2 | Confident with progress in the clinical environment |
| 1 | 1 | Satisfied with progress to date but not confident about clinical skill level |
| 1 | 1 | Under-confident and needing a lot of support |

Further discussions concluded that a student's level of confidence in both themselves and in their placement were the primary influence on support needs. On prompting, no one could define what a face-to-face visit provided that a video-based or telephone call could not. A participant commented that:

> I don't know, it's like ... easier to get a hug from a person, it would be a bit weird if you needed a hug from a TV screen.

The participants were asked whether they had ever needed or received a hug and all stated that they had not:

> But it's the thought that they might that might help... you can't get a tissue over the phone.

The study findings strongly indicate a requirement to consider individual need when planning for changes in methods of support. Previous research into the use of video-based support has involved primarily confident volunteers (Taylor 2009) who highlighted positive experiences with the process. Their experiences may reflect the discussions outlined above. However, it is also questioned whether perceptions may be altered with familiarity and exposure to an alternative practice. This is discussed further in the discussion section of this paper.

### *Visit content*

Students were asked to rank suggested areas for visit content in order of their perceived importance, results from this question are shown in Table 4. Support for emerging issues ($n = 30$) and learning and continuing professional development (CPD) ($n = 27$) appeared high on the participants' preferred content list.

Whilst supportive dialogue could arguably be conducted through any audio or audio-visual medium, the involvement of written work in CPD development may pose a problem for non-direct support methods. In addition, support for arising placement issues may involve sensitive or emotive elements. Thus, further investigation is needed into the ability of any alternative support method to fulfil this role.

### *Purpose of visits*

On being asked to define the purpose of clinical visits, participants demonstrated clear understanding of the wider role in overall student support with answers such as, "to facilitate learning", "check that the learning opportunities are at the right level", "... to deal with any issues that come up ...," "to help solve any conflicts between the student and educator".

This again raises questions about the ability of alternative formats of communication to meet these needs.

## Discussion

The findings of this study highlight a number of factors influencing participant perceptions of the support process, and identify areas of content perceived to be important within clinical visits. These findings are considered in the context of planning for change in the section below.

Table 4. A table indicating participant responses to a question asking them to rank proposed clinical visit content in order of perceived importance to them (highlighted areas indicate greatest number of responses in each category).

| | Rank 1 | Rank 2 | Rank 3 | Rank 4 | Rank 5 | Rank 6 | Rank 7 | Rank 8 | Rank 9 | Rank 10 | Not ans |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Guidance for issues arising from the placement itself | 21 | 9 | 2 | 2 | 0 | 4 | 1 | 2 | 0 | 0 | 12 |
| Discussion of personal issues that have arisen outside of the placement | 0 | 0 | 2 | 1 | 2 | 3 | 3 | 6 | 9 | 15 | 12 |
| Discussion of personal issues that have impacted upon the placement performance | 1 | 2 | 6 | 4 | 8 | 4 | 5 | 4 | 7 | 0 | 12 |
| Guidance regarding University assessments (not placement assessment) | 0 | 0 | 0 | 1 | 1 | 1 | 2 | 6 | 9 | 21 | 12 |
| Guidance regarding the marking of placement performance | 1 | 1 | 1 | 2 | 8 | 6 | 6 | 9 | 7 | 0 | 12 |
| CPD development | 2 | 9 | 4 | 8 | 3 | 7 | 6 | 2 | 0 | 0 | 12 |
| Support for conflicts arising between the student and the clinical educator | 5 | 9 | 10 | 6 | 5 | 1 | 3 | 0 | 1 | 1 | 12 |
| Clarification of things/issues that the clinical educator has said or raised | 2 | 4 | 7 | 11 | 4 | 5 | 2 | 3 | 3 | 0 | 12 |
| Help in focusing your placement learning | 10 | 6 | 6 | 4 | 4 | 4 | 4 | 1 | 1 | 1 | 12 |
| Discussion about the quality of the placement | 0 | 2 | 3 | 1 | 7 | 5 | 8 | 8 | 4 | 3 | 12 |

### *Risk*

Whilst this study aimed to evaluate the potential for a range of non-direct support methods, arising issues indicate limitations of non-visual approaches. Focus group discussions advocated consideration of individual student need rather than a ''one size fits all'' approach. However, one student discussed the desire to ''hide any problems'' and the ease of doing this via telephone. Supported by the researcher's experience with some students, where non-verbal cues have been the only indication of arising problems, this statement suggests a potential risk with non-direct support for vulnerable individuals. Whilst non-verbal communication alters as a result of power relationships, social behaviour and cultural (Moukheiber *et al.* 2010; Slessor, Phillips, and Bull 2010), the combined availability of non-verbal and verbal cues via video link may offer a lower risk option than audio only media such as the telephone or email.

### *Practical application of video media*

Consideration of the ability of video media to fulfil the placement support role has been easier with a clearer understanding of students' support needs. For example, in preparation for CPD discussion, students are asked to prepare and then share with the tutor, relevant materials utilising PowerPoint software would facilitate sharing of this material via video-mediated technology. Alternatives might include the use of Google Docs or Microsoft Office Live applications which enable individuals to collaborate, review and amend written materials via technology, in ''real time'', thus enabling discussion and amendment of placement paperwork in electronic form. However, installation of software across geographically and organisationally diverse locations, combined with the necessity to upload or scan materials, may make this overly complex.

It may also be possible to use hardware such as smartphones to photograph and then forward written work for review, whilst also conversing via video link. Whilst this process is laborious and does not allow for ''real time'' correction of documents, it may provide an easy alternative access, providing network or Wi-Fi connections are viable.

### *Benefits of video-based support*

A requirement to work with written materials may limit non-direct support methods on the grounds of perceived reduction in quality of experience. However, for failing students requiring multiple visits or those attending extremely distant placements, the use of video-based support may offer an attractive and cost-effective alternative to face-to-face. Consideration needs to be given, though, to use of the medium within difficult or emotive situations.

### *Emotional support*

As concerns over non face-to-face contact had been substantial, focus group participants were asked to explore this in more depth. Whilst unable to identify specific threats of non-direct support, the focus group emphasised concerns over difficulties with emotional dialogue. This was supported by a further study comparing video and face-to-face conversations in which concerns over the quality

of one-to-one support via video link were raised (Taylor 2011). Kappas and Krämer (2011) discuss the limitations of video-based media in meeting the emotional needs of interpersonal interaction, identifying changes in interaction as a result of video mediation and an impact upon accurate utilisation of non-verbal cues. However, they also discuss adaptation of individuals and development of coping strategies with exposure to the medium. This supports the need for further research into placement application following familiarisation with the medium.

### *The student voice*

Focus group discussions moved beyond the objectives of the study to discuss the students' views on an ideal approach to placement support. This "tangent" provided valuable insight and supports the value of focus group methodology within this study. Focus group participants proposed a "menu" of communication options consisting of an initial consultation via telephone between the clinical educator, academic tutor and student, used to assess progress of the placement and the student's needs, followed by an agreed upon method of mid-placement support. Choice would be between telephone, email, face-to-face and video-based communications. Whilst agreement with this proposal was unanimous, one participant clarified that face-to-face contact would be given if desired, with no expectation to vary the format.

Whilst literature tends to focus on the institutional value of visiting students in practice settings (Gore and Mitchell 1992; Martin 2005; Swinehart and Meyers 1993) this project also supports this in the context of the student voice. In an increasingly consumer-led environment, student voice has become stronger in driving policy and practice (Higher Education Academy 2010). The study findings, however, do not support the broad introduction of alternatives to face-to-face placement contact. The importance of individualised learning in guiding education in health (Krackov 2011) is recognised, and careful consideration of individual need within financial constraints is recommended when proposing any change to practice.

## Conclusion

This study has explored student perceptions of practice-placement support and the potential for alternatives to current approaches. Questionnaires focused on identifying the purpose and content of mid-placement contact. Participants perceived importance of placement support in motivating, supporting and developing learning, progressing CPD and addressing arising issues. As such, non-direct approaches need to be able to meet these requirements. Potential methods of sharing placement documentation whilst engaging with video-mediated dialogue are discussed.

Participants expressed concerns over non-direct support for emotional situations and went on to propose a menu of options for support, tailored to the needs of the individual. Discussion highlighted the potential for video-mediated communications to vulnerable students to reduce the risks of providing support via audio only media. The need for further study into the role of familiarisation with technologies, in enabling successful implementation, is proposed.

Educators are under increasing pressure to implement technology into curricula and a "one size fits all" approach is common. Whilst change is often at the system rather than the local level (Hartley 2010), it is essential to consider individualised learning if institutions are to maintain quality whilst also adhering to economic

drivers. Ultimately, in a time of increasing university fees the student voice has to be balanced with a sound evidence base for practice if institutions are to remain credible.

**Acknowledgements**

The author would like to thank Dr Diana Jones, Dr Helen Smith and Associate Professor Gail Wilson for their ongoing support and guidance. Transcription for this project was funded by the International Pedagogic Research and Evaluation Network (CETL-IPREN) and undertaken at Northumbria University, UK.

**References**

Andrews, G., *et al*. (2005) 'Professional roles and communications in clinical placements: a qualitative study of nursing students' perceptions and some models for practice', *International Journal of Nursing Studies*, vol. 43, no. 7, pp. 861–874.

Bowling, A. (2002) *Research Methods in Health. Investigating Health and Health Services*, Open University Press, Buckingham.

Buckingham, A. & Saunders, P. (2004) *The Survey Methods Workbook*, Polity, Cambridge.

Burns, I. & Paterson, I. M. (2005) 'Clinical practice and placement support: supporting learning in practice', *Nurse Education in Practice*, vol. 5, no. 1, pp. 3–9.

Gillespie, H. (1997) 'Benefits of visiting OT students during fieldwork placements', *British Journal of Therapy and Rehabilitation*, vol. 4, no. 6, pp. 307–331.

Gore, L. & Mitchell, P. (1992) 'School-based training: a local authority perspective', *Cambridge Journal of Education*, vol. 22, pp. 351–361.

Great Britain. (2008) *Climate Change Act 2008: Elizabeth II*, Chapter 27, The Stationary Office, London.

Hartley, P. (2010) 'So how far have we travelled? Reflections on the journey from 2006'. *SOLSTICE International Conference 2010*, Edge Hill University, UK. Available at: www.edgehill.ac.uk/solstice/files/2011/12/solstice2010_brochure.pdf

Henderson, A., Heel, A. & Twentyman, M. (2007) 'Enabling student placement through strategic partnerships between a health-care organization and tertiary institutions', *Journal of Nursing Management*, vol. 15, no. 1, pp. 91–96.

Higher Education Academy. (2010) 'Supporting students' unions and institutions to engage students in shaping their learning experience. A joint NUS, HEA project funded by HEFCE', [online] Available at: http://www.heacademy.ac.uk/ourwork/universitiesandcolleges/studentengagement/nuspartnership

Higher Education Funding Council for England. (2008) 'A new "University challenge": consultation on proposals for new higher education centres', [online] Available at: http://www.hefce.ac.uk/pubs/hefce/2008/08_27/#exec <http://www.hefce.ac.uk/pubs/hefce/2008/08_27/ >

Hutchings, A., Williamson, G. R. & Humphreys, A. (2005) 'Supporting learners in clinical practice: capacity issues', *Journal of Clinical Nursing*, vol. 14, pp. 945–955.

Kappas, A. & Krämer, N. C. (2011) *Face-to-Face Communication Over the Internet, Studies in Emotion and Social Interaction Series*, Cambridge University Press, Cambridge, UK.

Kemmis, S. (2007) Becoming Critical: Education, Knowledge and Action Research, Routledge, (Kindle Edition) Amazon 2011.

Krackov, S. (2011) 'Expanding the horizon for feedback', *Medical Teacher*, vol. 33, pp. 873–874.

Kumar, R. (2005) *Research Methodology: A Step-by-Step Guide for Beginners*, SAGE, London.

Levett-Jones, T. & Bourgeois, S. (2011) *The Clinical Placement: An Essential Guide for Nursing Students*, Churchill Livingstone, Chatswood, NSW, Australia.

Martin, H. (2005) 'Do placement visits offer value for money?', *British Journal of Occupational Therapy*, vol. 68, no. 4, pp. 186–187.

Moukheiber, A., *et al*. (2010) 'Gaze avoidance in social phobia: objective measure and correlates', *Behaviour Research and Therapy*, vol. 48, no. 2, pp. 147–151.

Neill, N. & Mulholland, G. (2003) 'Student placement – structure, skills and e-support', *Education and Training*, vol. 45, no. 2, pp. 89–99.

Northumbria University (2008/9) BSc (Hons) Social Work. Level Four. Year 1. Practice Handbook and Portfolio: Practice Skills: Working with People. SW0404.

Reason, P. & Bradbury, H. (2001) 'Inquiry and participation in search of a world worthy of human aspiration', *Handbook of Action Research: Participative Inquiry and Practice*, eds P. Reason & H. Bradbury, SAGE, London, p. 1.

Robson, C. (2002) *Real World Research*, Blackwell, Oxford.

Ruane, J. (2005) *Essentials of Research Methods: A Guide to Social Research*, Blackwell, Oxford.

Senge, P. (1998) 'Sharing knowledge', *Executive Excellence*, vol. 15, pp. 11–12.

Slessor, G., Phillips, L. & Bull, R. (2010) 'Age-related changes in the integration of gaze direction and facial expressions of emotion', *Emotion*, vol. 10, no. 4, pp. 555–562.

Swinehart, S. & Meyers, S. (1993) 'Level 1 fieldwork: creating a positive experience', *American Journal of Occupational Therapy*, vol. 47, pp. 68–73.

Taylor, T. (2009) 'Video conferencing: an effective solution to long distance student placement support?', *Widening Participation and Lifelong Learning*, vol. 11, pp. 44–48.

Taylor, T. (2011) 'Video conferencing vs talking face-to-face: is video suitable for supportive dialogue?', *International Journal of Therapy and Rehabilitation*, vol. 18, no. 7, pp. 392.

University of Bradford. (2007) 'Student support. School of health studies: radiography', [online] Available at: http://www.brad.ac.uk/health/rad/support.php.

University of Brighton. (2009/10) 'Faculty of Health and Social Science, School of Health Professions, BSc (Hons) Physiotherapy & MSc in Rehabilitation Science; Clinical/Practice-based Education Handbook'. Available at: http://www.brighton.ac.uk/sohp/placements/StudentHandbook2009-10.pdf

*Research in Learning Technology*
Supplement: ALT-C 2012 Conference Proceedings


# Learning design: reflections upon the current landscape

Yishay Mor*[a] and Brock Craft[b]

[a]*Institute of Educational Technology, Open University, Milton Keynes, UK;* [b]*Institute of Education, University of London, London, UK*

*(Received 12 March 2012; final version received 15 June 2012)*

The mounting wealth of open and readily available information and the accelerated evolution of social, mobile and creative technologies call for a re-conceptualisation of the role of educators: from providers of knowledge to designers of learning. This call is reverberated by the rising trend of research in learning design (LD). Addressing this, the Art and Science of Learning Design workshop brought together leading voices in the field, and provided a forum for discussing its key issues. It focused on three major themes: (1) practices, methods and methodologies, (2) tools and resources and (3) theoretical frameworks. This paper proposes a definition of LD, reviews the main contributions from the workshop, and suggests some challenges for future research.

**Keywords:** learning design; epistemology; design methods; design frameworks; theory development; representations

## Introduction

In 1993, Alison King called for a repositioning of educators, "from sage on the stage to guide on the side". The intervening two decades has seen dramatic changes in learning, arising in no small part by innovations in technology, and recently, we are also witnessing a shift of emphasis: from distributors of knowledge to designers of learning experiences. The idea that artefacts could be devised to induce learning is not new. Indeed, Buck (1989) provides a fascinating account of learning machines designed by Archimedes, Hero of Alexandria, Quintilian – a first century Roman teacher and rhetorician, and others, to teach subjects from philosophical principles to gladiator skills. Our era is distinguished by the wealth of open and readily available information, and the accelerated evolution of social, mobile and creative technologies. These offer learners and educators unprecedented opportunities, but also entail increasingly complex challenges. Consequently, the role of educators needs to adapt from distributors of knowledge to designers for learning. Educators may still provide access to information, but now they also need to carefully craft the conditions for learners to enquire, explore, analyse, synthesise and collaboratively construct their knowledge from the variety of sources available to them. The call for such a repositioning of educators is heard from leaders in the field of technology-enhanced learning (TEL) and resonates well with the growing culture of design-based research in education. Yet, it is still struggling to find a foothold in educational practice. We contend the root causes for this discrepancy are the lack of articulation of design

*Corresponding author. Email: yishay.mor@open.ac.uk

ISBN 978-91-977071-4-5 (print), 978-91-977071-5-2 (online)


http://dx.doi.org/10.3402/rlt.v20i0.19196

practices and methods in education, the lack of a culture of teacher-as-designer among practitioners, and the shortage in tools and representations to support such practices.

In October 2011, the Art and Science of Learning Design (ASLD) workshop was convened in London, UK, to explore the tools, methods and frameworks available for practitioners and researchers invested in designing for learning, and to articulate the challenges in this evolving domain.[1] The workshop adopted an unconventional design, whereby contributions were shared online beforehand, and the event itself was dedicated to synergy and synthesis. In a novel bid to make the workshop as open as possible, even to external participants, social media tools were employed to support dissemination contemporaneously with the events at the workshop. Participants were encouraged to collaboratively write and critique online, to use twitter and to contribute to workshop sessions in CloudWorks,[2] a social networking site for finding, sharing and discussing learning and teaching ideas and designs.

The goal of this paper is to summarise the outputs of the workshop and to reflect on them in reference to the need to evolve the role of educators, and the barriers to this. We begin by presenting and comparing the common definitions of learning design (LD), and clarifying its links to the related but distinctly different field of instructional design (ID). We then identify some of the current issues in the field, which led to and informed the ASLD Workshop. We then present an overview of the emerging themes identified at the workshop, and guide the reader through further reading of the workshop outcomes. In the Discussion section, we examine three of the current issues and challenges raised by the workshop contributions. We explore their relevance and value to educators, content and technology developers and researchers, and finally raise some conclusions about the road ahead.

## Learning Design: clarifying the concept

Design refers to the deliberate shaping of form in response to function. LD is the act of devising new practices, plans of activity, resources and tools aimed at achieving particular educational aims in a given situation. Smith and Ragan (2005) have proposed that LD might be more accurately described as Design for Learning. LD should be informed by subject knowledge, pedagogical theory, technological know-how and practical experience. At the same time, it should also engender innovation in all these domains and support learners in their efforts and aims.

### *Common definitions*

Koper (2006) states:

> A 'learning design' is defined as the description of the teaching-learning process that takes place in a unit of learning (e.g., a course, a lesson or any other designed learning event). The key principle in learning design is that it represents the learning activities and the support activities that are performed by different persons (learners, teachers) in the context of a unit of learning.

Conole (forthcoming) defines LD as:

> A methodology for enabling teachers/designers to make more informed decisions in how they go about designing learning activities and interventions, which is pedagogically informed and makes effective use of appropriate resources and technologies.

> This includes the design of resources and individual learning activities right up to curriculum-level design. A key principle is to help make the design process more explicit and shareable. Learning design as an area of research and development includes both gathering empirical evidence to understand the design process, as well as the development of a range of Learning Design resource, tools and activities.

These definitions suggest two seemingly competing approaches. Falconer, Finlay, and Fincher (2011) note that LD has two roots in TEL. The first is the construction of computer systems to orchestrate the delivery of learning resources and activities for computer-assisted learning. The second is in the need to find effective ways of sharing innovation in TEL practice, providing an aid to efficiency and professional development for teachers. Koper's definition above represents the first tradition, while Conole's is derived from the second.

The discussions at the ASLD workshop indicated a growing recognition for the need for dialogue across these two traditions, which should lead to common definitions that acknowledge LD both as a noun (activity) and a verb (the product of that activity). Such dialogue would promote the establishment of common standards – not just in the technical sense (such as the existing Integrated Management Systems-Learning Design (IMS-LD) specification), but in terms of scientific standards, best practices and measures of quality.

### *Learning Design and Instructional Design*

In considering the current research in LD, it is impossible to disregard the significant history of work in the domain of Instructional Design (ID). The domains of ID and LD share many broadly overlapping attributes, which can lead to some confusion among both researchers and practitioners.[3] As noted by Reiser (2001), ID traces its origins to the Second World War and the need of the US military to rapidly train large numbers of people in performing technical tasks both for domestic production of war materiel and for combat. LD is more often associated with the emergence of online and TEL research in the late 1990s and 2000s. But their differences stem from more than terminology or historical origin. Most notably, they have differing theoretical backgrounds, with ID emerging from a Skinnerian perspective, strongly influenced by Tyler's ideal of behavioural objectives (Reiser 2001) while LD stems from the constructivist perspectives of Piaget and Vygotsky. This has led to a focus on learning artefacts and methods, and in designing and delivering instruction according to instructional events and their relevance to specific psychomotor learning skills. A systematic approach to task decomposition and training characterised the early methods of ID, which were later modified with the arrival of systems engineering techniques from the domain of computing and more recent research into Cognitive Load (Sweller 1994).

By contrast, the relatively recent emergence of LD research has seen more emphasis on the learner's context and in constructivist interpretations of the learning process, situated within an ecology of technological tools to support this. Perhaps because of its longer history, the use of ID has received greater attention in the USA than elsewhere. MacLean and Scott (2001) also observe that the level of professional support and development for LD is more developed in the USA and Canada than in the UK. Another consequence of these different historical and theoretical perspectives is that there are both gaps and overlaps in the literatures, and the research within one community, which might be particularly relevant to the other,

may go untapped or unnoticed. The bodies of research remain relatively siloed and cross publication is infrequent, though this is tending to diminish. Rather than take one side or the other, we feel that it is beneficial to recognise the differing traditions and the useful research from both communities by incorporating it into our thinking about LD. At the same time, our work has centred on technology-enhanced approaches to the challenging task of supporting teaching and learning, and as this is the fount from which LD has emerged, it seems a more suitable title for this collection.

### *Current issues*

Dobozy (2011) highlights the challenges of TEL, quoting Slavin's (2002) claim that "education today is at much the same pre-scientific point as medicine was a hundred years ago", and argues that LD holds a viable potential for addressing these challenges. Yet, she contends, this potential is undermined by competing traditions and terminologies and lack of clarity, as demonstrated by Berggren *et al*. (2005):

> The initial immersion into Learning Design gave us an experience of confusion over terms, concepts and tools. Our group constantly mixed discussions amongst conceptual points, codified specifications and multiple tools which are in various stages of development. Teachers will need to grasp these differences before a meaningful discussion can take place.

Dobozy notes that even the basic terms are contested – the field itself is called "learning design" (Dalziel 2006) "instructional design" (Chu and Kennedy 2011) "curriculum design" (Ferrell 2011) "educational design" (Goodyear and Ellis 2007), "design for learning" (Beetham and Sharpe 2007) and "design-based learning" (Wijen 2000). While it is arguable that some of these are distinct perspectives, these distinctions need to be clarified and the synergies and overlaps among the traditions need to be explored. Cameron (2010) provides a concise review of the varying perspectives on "what is learning design". Building on this, Debozy suggests a classification of three types of LD: Type 1 – LD as a concept, Type 2 – LD as a process and Type 3 – LD as a product. Types 2 and 3 correspond to the distinction proposed by Falconer, Finlay and Fincher (2011) above.

The ASLD workshop attempted to address the key issues of LD to meet some of its challenges. Mirroring Debozy's classification, it was organised by the three major themes: (1) practices, methods and methodologies, (2) tools and resources and (3) theoretical frameworks. The first theme is akin to Dobozy's LD Type 2 and the second to the means of production (related to Type 3). The last workshop theme centred on concepts (Type 1), to identify synergies between the other two themes. The following sections provide an overview of the contributions made by workshop participants. The full text of these contributions is available from the open, online CloudWorks repository[2] of the workshop outputs. This overview is a snapshot of a particular event, and as such is, by necessity, incomplete. Yet, we believe it marks a significant point in time and highlights some of the key current debates in the field.

## Theme 1: practices, methods and methodologies

The first thematic group of the workshop[4] considered some contemporary trends in the practices, methods and methodologies of LD – from identifying and rationalising

the stages of the LD process, to evaluating the results of design work done and interpreting what is, and is not, effective. Much of the literature in LD describes the representations or the products of design work, but not the process itself.

Dimitriadis, Prieto and Villagrá-Sobrin emphasise the importance of the contextual logistics of learning, when designs and design patterns are enacted in the classroom. They use several examples to illustrate how high- and low-level formalisations impact on teachers and learners.

Another formalisation, the IMS-LD approach, has attracted noteworthy attention within the LD community and has gained a lot of support from researchers since its introduction in 2003. However, its uptake has remained relatively slow, given this level of interest. Responding to this observation, Griffiths, Goddard, and Wang describe a study comprising interviews of practitioners and leading participants in the IMS-LD community which attempts to explain the limitations to its adoption.

Ronen-Fuhrman and Kali describe a study of graduate students in education – the very people who will put contemporary research in LD into practice. They show how the students' use of an epistemological model to aid them in designing learning in TEL modules closes gaps between theoretical and applied knowledge. This work also informs the refinement of the innovative Design Principles Database which could be useful not only to students but to seasoned teachers.

Masterman notes the importance of evidence in assessing the effectiveness of the design process, using a case study to describe a method of analysing LD software. She also highlights the important consequences for LD more broadly.

**Theme 2: tools and resources**

In addition to the difficulty of developing design practices and methods, an ancillary challenge is that there are few tools to support the LD process itself. Many other design-focused disciplines have seen the emergence of significant software supports for their work. Architects and engineers have their CAD tools, Graphic Designers and 3D animators can choose from a range of creative suites, and there are even packages for designing performative activities such as theatrical lighting. Yet, to support the complex process of LD there are comparatively few tools to choose from. The second thematic group of the workshop, along with a hands-on session, explored some of the most recent and promising of them.[5]

As research in LD has evolved, so have a modest number of software systems and platforms to support design activities. These implement methods of LD at various levels of learning activity and provide support for sharing work with others. Familiar representations are important for giving teachers new ways to engage with technology to enhance LD. Helen Walmsley illustrates this principle by presenting a simple pedagogic template in the form of a Word document. She shows how this can be extremely effective for creating curriculum and tool-focused e-Learning, at this micro-level of design work, where planning individual learning activities or sessions occurs. An emphasis on sharing and co-edition are also the basis for a case study in the use of LdShake, described by Hernández-Leo *et al*. (2011). Their focus on social-network-oriented work and sharing across teams and institutions also illustrates how innovations in LD can affect larger initiatives across schools and communities. Ryberg *et al*. describe a method that emphasises collaboration in the design process. They show how this can help in creating activities for networked learning.

Several tools were offered for hands-on experience, and are available on CloudWorks. As a contrasting view on the challenges raised for IMS-LD in the first thematic group, Katasmani and Retalis present CADMOS, a system that achieves the challenge of providing support with IMS-LD compliance. Their study shows how the right tool for the right purpose can support teachers meaningfully in their work by addressing specific challenges such as the "separation of concerns". Derntl presents another system, OpenGLM, which supports the first two levels of IMS-LD design, but without the need to be an expert in the framework. It provides a set of visual representations and simple interactions to aid practitioners in designing and sharing IMS-LD-based designs. Effective representations and ease-of-use are intimately intertwined. As noted extensively in Botturi and Stubbs (2008), significant challenges are raised by the difficulty of meaningfully expressing such representations. Brasher *et al*. have created a tool for just this purpose – CompendiumLD, and reflect upon what they have learned in using and refining it. They show how the challenges of representation will likely become more acute as technology-supported LDs become richer and more complex.

Learning design systems can equally operate at more strategic level to support thinking about both learning and the required resources to support it. Laurillard and Masterman describe such a system, the Learning Designer, that supports such decisions with an Artificial Intelligence (AI)-driven recommender engine, and facilitates sharing and reuse.

Rounding out this panoply of software, Emin and Pernin describe both a conceptual framework for LD (ISiS), and a tool (ScenEdit) that implements it. Their work straddles two thematic stands and highlights how tight integration of a theory-driven conceptual framework, can be effectively manifested in software.

**Theme 3: theories and frameworks**

Theory generation can be achieved both from findings of research aimed at theory building and from reflection on practitioner experiences. Such theories can support the development of conceptual frameworks of knowledge to support the LD process. The third thematic group of the ASLD workshop explored some of the emergent theories and knowledge frameworks that are influencing the epistemology of LD.

Prieto, Dimitriadis, and Villagrá-Sobrin introduce the notion of "atomic patterns" and use it to propose a representation for LDs (especially collaborative LDs using multiple Information Communications Technology (ICT) tools), which tries to depict how the activities are actually enacted by the teacher in the classroom. Fleshing out an applied perspective, Burgos illustrates some of the practical challenges of implementing IMS-LD, providing evidence from several learning scenarios and a case study. The challenges to adoption of IMS-LD serve to illustrate both the importance and the difficulty of providing a unified foundation on which to support learning designers and practitioners. Examining how this and other kinds of TEL innovation work can impact on everyday teachers, McKinney takes a look at the broader picture by highlighting how the gaps between theory and practice can be bridged. Both fine-grained issues in classrooms and more systemic issues must be addressed. She outlines significant methodological considerations that should be considered by designers and researchers in this context. Cook further explores some considerations researchers must be sensitive to, by showing how research can be scaled up for large techno-pedagogical designs. Two projects illustrate the attendant

challenges. They shed light on means of grappling with the difficult problems of building systems for larger audiences of learners in mobile and informal learning contexts – a key area of theoretical development that is just beginning to see significant attention. New frameworks will have to be developed to support work in this area. Persico and Pozzi call for just this kind of research, framework development. They conclude this thematic strand with an analysis that provides a multi-dimensional framework drawing together a number of approaches and tools for design of learning. Their analysis of four key areas of research in LD, namely, representation, abstraction, pedagogic approach and types of end users identifies essential areas for further investigation. This conclusion to the thematic strand on Theories and Frameworks shines a light on the potential areas for fruitful continued research and development and provides an epistemological capstone to the thematic strand on Methods and Tools.

**Discussion**

The ASLD workshop is indicative of the growing awareness and vibrant community of researchers and practitioners shaping the field of LD. On the one hand, the field is maturing, with the articulation of theoretical and methodological frameworks, the availability of a wide choice of tools, and the buildup of a cannon of literature. On the other hand, several challenges are emerging as clear directions for future work.

The first is the standardisation of a comprehensive representational infrastructure. By this, we mean human-readable and writable, textual and graphical (and perhaps dynamic) forms of describing LD at multiple levels of abstraction. One metaphor that surfaced repeatedly at the ASLD workshop was that of musical notation. Musical notation enables complex, expressive, dynamic, time-based content to be captured accurately and succinctly, yet expressively. Moreover, the symbolic, formalised abstraction of the content does not impede interpretation and reproduction. On the contrary, capturing the "essence" of a musical work formally facilitates the creative expression of the composer, whilst leaving room for interpretive reproduction of musicians. In the genre of Jazz for example, the music of Miles Davis can be interpreted in myriad ways by many musicians, without losing its essential nature. Teachers have frequently related their desire to record the essence of their practice (at various levels of detail and with many kinds of activities), whilst not sacrificing their ability to be creative, due to limitations of the means of capture. This analogy breaks down, if pushed too far. In the end, one would like to be able to assert that a particular teaching method or approach leads to better learning experiences among students, and some formative or summative assessment metric is inevitably involved in demonstrating this. Music, a largely aesthetic endeavour, is less germane to this kind of evaluation. However, the impact of notation on dissemination, sharing and indeed creative expression of music would be hard to understate. Another useful analogy is the language of architectural drawings. An architect's design process is scaffolded by a progression through a series of graphical and other articulations of their ideas. These representations afford a discussion of the design objectives and the means chosen to address them. They eventually require the interpretation of craftsmen in order to be implemented as physical buildings, yet any professional can assess whether a certain construction matches the design prescribed in the drawings. The field of LD enjoys an impressive array of textual, graphical and computational representations of practice and resources. However, it still lacks the canonical "score"

or "drawing" of music and architecture. In order for educators to effectively orchestrate learning within this landscape, they need to perceive themselves, and indeed to be perceived by society, as techno-pedagogical designers. A design attitude should be reflected in the production of new resources, as well as in effective configuration and customisation of existing ones. The design paradigm has established itself in TEL research. Yet, for it to attain its full desired impact, it needs to develop a common language and make this language accessible to the widest possible audience. Such a language, and the related media of interaction, should allow experts and novices to extract design knowledge from experience, articulate it in a coherent manner, connect, combine and manipulate it, and use it to resolve new challenges.

This leads us naturally to the second challenge: a common language of LD needs to be supported by appropriate tools and community spaces, which will streamline the process of constructing, validating and using design knowledge, making it open, accessible and transparent. It cannot be a uniform, centralised entity. It must allow for a diversity of discourse by establishing a set of open protocols and standards over which an open process of massively collaborative knowledge building can thrive. This process needs to be embedded in the culture of the professional community. Again, recent years have witnessed the flourishing of an impressive arsenal of LD tools. Yet, no single tool can address the requirements of all practitioners in all situations. Nor can a single tool can provide a "round trip" solution, which must support the full cycle from inception, through challenge definition, conceptualisation, elaboration, enactment, evaluation and reflection and back to remodelling. Thus, the question is: how do we create a platform for open, live, malleable, dynamic representations of design knowledge in TEL, supporting collaborative processes of design for learning, learning to design and learning by design, and including the broadest community possible in these processes?

A common language of LD and a comprehensive platform to support it are necessary but not sufficient conditions for the emergence of a professional culture of LD. An open platform for LD might promote the emergence of a new culture of educational practice, in which expertise is rapidly and effectively shared, critiqued and aggregated. It will provide for the wide proliferation of cost-effective and robust educational practices, making effective use of technological advances as they appear. However, such a culture will not be instigated simply by the existence of the right tools and representations. The existing LD community needs to engage in a massive project of professional development, driving a new perception of educational profession, as a rigorous creative practice of perpetual innovation. The principles underlying the LD approach, the practices reifying those principles, and the methodological framework binding those together need to be made explicit and communicated to the widest audience possible.

Finally, the uncharted links and dimensions of a design approach to educational practice need to be exploded. Other design disciplines emphasise their creative and aesthetic qualities. How are these reflected in the domain of LD? Should we promote them, and how? Can we evaluate the creative and aesthetic qualities of a particular LD process or artefact? On the other hand, design approaches have recently gained prominence in educational research. Should we, and can we, forge links between design-based research and research-inspired practice? Several studies (Ronen-Fuhrmann, Kali, and Hoadley 2008; Voogt *et al.* 2011) demonstrate the value of engaging in design for teachers' professional development. This is no surprise, if we

acknowledge educators' continuous development as a learning process, and consider learning-by-design as a powerful pedagogical framework. Mitch Resnick (2007) calls for re-conceptualising education to promote the creative society. In order to do that, we need to re-conceptualise teaching as a creative practice. With this in mind, we propose a view of LD as a grounded rigorous creative process of perpetual educational innovation: grounded in a well-defined concrete context of practice, rigorous in its attention to scientific evidence and pedagogical theory, and creative in its approach to generating new solutions to educational challenges.

## Conclusion

We believe that the great deal of enthusiastic research in LD will continue to be fruitful for the key recipients of our industrious efforts: other researchers, teachers and not least, learners. Indeed many of us within the research community have been or continue to be teachers and learners, ourselves. These communities come in many shapes and from diverse, rich traditions and cultures around the world. Yet, they face the common challenges of mutual collaboration, sharing and support in the complex social and increasingly, socio-technical process that is twenty-first century learning. The work represented here is emblematic of the aspirations to meeting this challenge and confirms that we are heading in the right direction, together.

## Acknowledgements

The ASLD workshop, and the writing of this paper, where supported by the Learning Design Grid theme team of the STELLAR network of excellence (www.ld-grid.org).

## Notes

1. http://www.ld-grid.org/workshops/ASLD11
2. http://cloudworks.ac.uk/cloudscape/view/2349
3. For an interesting overview of the lively discussions surrounding this, see "LD vs. ID", a Cloudworks discussion thread at http://cloudworks.ac.uk/cloud/view/2536
4. http://cloudworks.ac.uk/cloud/view/5790
5. http://cloudworks.ac.uk/cloud/view/5793 and http://cloudworks.ac.uk/cloud/view/5841

## References

Beetham, H. & Sharpe, R. (2007) *Rethinking Pedagogy for a Digital Age*, Routledge, New York, NY, 10001.

Berggren, A., *et al*. (2005) 'Practical and pedagogical issues for teacher adoption of IMS learning design standards in moodle LMS', *Journal of Interactive Media in Education*, vol. 2005, no. 1, pp. 1–24.

Botturi, L. & Stubbs, S. T. (2008) *Handbook of Visual Languages for Instructional Design. Theories and Practices*, Information Science Reference, Hershey, PA.

Buck, G. H. (1989) 'Teaching machines and teaching AIDS in the ancient world', *McGill Journal of Education/Revue des sciences de l'éducation de McGill*, vol. 24, no. 1, pp. 31–54.

Cameron, L. (2010) 'How learning design can illuminate teaching practice', *The Future of Learning Design Conference*, Wollongong, Australia, December 2009, [online] Available at: http://ro.uow.edu.au/fld/09/Program/3/

Chu, S. & Kennedy, D. (2011) 'Using online collaborative tools for groups to co-construct knowledge', *Online Information Review*, vol. 35, no. 4, pp. 581–597.

Conole, G. (forthcoming) *Designing for learning in an open world*, Springer, New York.

Dalziel, J. R. (2006) 'Lessons from LAMS for IMS learning design', *Sixth International Conference on Advanced Learning Technologies, IEEE*, Kerkrade, Netherlands, July 2006, pp. 1101–1102.

Dobozy, E. (2011) 'Typologies of learning design and the introduction of a "LD-Type 2" case example', *eLearning Papers*, Vol. 27, no. 27, pp. 1–11. [online] Available at: http://elearningeuropa.info/sites/default/files/asset/In-depth_27_1.pdf

Falconer, I., Finlay, J. & Fincher, S. (2011) 'Representing Practice: Practice models, patterns, bundles', *Learning Media and Technology*, vol. 36, no. 2, pp. 101–127.

Ferrell, G. (2011) *Transforming Curriculum Design – Transforming Institutions*, Briefing paper, Joint Information Systems Committee (JISC), [online] Available at: http://www.jisc.ac.uk/publications/briefingpapers/2011/bpcurriculumdesign.aspx

Goodyear, P. & Ellis, R. (2007) 'Students' interpretations of learning tasks: Implications for educational design', *Proceedings of the ASCILITE 2007 conference*, Singapore, pp. 339–346.

Hernández-Leo, D. *et al*. (2011) 'LdShake: Learning design solutions sharing and co-edition', *Computers & Education*, vol. 57, no. 4, pp. 2249–2260.

Koper, R. (2006) 'Current research in learning design', *Educational Technology & Society*, vol. 9, no. 1, pp. 13–22.

Maclean, P. & Scott, B. (2007) 'Learning design: Requirements, practice and prospects', *Campus-Wide Information Systems*, vol. 24, no. 3, pp. 187–98.

Reiser, R. (2001) 'A history of instructional design and technology: Part II: A history of instructional design', *Educational Technology Research and Development*, vol. 49, no. 1, pp. 57–67.

Resnick, M. (2007) 'Sowing the seeds for a more creative society', *Learning and Leading with Technology*, vol. 35, no. 4, pp. 18–22.

Ronen-Fuhrmann, T., Kali, Y. & Hoadley, C. (2008) 'Helping education students understand learning through designing', *Educational Technology*, vol. 48, no. 2, pp. 26–33.

Slavin, R. E. (2002) 'Evidence-based education policies: transforming educational practice and research', *Educational Researcher*, vol. 31, no. 7, pp. 15–21.

Smith, P. L. & Ragan, T. J. (2005) *Instructional Design*, Wiley, Hoboken, NJ, USA.

Sweller, J. (1994) 'Cognitive load theory, learning difficulty, and instructional design', *Learning and Instruction*, vol. 4, no. 4, pp. 295–312.

Voogt, J., *et al*. (2011) 'Teacher learning in collaborative curriculum design', *Teaching and Teacher Education*, vol. 27, no. 8, pp. 1235–1244.

Wijen, W. (2000) *Towards design-based learning*, Technische Universiteit, Eindhoven, NL, OGO brochure, No 2. Educational Service Centre, [online] Available at: http://w3.tue.nl/fileadmin/stu/stu_oo/doc/OGO_brochure_1_EN.pdf

*Research in Learning Technology*
Supplement: ALT-C 2012 Conference Proceedings


# Automatic generation of analogy questions for student assessment: an Ontology-based approach

Tahani Alsubait*, Bijan Parsia and Uli Sattler

*School of Computer Science, The University of Manchester, Manchester, UK*

*(Received 13 March 2012; final version received 19 June 2012)*

Different computational models for generating analogies of the form "A is to B as C is to D" have been proposed over the past 35 years. However, analogy generation is a challenging problem that requires further research. In this article, we present a new approach for generating analogies in Multiple Choice Question (MCQ) format that can be used for students' assessment. We propose to use existing high-quality ontologies as a source for mining analogies to avoid the classic problem of hand-coding concepts in previous methods. We also describe the characteristics of a good analogy question and report on experiments carried out to evaluate the new approach.

**Keywords:** e-assessment; ontology; analogy questions; relational similarity; vector space model; corpus-based evaluation

## Introduction

Effective assessment of students is an ongoing process that should be carried out in different phases of education: planning as in diagnostic assessment, teaching and learning as in formative and self-assessment, reporting and recording as in summative assessment. At the same time, designing and implementing effective assessments, with increased numbers and higher expectations of students, is time consuming and expensive (i.e. hard). Adding an "e" prefix to assessment is not magical; interested practitioners still face some knotty problems. Typically, e-assessment refers to using technology to manage and deliver assessment. It can also provide automatic grading and instant feedback, especially with objective tests (e.g. multiple-choice). However, a major and yet unsolved problem of e-assessment is the generation of high-quality assessment items automatically (or at least semi-automatically). We argue that moving from a delivery model to a generation model is the key to the transition from e-assessment systems of today to those of the next generation. Moreover, technology-aided generation of assessment items is useful only if backed by an accepted pedagogical theory, which is usually missing in current generation models. In fact, this applies to both automatic and manual generation methods. For example, Paxton (Paxton 2001) carried out some empirical evaluations and reported that multiple-choice tests are often not well-constructed.

Part of the problem is the dearth of evaluation metrics. One possible solution is to use Item Response Theory (IRT) (Kehoe 1995; Miller, Linn, and Gronlund 2008; Mitkov, An Ha, and Karamani 2006) which describes the statistical behaviour of

*Corresponding author. Email: tmsubait@gmail.com

ISBN 978-91-977071-4-5 (print), 978-91-977071-5-2 (online)

http://dx.doi.org/10.3402/rlt.v20i0.19198

good/bad questions by following a procedure to measure three parameters: (1) possibility of guessing the correct answer, (2) tuned difficulty of test items and (3) proper discrimination between good and poor students. IRT can guide us in the evaluation of test items. However, we need a theory that guides us in the generation-process of test items that conform to the desired characteristics. A possible solution that we conjectured is to use a similarity-based approach to generate questions of different characteristics. For example, it is expected that questions with high similarity between the stem and key parts and less similarity between stem and distractors are easy questions (or perhaps guessable). Note that in MCQ terminology, the question part is called the stem, the correct answer is called the key and wrong answers are called distractors. Similarly, the question would be more difficult if the distractors were more similar to the stem compared to the key answer (e.g. lexical similarity).

To alleviate the burden of manual generation of assessment items, we propose an approach to automatically generate MCQs from Description Logics (DL) (Baader *et al*. 2007) ontologies. DL ontologies are engineering artefacts that provide formal and machine processable descriptions of the basic notions of a domain of interest. Many high-quality ontologies already exist, which suggests that mining such rich resources for assessment questions might be fruitful. Recently, a handful of studies explored the generation of MCQs from ontologies (Al-Yahya 2011; Fairon 1999; Holohan 2005, 2006; Papasalouros, Kotis, and Kanaris 2008; Zitko *et al*. 2008; Zoumpatianos, Papasalouros, and Kotis 2011), but very little research has been done on theoretical, empirical and evaluation aspects. Most of the proposed methodologies generate questions of the form "What is X?" or "Which of the following is an example of X?" based on class–subclass and/or class–individual relationships. These types of questions can be criticised as assessing lower levels only (e.g. recall) of Bloom's taxonomy of learning objectives (Bloom and Krathwohl 1956). Moreover, it is unlikely that a real test will consist of items that are all of this kind; hence, it is crucial to design approaches capable of generating questions of other kinds.

In this article, we describe the design and report on evaluation of a new approach for generating questions that require higher cognitive ability such as retrieving and mapping analogies of the form "A is to B as C is to D".

## Analogy questions

Analogical reasoning is based on comparing two different types of objects and identifying points of resemblance. Hence, similarity plays a major role in analogical reasoning. In multiple-choice analogy questions, the student is given a pair of words and is asked to identify the most analogous pair of words among a set of alternative options. The required task is to recognise the relation between the pair of words in the stem and to find the pair of words that has a similar underlying relation. Multiple-choice analogy questions are used in various educational tests (e.g. college entrance tests such as SAT, GRE). As an example, see the question (GREguide 2012) in Table 1 taken from a sample of GRE verbal analogy questions:

Different computational models (Falkenhainer 1988; Gentner 1983; Larkey & Love 2003; Winston 1980) for analogy-making have been proposed over the past 35 years. These models are based typically on comparing two structured representations encoded in predicate logic statements [e.g. Structure Mapping Theory (SMT) (Falkenhainer, Forbus, and Gentner 1989; Gentner 1983)]. The SMT is more

Table 1. A Sample multiple-choice analogy question [GREguide (2012)].

| Stem | CUTLERY: KNIFE:: |
|---|---|
| Choices | (A) machinery: fuel<br>(B) lumber: saw<br>(C) furniture: chair<br>(D) suitcase: handle |
| Key | (C) furniture: chair |

sensitive to higher order relations (e.g. cause, imply). These models are founded on the premise that detecting analogies are useful for transferring knowledge between two domains (usually called base and target). In this article, we take a different approach: first we define *Analogy* as a function that takes two representations and returns a numerical value [0,1] representing their analogy. Examples of such functions will be discussed later. Then we show how to use this function to develop an MCQ generator that is capable of controlling the difficulty of questions. In addition, the Analogy function can be used to generate only plausible (i.e. expected to be functional) distractors. To achieve this, we use thresholds $\Delta_1$, $\Delta_2$, $\Delta_3$, to parameterise our notion of analogy question (see Definition 1 below). We also define the function *Relatedness* that takes two concepts and returns their relatedness value [0,1]. This function can be used to filter the generated pairs in the stem, key and distractors according to a threshold $\Delta_R$. Again, examples will be discussed later.

**Definition 1** Let Q be an analogy question with stem $S = (A,B)$, key $K = (X,Y)$ and a set of distractors $D = \{D_i = (E_i,F_i) \mid 1 < i \leq \max\}$. We assume that Q satisfies the following conditions:

(1) *The stem S, the key K, the distractor $D_i$ are all good (i.e. $Relatedness(A,B) \geq \Delta_R$, $Relatedness(X,Y) \geq \Delta_R$, $Relatedness(E_i,F_i) \geq \Delta_R$).*
(2) *The key K is significantly more analogous to S compared to the distractors (i.e. $Analogy(S,K) \geq Analogy(S,D_i) + \Delta_1$).*
(3) *The key K is sufficiently analogous to S (i.e. $Analogy(S,K) \geq \Delta_2$).*
(4) *The distractors should be analogous to S to an extent (i.e. $Analogy(S,D_i) \geq \Delta_3$).*
(5) *Each distractor $D_i$ is unique (i.e. $Analogy(S,D_i) \neq Analogy(S,D_j)$).*

As an example of a *Relatedness* function, one can consider pairs of class names that are referenced together in at least one ontological axiom (perhaps in different sides of the axiom) as closely related classes. For instance, if we have an axiom in our ontology that defines X in terms of Y (e.g. $X \sqsubseteq \exists\, r.Y$) then *Relatedness*(X,Y) is greater than zero. For our current purposes, we designed a *Relatedness* function that captures class-subclass relations between pairs of named classes that correspond to one of the structures in Figure 1. As you might notice, we restricted our attention to those structures that have at most one change in direction and at most two steps in each direction. We also ignored some structures caused by multiple inheritances (e.g. 1d1u). These restrictions were considered to avoid too difficult (and probably confusing) questions. Also, these restrictions seem to be more aligned with human-generated analogy examples. While in the most general case, one should consider

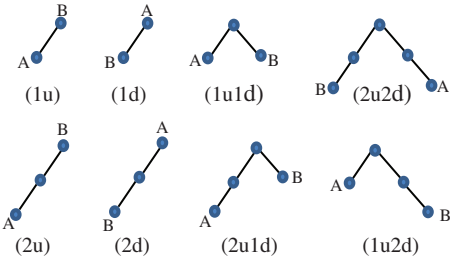



Figure 1. Closely related structures of class-subclass relations [labels represent no. of steps and direction (up or down)].

pairs with arbitrary related classes (e.g. by considering user-defined relations), for current purposes we only consider class-subclass relations. This simplifies the problem considerably in several dimensions while still generating quite a few candidate pairs (as we will see later).

As discussed above, we would like to be able to control the difficulty of the questions. According to Definition 1 and Propositions 1, 2, 3 we can control the difficulty of $Q$ by increasing or decreasing $\Delta_1$, $\Delta_2$ and $\Delta_3$.

***Proposition 1*** *Increasing* $\Delta_1$ *decreases the difficulty of* $Q$.

***Proposition 2*** *Increasing* $\Delta_2$ *decreases the difficulty of* $Q$.

***Proposition 3*** *Decreasing* $\Delta_3$ *decreases the difficulty of* $Q$.

The *Analogy* function can be defined in different ways. For example, we can compare the number of steps between classes in each pair; pairs with similar number of steps in their representations would be more analogous. In this paper, we define the function *Analogy* in terms of similarities in number of steps and changes in direction (see Definition 2).

**Definition 2** Let Analogy(x,y) be a function that takes two pairs of concepts and returns a numerical score for their analogy value [0,1]. The score is determined according to Table 2 in which values are derived from equation 1 as follows:

$$\begin{aligned} Analogy(x,y) &= SS/TS \times SD/TD && (1)\\ SS &= Shared\ Steps(x,y) && (2)\\ TS &= Total\ Steps(x,y) && (3)\\ SD &= Shared\ Directions(x,y) && (4)\\ TD &= Total\ Directions(x,y) && (5) \end{aligned}$$

Table 2. Values returned by the proposed function Analogy(x,y).

| | 1u | 1d | 2u | 2d | 1u1d | 2u1d | 1u2d | 2u2d |
|---|---|---|---|---|---|---|---|---|
| 1u | 1 | 0 | 1/2* | 0 | 1/4 | 1/9 | 1/9 | 1/16 |
| 1d | 0 | 1 | 0 | 1/2* | 1/4 | 1/9 | 1/9 | 1/16 |
| 2u | 1/2* | 0 | 1 | 0 | 1/3 | 4/9 | 1/6 | 1/4 |
| 2d | 0 | 1/2* | 0 | 1 | 1/3 | 1/6 | 4/9 | 1/4 |
| 1u1d | 1/4 | 1/4 | 1/3 | 1/3 | 1 | 4/9 | 4/9 | 1/2* |
| 2u1d | 1/9 | 1/9 | 4/9 | 1/6 | 4/9 | 1 | 1/2 | 9/16 |
| 1u2d | 1/9 | 1/9 | 1/6 | 4/9 | 4/9 | 1/2 | 1 | 9/16 |
| 2u2d | 1/16 | 1/16 | 1/4 | 1/4 | 1/2* | 9/16 | 9/16 | 1 |

*These values were not calculated using equation 1 but were manually coded because they correspond to similar but scaled structures.

**Question generation**

Our proposed approach to the generation of multiple-choice analogy questions consists of two phases: (1) extraction of interesting pairs of concepts by using the *Relatedness* function, those pairs can be used as stems, keys or distractors and (2) generation of multiple-choice questions based on the similarity between pairs which can be derived from the proposed *Analogy* function. The general algorithm is presented below (see Algorithm 1). The difficulty of the generated questions can be controlled by setting the parameters $\Delta_1$, $\Delta_2$ and $\Delta_3$. In addition, the number of distractors can be controlled by setting the parameter "max". Note that avoiding non-functional (i.e. not picked by any student) is preferred (Haladyna & Downing 1993; Paxton 2001).

| **Algorithm 1** | Generate_Analogy_Question(Ontology O, $\Delta_R$, $\Delta_1$, $\Delta_2$, $\Delta_3$, max) |
|---|---|
| 1 | AQ = {}; i = 0; |
| 2 | For each pair of classes (A,B) in O s.t. Relatedness(A,B) $\geq \Delta_R$ |
| 3 | For each pair of classes (X,Y) in O s.t. (A,B) $\neq$ (X,Y) and Relatedness(X,Y) $\geq \Delta_R$ and_ Analogy((A,B),(X,Y)) $\geq \Delta_2$ |
| 4 | Q.S = (A,B); |
| 5 | Q.k = (X,Y); |
| 6 | For each i $\leq$ max |
| 7 | Get a pair of classes ($E_i$,$F_i$) in O s.t. (A,B) $\neq$ ($E_i$,$F_i$) and Relatedness($E_i$,$F_i$) $\geq \Delta_R$ and_ Analogy((A,B),($E_i$,$F_i$)) $\geq \Delta_3$ |
| 8 | If Analogy((A,B),(X,Y)) $\geq$ Analogy((A,B),(Ei,Fi)) + $\Delta_1$ and Unique($E_i$,$F_i$) |
| 9 | Q.D = Q.D + ($E_i$,$F_i$); |
| 10 | I++; |
| 11 | End If |
| 12 | Next i |
| 13 | AQ = AQ + Q; |
| 14 | Next (X,Y) |
| 15 | Next (A,B) |
| 16 | Return AQ; |

We used three different ontologies to test the proposed analogy-generation engine. The three ontologies are presented in Table 3 below with some basic ontology statistics. The first ontology is the Gene Ontology which is a structured vocabulary for the annotation of gene products. It has three main parts: (1) molecular function, (2) cellular component and (3) biological role. The second and third ontologies are the People & Pets Ontology and Pizza Ontology which are very simple ontologies that were built to be used in ontology development tutorials. The table shows the number of satisfiable classes in each ontology and the number of sample questions generated by the engine (this is only a representative sample of all the generated

Table 3. Basic ontology statistics.

| | No. of classes | No. of questions | % correct ~ |
|---|---|---|---|
| Gene Ontology | 36146 | 25 | 8% |
| People & Pets | 58 | 15 | 67% |
| Pizza Ontology | 97 | 16 | 88% |

questions). The table also shows the percentage of questions that our proposed solver agent can correctly solve. The details of the approach used to simulate question solving are explained in the following section.

### Corpus-based evaluation

In order to evaluate the proposed approach for analogy generation, we follow the method explained by Turney and Littman (Turney and Littman 2005) for evaluating analogies using a large corpus. In their study, Turney and Littman reported that their method can solve about 47% of multiple-choice analogy questions (compared to an average of 57% correct answers solved by high school students). The solver takes a pair of words representing the stem of the question and five other pairs representing the answers presented to students. Their proposed method is inspired by the Vector Space Model (VSM) of informational retrieval. For each provided answer, the solver creates two vectors representing the stem ($R_1$) and the given answer ($R_2$). The solver returns a numerical value for the degree of analogy between the stem and the given answer. Then, the answers are ranked according to their analogy value and the answer with the highest rank is considered the correct answer. To create the vectors, they proposed a table of 64 joining terms that can be used to join the two words in each pair (stem or answer). The two words and joined by these joining terms in two different ways (e.g. "X is Y" and "Y is X") to create a vector of 128 features. The actual values stored in each vector are calculated by counting the frequencies of those constructed terms in a large corpus (e.g. web resources indexed by a search engine). To improve the accuracy of their proposed method, they suggested using the logarithm of the frequency instead of the frequency itself.

In this article, we follow a similar procedure. First, we constructed a table of joining terms relevant to the relations considered in our approach (e.g. "is a", "type", "and", "or"). Based on these joining terms, we create vectors of 10 features for the stem, the key and each distractor. The constructed terms are sent as a query to a search engine (Yahoo!) and the logarithm of the hit count is stored in the corresponding element in the vector. The hit count is always incremented by one to avoid getting undefined values. Following this procedure, our proposed solver agent solved 8% of the questions generated from the Gene Ontology, 67% of the questions generated from the People and Pets Ontology and 88% of the questions generated from the Pizza Ontology. We argue that this is caused by the specific terminology used in the Gene Ontology and lack of web resources that have information regarding it compared to the other ontologies.

### Conclusion and future work

In this article, we presented a new approach for generating multiple-choice analogy questions from existing ontologies. We described the design of analogy-generator and analogy-solver. The solver achieved a maximum accuracy of 88%. However, it achieved a low accuracy value of 8% when used to solve analogies generated from the Gene Ontology. We assume that the difficulty of the domain is considered as an additional dimension to our difficulty controlling model.

For future work, we are going to generalise our approach for analogy generator to include user-defined relations. To evaluate analogies generated from arbitrary

relations, we suggest using Latent Relational Similarity (LRS) (Turney 2005) which has the advantage of learning relations instead of using predefined joining terms.

**References**


Al-Yahya, M. (2011) 'Ontoque: a question generation engine for educational assessment based on domain ontologies', *11th IEEE International Conference on Advanced Learning Technologies*, Athens, Georgia, USA, pp. 393–395.

Baader, F., *et al.* (2007) *The Description Logic Handbook: Theory, Implementation and Applications*, 2nd edn, Cambridge University Press, Cambridge, UK.

Bloom, B. S. & Krathwohl, D. R. (1956) *Taxonomy of educational objectives: the classification of educational goals by a committee of college and university examiners. Handbook 1. Cognitive domain*, Addison-Wesley, New York, NY.

Fairon, C. (1999) 'A web-based system for automatic language skill assessment: evaling', *Proceedings of Computer Mediated Language Assessment and Evaluation in Natural Language Processing Workshop*, University of Maryland, USA, pp. 62–67.

Falkenhainer, B. (1988) *Learning from Physical Analogies*, PhD thesis, University of Illinois.

Falkenhainer, B., Forbus, K. & Gentner, D. (1989) 'The structure-mapping engine: Algorithm and examples', *Artificial Intelligence*, vol. 41, pp. 1–63.

Gentner, D. (1983) 'Structure-mapping: a theoretical framework for analogy', *Cognitive Science*, vol. 7, pp. 155–170.

GREguide. (2012) 'Graduate Record Examination Guide', Available at: http://www.greguide.com.

Haladyna, T. & Downing, S. (1993) 'How many options is enough for a multiple choice test item?', *Educational & Psychological Measurement*, vol. 53, no. 4, pp. 999–1010.

Holohan, E. e. a. (2005) 'Adaptive e-learning content generation based on semantic web technology', *Proceedings of Workshop on Applications of Semantic Web Technologies for e-Learning*, Amsterdam, pp. 29–36.

Holohan, E. e. a. (2006) 'The generation of e-learning exercise problems from subject ontologies', *Proceedings of the Sixth IEEE International Conference on Advanced Learning Technologies*, Kerkrade, Netherlands, pp. 967–969.

Kehoe, J. (1995) 'Basic item analysis for multiple-choice tests', *Practical Assessment, Research & Evaluation*, vol. 4, no. 10, Retrieved August 15, 2012 from http://PAREonline.net/getvn.asp?v=4&n=10.

Larkey, L. & Love, B. (2003) 'Cab: Connectionist analogy builder', *Cognitive Science*, vol. 27, pp. 781–794.

Miller, M., Linn, R. & Gronlund, N. (2008) *Measurement and Assessment in Teaching*, 10th edn, Pearson, Cambridge, UK.

Mitkov, R., An Ha, L. & Karamani, N. (2006) 'A computer-aided environment for generating multiple-choice test items. Cambridge university press', *Natural Language Engineering*, vol. 12, no. 2, pp. 177–194.

Papasalouros, A., Kotis, K. & Kanaris, K. (2008) 'Automatic generation of multiple-choice questions from domain ontologies', *IADIS e-Learning 2008 conference*, Amsterdam, pp. 427–434.

Paxton, M. (2001) 'A linguistic perspective on multiple choice questioning', *Assessment & Evaluation in Higher Education*, vol. 25, no. 2, pp. 109–119.

Turney, P. (2005) 'Measuring semantic similarity by latent relational analysis', *IJCAI is the International Joint Conference on Artificial Intelligence*, Edinburgh, UK, pp. 1136–1141.

Turney, P. & Littman, M. (2005) 'Corpus-based learning of analogies and semantic relations', *Machine Learning*, vol. 60, no. 1–3, pp. 251–278.

Winston, P. (1980) 'Learning and reasoning by analogy', *Communications of the ACM,* vol. 23, pp. 689–703.

Zitko, B., *et al*. (2008) 'Dynamic test generation over ontology-based knowledge representation in authoring shell', *Expert Systems with Applications: An International Journal*, vol. 36, no. 4, pp. 8185–8196.

Zoumpatianos, K., Papasalouros, A. & Kotis, K. (2011) 'Automated transformation of swrl rules into multiple-choice questions', *FLAIRS Conference 11*, Palm Beach, FL, USA, pp. 570–575.

*Research in Learning Technology*
Supplement: ALT-C 2012 Conference Proceedings


# Disruptive technologies in higher education

Michael Flavin*

*King's Learning Institute, King's College, London, UK*

*(Received 20 February 2012; final version received 20 June 2012)*

This paper analyses the role of "disruptive" innovative technologies in higher education. In this country and elsewhere, Higher Education Institutions (HEIs) have invested significant sums in learning technologies, with Virtual Learning Environments (VLEs) being more or less universal, but these technologies have not been universally adopted and used by students and staff. Instead, other technologies not owned or controlled by HEIs are widely used to support learning and teaching. According to Christensen's theory of Disruptive Innovation, these disruptive technologies are not designed explicitly to support learning and teaching in higher education, but have educational potential. This study uses Activity Theory and Expansive Learning to analyse data regarding the impact of disruptive technologies. The data were obtained through a questionnaire survey about awareness and use of technologies, and through observation and interviews, exploring participants' actual practice. The survey answers tended to endorse Disruptive Innovation theory, with participants establishing meanings for technologies through their use of them, rather than in keeping with a designer's intentions. Observation revealed that learners use a narrow range of technologies to support learning, but with a tendency to use resources other than those supplied by their HEIs. Interviews showed that participants use simple and convenient technologies to support their learning and teaching. This study identifies a contradiction between learning technologies made available by HEIs, and technologies used in practice. There is no evidence to suggest that a wide range of technologies is being used to support learning and teaching. Instead, a small range of technologies is being used for a wide range of tasks. Students and lecturers are not dependent on their HEIs to support learning and teaching. Instead, they self-select technologies, with use weighted towards established brands. The use of technologies outside HEIs has implications for the monitoring of learning and teaching, and for the role of HEIs, which are no longer the gatekeepers to knowledge.

**Keywords:** confronting reality; problem solving; VLEs; online learning; informal learning; disruptive innovation; disruptive technology; activity theory; expansive learning

## 1. Introduction

Higher Education Institutions (HEIs) in the UK have invested significantly in digital technologies for learning and teaching; Virtual Learning Environments (VLEs) are more or less universal. However, technologies provided by HEIs have not been universally successful in terms of adoption and usage (Blin and Munro 2008; Conole *et al.* 2008; Selwyn 2007). Meanwhile, students and lecturers use technologies

*Corresponding author. Email: michael.flavin@kcl.ac.uk

ISBN 978-91-977071-4-5 (print), 978-91-977071-5-2 (online)


http://dx.doi.org/10.3402/rlt.v20i0.19184

not owned or controlled by HEIs to support and enhance their learning and teaching.

A number of researchers have anticipated that the use of technologies in learning and teaching would disrupt learning and teaching practices in higher education (e.g., Blin and Munro 2008; Sharples 2003). However, digital technologies have, in practice, largely reproduced, rather than transformed and disrupted, existing pedagogical approaches (Fry and Love 2011; Margaryan, Littlejohn, and Vojt 2011). It is therefore appropriate to explore how non-institutional technologies contribute to learning and teaching in higher education. In order to address this issue, this paper investigates the role of "disruptive technologies" (Christensen 1997) in higher education.

### *1.1. Disruptive technologies*

Disruptive technologies are those that disrupt established practices, often starting with a small number of users, but growing over time to the extent that they displace a previously dominant, incumbent technology. Conversely, sustaining technologies are technologies that enhance the performance of established technologies, as Christensen (1997) outlines:

> What all sustaining technologies have in common is that they improve the performance of established products ... Disruptive technologies bring to market a very different value proposition than had been available previously ... Products based on disruptive technologies are typically cheaper, simpler, smaller, and, frequently, more convenient to use. (p. xv)

Christensen and Raynor (2003) subsequently changed the term "disruptive technology" to "disruptive innovation", arguing that the disruption is not an intrinsic feature of the technology, but, instead, emerges through practice. However, I use the term "disruptive technology" in this paper for clarity's sake, as my research is fundamentally interested in technologies for learning and teaching.

Christensen, Horn, and Johnson (2011) argue that the school system in the USA has relied on sustaining technologies, and Christensen and Eyring (2011) argue that higher education in the USA has also followed the sustaining technology approach: "Even when computers were introduced into the classroom, they were used to enhance the existing instructional approaches, rather than to supplant them. Lectures, for example, were augmented with computer graphics, but the lecture itself persisted in its fundamental form" (p. 18). In this sense, Christensen's argument repeats the findings of Blin and Munro (2008) in their study of a VLE at a campus university in Ireland. Where Blin and Munro conclude, "although use of the VLE is widespread within the university, little disruption of teaching practices ... has occurred" (2008, p. 488), Christensen *et al.* argue, "traditional instructional practices have changed little despite the introduction of computer and other modern technologies" (2011, p. 83).

### *1.2. Activity Theory and Expansive Learning*

Expansive Learning (Engeström 1987) derives from Activity Theory, which was formulated from Vygotsky's (1978, 1927/1997) theory of human development. Activity Theory argues that human actions are not a direct transmission between subject and object, but are mediated through the use of (broadly defined) tools.

Activity Theory is an appropriate lens for this paper because it enables an exploration of how digital technologies impact on other aspects of higher education, including social relations. Scanlon and Issroff (2005) have previously used Activity Theory to analyse the impact of technologies in higher education, and, at a school level, Hardman (2005) used Activity Theory to analyse the impact of technology in teaching mathematics in deprived communities in South Africa. In both cases, the researchers noted the impact of new technologies on the division of labour within a classroom setting. Vygotsky (1978) represented the first generation model of human activity as a simple triangle (Figure 1). Vygotsky's model illustrates his theory that human beings do not interact directly with their environment. Instead, they use tools (including signs and codes as well as physical apparatus) as mediators.

Engeström (1987) developed the expanded model of human activity (the activity system) to include and highlight the collaborative nature of human activity by adding social elements to Vygotsky's original model of human activity, as shown in Figure 2.

The bottom row of the triangle (the layer added by Engeström) features the rules, the community and the division of labour as its nodes. The rules node represents the conventions and regulations shaping an activity (such as assessment within an education system). Community refers to those affected by the activity, and the division of labour node represents who does what in an activity, thereby illustrating both the distribution of tasks, and the hierarchy of power.

There can, however, be contradictions in the interaction of the nodes, and it is these contradictions that Engeström (1987, 2001) identifies as significant in Expansive Learning, as the contradiction can enable the construction of new knowledge. For example, a lecturer works with students with the intended outcome of high-quality learning. Digital technologies (tools) can be used to facilitate the learning. However, if a new tool is available, over which the students (rather than the lecturer) have mastery, this may require new practices within the activity system in order for the object of high-quality learning to be accomplished, as was observed by Scanlon and Issroff (2005). When digital technologies are brought into a classroom setting, the lecturer may have to relinquish some of their authority (thus impacting on the "rules" and "division of labour" nodes) in order to enable enhanced learning. The analysis overlaps with Christensen's Disruptive Technology theory (1997) in the sense that a new technology can disrupt existing practices (and thereby risk rejection), but also that the new technology can go on to change the practice itself.

A feature of Engeström's approach is that tools do not need an instruction manual: "A tool always implies more possible uses than the original operations that have given birth to it" (1987), and "the material form and shape of the artifact [sic]

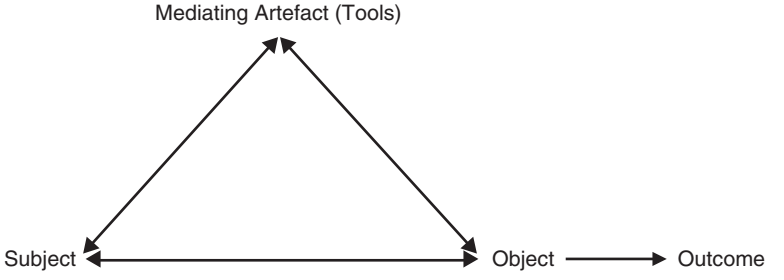



Figure 1. First-generation activity system (based on Vygotsky 1978).

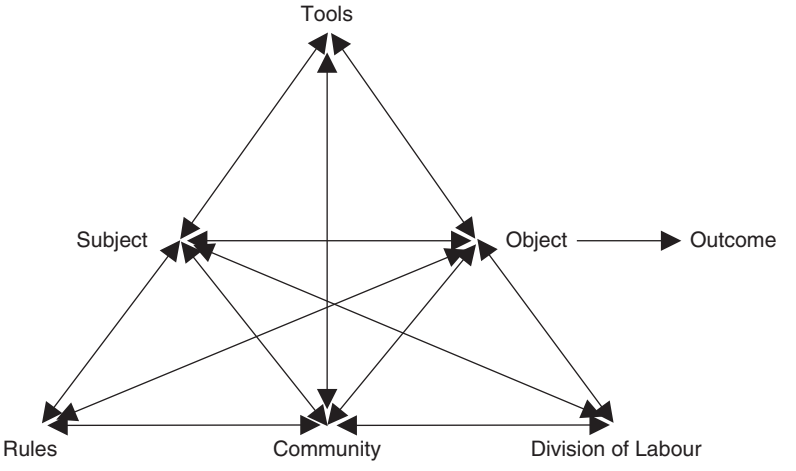



Figure 2. Second-generation activity system (based on Engeström 1987).

have only limited power to determine its epistemic use'' (2007, pp. 34–35). This leads Engeström to conclude, ''In Expansive Learning ... reconfiguration of given technologies by their users is essential'' (2007, p. 35). Engeström's argument implies that people establish the meanings of technologies through their uses of them. Meaning is not constrained by design.

## 2. Research methodology

This study focuses on understanding the role of disruptive technologies in higher education learning and teaching.

From November 2010 to March 2011 a pilot survey was conducted, using a questionnaire comprising tick box questions and open-ended queries. The questionnaire explored the following issues: (1) What technologies are participants aware of?, (2) What do participants use technologies for? and (3) To what extent do participants use technologies for more than one purpose? The survey yielded baseline data about technology use, and which technologies were used most widely and for more than one purpose. Of the 28 people surveyed 13 were undergraduates, four were postgraduate students and one was a postgraduate researcher. The survey also included six lecturers and four academic-related staff.

The original questionnaire was revised to include technologies that did not feature in the pilot study questionnaire. A new survey took place in October–November 2011. Twenty questionnaires were returned by 15 undergraduate students, one postgraduate researcher, two lecturers and two academic-related staff. None of these respondents was from the first sample.

Seven observation studies were conducted in October–November 2011. The participants (four students and three lecturers) were given a task concerning the identification and storage of information to support learning and teaching, and their responses to the task were recorded by the researcher.

Furthermore, five interviews were conducted in December 2011–January 2012. Two were semi-structured and focused largely on the use of specific technologies. The remaining three interviews were structured, exploring the use of technologies more broadly.

## 3. Findings and discussion

### *3.1. Questionnaire surveys*

The pilot survey findings showed that individual technologies were being used for more than one purpose. For example, Facebook was used for recreation by 16 participants, but also for work (seven) and informal learning (three), with informal learning signifying learning not undertaken in the context of a formal course. Twitter was used for recreation by 10 participants, but also for work (seven) and informal learning (five). The pilot questionnaire replies also showed respondents' limited awareness of emerging technologies; 21 participants had not heard of Wallwisher, Xtranormal or Prezi, and 13 participants had not heard of Delicious.

The pilot survey findings for Wikipedia indicated its ubiquity: 21 participants used it for recreation, 20 for informal learning, 15 for formal learning and 16 for work. One participant wrote, "Wiki[pedia] often comes up as the first port of call for quick research, but due to it's [sic] unreliability I would usually try to corroborate any information found there". Another participant wrote, "I wouldn't blindly trust the articles themselves as reliable sources of information" and a further participant wrote, "I'm always wary about the veracity of the information". It is noteworthy that the use of Wikipedia is not prevented by its perceived unreliability, as it is a readily available tool to serve a purpose, and hence has a role within an Activity Theory framework.

The pilot survey suggested that users create their own purposes for Wikipedia. In addition, Wikipedia has challenged more established encyclopaedias, which can be classed as a sustaining technology because they update their knowledge along existing lines and within similar publication formats, but are challenged by a rival online encyclopaedia which is free, and readily available. One participant stated, "The biggest advantage of Wikipedia is that the answers are at your finger tips, you can ask a question and the answer appears without the need for flicking from chapter to chapter in a book". Like many disruptive technologies, Wikipedia is cheaper (free in this particular case), simpler, smaller and more convenient than its more established rivals.

The second survey showed respondents' low awareness of new technologies that can be used to support learning and teaching: participants tended to rely on well-established technologies. For example, 19 of the 20 participants had not heard of Xtranormal, 17 had not heard of Wordle or Wallwisher, and 15 had not heard of Delicious or Prezi.

The second survey also showed that 17 participants from the second sample used Wikipedia for informal learning, 15 for recreation, 12 for work and 10 for formal learning. These findings mirrored the findings of the first survey, in the sense that participants shaped their own purposes for technologies, using individual technologies for a range of purposes. Moreover, participants relied on a few technologies. One participant stated, "Adding too many technologies to support teaching/learning, especially where one or two can do the job well, can overwhelm the student (and the educator!)". From an Activity Theory perspective, a plethora of tools can cause tension between the subject (the learner) and the object (the learning); learners benefit from clear and simple guidance on how to use digital technologies to support their learning.

In both surveys only one respondent had used Second Life. In the second survey, the participant who used Second Life did so in their role as a research student: again,

it is noteworthy that the purpose was determined by the user, not by a designer's intentions. Second Life is a technology with a relatively steep learning curve, but almost all the participants used Wikipedia, which is conspicuously easy to use, not least because it is an encyclopaedia, a familiar type of publication. Second Life, a virtual world, calls for some acclimatisation before users can make optimal use of it. Wikipedia conforms to Christensen's definition of a disruptive technology, but Second Life lacks Wikipedia's simplicity.

### *3.2. Interviews*

In February 2011, two participants in the first survey were each introduced to a technology they had not previously heard of, then given time to incorporate this technology into their practice. They were interviewed 10 months later, in December 2011, regarding their use of the new technology, and their use of technologies more generally.

The first respondent (a lecturer) had been introduced to Delicious (free online bookmarking service) by the researcher, but not given instruction on how to use it. In the 10 months, she had used Delicious frequently, with use of the tool expanding to include her family, and her wider social network. She related her experience to the ease of use of Delicious: "I think it was a fairly rapid adoption. I wouldn't call myself somebody who was naturally proficient in technology, but it was very much an instinctive environment". Delicious conforms to Christensen's definition of a disruptive technology (1997), as it is easy to use. It is also convenient and free.

This respondent was also asked about her perceptions of her undergraduate students' uses of technologies to support learning, three months into the academic year.

> They have got access to [name of HEI] virtual learning environment. Some of them have been fairly swift to embrace that. Others still have not logged-on, which is a concern as even in the induction week we showed them how to do it … So some are not as technologically proficient as we thought they would be. Others are extremely adept. We did some presentations earlier this week; they were quite happy hyperlinking to YouTube and other sites. Similarly they are quite happy to sit down and work with their own laptops or iPads and conduct research there – in fact they prefer to do that than rifle through the core text, even when you tell them that the information is there in the core text. They instinctively jump onto what they are more familiar with.

While the interview did not explore ideas concerning why the students were not all accessing the institutional VLE but making frequent use of other technologies, it is noteworthy that the students appear to have their own preferred technologies for learning, which are not necessarily the learning technologies supplied by their HEI.

During interview the second respondent (a learning technologist and postgraduate student) was asked whether she had used Wallwisher, a free online notice board to which she had been introduced by the researcher. The participant had not used Wallwisher, stating, "… like with all of these things, unless everyone else is using it, it doesn't perhaps fulfill its potential …". She was unable to construct a personal meaning for the technology, which thus remained unused. Moreover, she was put off by the fact that other people were not using the technology. A critical mass may be important for the widespread adoption of a technology, perhaps through marketing that can create a community of users. Innovative uses of technologies to support

learning can possibly be manufactured, an argument laid out in Markides's (2006) critique of Disruptive Innovation.

### *3.3. Observation studies*

In the observation studies, participants were given a task concerning the identification and storage of information to support learning and teaching. Of the seven participants four were students who were given the following task:

> You have been asked to write an essay for assessment at a H.E. Institution, concerning the issue of widening participation in H.E. Identify, gather and store relevant information for this essay, using only the computer in front of you. Do this for fifteen minutes.

The remaining three participants were lecturers, and were given the following task:

> You have been asked to prepare a class on emergent forms of assessment in H.E. Identify, gather and store learning and teaching materials for this purpose, using only the computer in front of you. Do this for fifteen minutes.

The participants in both groups used a narrow range of technologies, perhaps unsurprisingly given the short time available to them. The most common approach, adopted by five of the participants, involved doing most of the research via Google, with results (text or URLs) saved to a blank Word document and saved in My Documents. Four participants used an academic journal aggregator made available by their HEI, but one of those four went to the journal aggregator after having undertaken their initial search on Google. Only one participant used Delicious to store and tag web links; five copied links to a blank Word document, and one emailed links to herself, via a facility made available on the academic journal aggregator.

Participants did not look beyond the first two pages of results obtained on Google, and five participants did not go beyond page 1 of results on either Google or Google Scholar. It appears users want and expect quick results, and value ease of access (in line with Christensen's argument), though the participants' actions may also have been shaped by the short time allowed for the tasks.

Three participants used Google Scholar. Six of the seven used Google. One participant entered search terms in a search box on her HEI's home page. The results came up provided by Bing. The participant clicked off Bing without looking at the results, and repeated the same search on Google. It appeared the participant had a preferred brand, and was not interested in trying another. Seeing technology in terms of brand choices links in with Markides's (2006) critique of Disruptive Innovation: he argues that innovations and disruptions in technologies are shaped more by effective marketing than by spontaneous creativity.

While the two observation studies show participants using a narrow range of technologies, all the participants were able to undertake the task. The technologies selected were able to do the job, hence students did not use other technologies. Technologies are being used flexibly, and in some senses disruptively because the user creates a purpose for the technology, but the evidence from the observation studies suggests that a limited range of technologies is being used to support learning and teaching, a conclusion also drawn by Margaryan, Littlejohn, and Vojt (2011) and Jones and Healing (2010) in their studies of students' uses of technologies to support learning.

From an Activity Theory perspective, the observation studies show technology, as a tool, impacting on other nodes within the activity system. In particular, the social nodes in Engeström's activity system triangle (rules, community and division of labour) are affected by how technologies are being used to support learning and teaching. Learners are no longer reliant on reading lists supplied by lecturers, and use other sources to support their learning. Therefore, the role of the HEI as gatekeeper to knowledge is altered, as material can be accessed any time and from anywhere.

### *3.4. Structured interviews*

Three structured interviews were conducted in January 2012. Each of the interviewees (a lecturer and two students) was asked questions relating to their uses of technologies to support learning and teaching, including "Where do you get the learning materials you use for work you submit for assessment?" to the students, and "As a Lecturer, in your opinion, where do students get the resources they use for assessed work?" to the lecturer. One participant (the lecturer) stated that her students relied on Google for finding learning materials, and rarely used an academic journal aggregator. The postgraduate student stated that she used Google and Google Scholar to support her set texts. The lecturer also stated that she preferred Google Scholar to her HEI's academic journal aggregator: "I don't find it as user-friendly as I find Google". The interviews suggest that the participants do not see their HEI as the gatekeeper to knowledge. The participants go to Google, rather than to their HEIs' journal aggregators, for information to support learning and teaching. The lecturer indicated that ease of use was a factor as to why she opted for Google. Google, therefore, may be a disruptive technology in its own right, in that its convenience and ease of use puts it ahead of an HEI's own resources. Google, in this context, also affects the academic community and the division of labour within it, by providing an alternative route to knowledge, and implicitly challenging the HEI's custodianship of knowledge.

## 4. Conclusion

There is no evidence arising from the surveys or interviews to suggest that a wide range of technologies is being used to support learning and teaching in higher education. Instead, a narrow range of technologies is being used to undertake a wide range of tasks, with the use of Wikipedia and Google being particularly common. As Christensen's theory predicts, people prefer to use technologies that are free and easy to use. If technologies are kept simple, people are more likely to use them.

Markides (2006) is a useful source for understanding why particular technologies build a critical mass of usage. Data from the survey, observation and interviews reported here suggest that both students and lecturers have preferred technology brands. Markides's argument implies that disruption does not arise organically, but that markets for disruptive technologies can be created through astute practice. For example, the encyclopaedia is an established form of publication, but Wikipedia has changed how an encyclopaedia (and, arguably, knowledge more widely) is produced, distributed and used. Hence, Markides's analysis does not necessarily contradict Christensen's, as disruption is partly about users creating their own purposes for technologies through practice. Disruption does not arise from the intrinsic features of

the technology (Christensen and Raynor 2003); practice does not occur in a vacuum but is shaped by underpinning economic and social factors.

From an Activity Theory perspective, Wikipedia is a tool that disrupts the rules node of the activity triangle, and the division of labour node. Students are not solely reliant on their HEI for learning. Activity Theory also suggests that the gatekeeper role of both lecturer and HEI is changing. There are alternative routes to acquiring knowledge, and they are easy to use, convenient and often free. The same cannot always be said of learning technologies supplied by HEIs. The disruptive use of technologies also has implications for the monitoring of learning, and for the division of labour within higher education, because of the plethora of alternative pathways to knowledge challenging, implicitly, the role of the lecturer.

Further research may be able to inform the strategic development of library services in HEIs, as the research has implications for how knowledge is accessed. Further research could also explore the breadth of participants' technology choices, and the extent to which participants' choices in this regard are shaped by the effective marketing of technologies.

## References


Blin, F. & Munro, M. (2008) 'Why hasn't technology disrupted academics' teaching practices? Understanding resistance to change through the lens of activity theory', *Computers and Education*, vol. 50, pp. 475–490.

Christensen, C. M. (1997) *The Innovator's Dilemma: When New Technologies Cause Great Firms to Fail*, Harvard Business School Press, Boston, MA.

Christensen, C. M. & Eyring, H. J. (2011) *The Innovative University: Changing the DNA of Higher Education from the Inside Out*, Jossey-Bass, San Francisco.

Christensen, C. M., Horn, M. B. & Johnson, C. W. (2011) *Disrupting Class: How Disruptive Innovation Will Change the Way the World Learns*, McGraw Hill, New York.

Christensen, C. M. & Raynor, M. E. (2003) *The Innovator's Solution: Creating and Sustaining Successful Growth*, Harvard University Press, Cambridge, MA.

Conole, G., *et al*. (2008) 'Disruptive technologies', 'pedagogical innovation': what's new? Findings from an in-depth study of students' use and perception of technology', *Computers and Education*, vol. 50, pp. 511–524.

Engeström, Y. (1987) *Learning by Expanding: An Activity-theoretical Approach to Developmental Research*, Orienta-Konsultit Oy, Helsinki. Available at: http://lchc.ucsd.edu/MCA/Paper/Engestrom/expanding/toc.htm.

Engeström, Y. (2001) 'Expansive Learning at Work: toward an activity theoretical reconceptualization', *Journal of Education and Work*, vol. 14, no. 1, pp. 133–156.

Engeström, Y. (2007) 'Enriching the theory of expansive learning: lessons from journeys toward coconfiguration', *Mind, Culture and Activity*, vol. 14, no. 1–2, pp. 23–39.

Fry, N. & Love, N. (2011) 'Business lecturers perceptions and interactions with the virtual learning environment', *International Journal of Management Education*, vol. 9, no. 4, pp. 51–56.

Hardman, J. (2005) 'An exploratory case study of computer use in a primary school mathematics classroom: new technology, new pedagogy?', *Perspectives in Education*, vol. 23, no. 4, pp. 1–13.

Jones, C. & Healing, G. (2010) 'Net generation students: agency and choice and the new technologies', *Journal of Computer Assisted Learning*, vol. 26, pp. 344–356.

Margaryan, A., Littlejohn, A. & Vojt, G. (2011) 'Are digital natives a myth or reality? University students' use of digital technologies', *Computers and Education*, vol. 56, pp. 429–440.

Markides, C. (2006) 'Disruptive innovation: in need of better theory', *The Journal of Product Innovation Management*, vol. 23, no. 1, pp. 19–25.

Scanlon, E. & Issroff, K. (2005) 'Activity Theory and Higher Education: evaluating learning technologies', *Journal of Computer Assisted Learning*, vol. 21, pp. 430–439.

Selwyn, N. (2007) 'The use of computer technology in university learning and teaching: a critical perspective', *Journal of Computer Assisted Learning*, vol. 23, no. 2, pp. 83–94.

Sharples, M. (2003) 'Disruptive devices: mobile technology for conversational learning', *International Journal of Continuing Engineering Education and Lifelong Learning*, vol. 12, no. 5–6, pp. 504–520.

Vygotsky, L. S. (1978) in *Mind in Society-The Development of Higher Psychological Processes*, eds M. Cole, V. John-Steiner, S. Scribner & E. Souberman, Harvard University Press, Cambridge, MA, USA.

Vygotsky, L. S. (1927/1997) 'The historical meaning of the crisis in psychology: a methodological investigation', in *The Collected Works of L. S. Vygotsky, Vol. 3: Problems of the Theory and History of Psychology*, eds R. W. Rieber & J. Wollock, Plenum, New York.

*Research in Learning Technology*
Supplement: ALT-C 2012 Conference Proceedings


# Rules of engagement: developing the online tutor

Aileen McGuigan* and Lucy Golden

*School of Education, Social Work and Community Education, University of Dundee, Dundee, UK*

*(Received 20 February 2012; final version received 17 June 2012)*

This paper considers professional development in a context that is familiar and problematic to teaching teams in tertiary education everywhere, that of delivering online programmes with an ever-decreasing complement of staff. The Teaching Qualification Further Education (TQFE) teaching team at University of Dundee confronted the reality of reduced staff numbers by centralising tutoring and support for programme participants. The new system involves standardising tutoring as far as possible through generic email, blog and microblog accounts, all badged "TQFE-Tutor" and staffed on a roster basis. Once the new "rules of engagement" via TQFE-Tutor were in place, it became clear that in addition to benefits in terms of student support, there were other unintended positive consequences: opportunities for informal professional development for staff and the promotion of effective team working. The experience of collective tutoring has facilitated collaboration on a range of innovations within online learning. This paper describes the evolution of the TQFE-Tutor innovation and reports upon a small scale study which was carried out to gather the views of the tutor team working with TQFE-Tutor. The authors conclude that the centralisation of communication and tutoring on the TQFE programme has been highly beneficial in terms of professional development for the team.

**Keywords:** confronting reality; sustainable models; online tutoring; sharing knowledge; CPD

## Introduction

The Teaching Qualification Further Education (TQFE) is a professional teaching qualification programme for in-service lecturers in the tertiary education sector and has been delivered online at University of Dundee since 2006, to about 200 participants per annum. TQFE-Tutor incorporates a University email account (Office 365), a purpose-built blog (Wordpress) and a microblog (Twitter). It unites the nine members of the programme team, now working "as one" via these media tools on a roster basis. It is intended to enhance the learning of programme participants, supplementing and intensifying the programme's teaching and learning materials and contributing towards the three core elements of an educational experience: the social, cognitive and teaching presences, as explored by Garrison and colleagues (Garrison and Anderson 2003; Garrison, Anderson, and Archer 1999; Garrison and Cleveland-Innes 2005). Staff on the TQFE programme almost exclusively conduct their work online and it is the authors' view that this is therefore the ideal location for their own professional development, a view shared with

*Corresponding author. Email: a.mcguigan@dundee.ac.uk

ISBN 978-91-977071-4-5 (print), 978-91-977071-5-2 (online)

http://dx.doi.org/10.3402/rlt.v20i0.19183

Boud (1999) and various later commentators, such as Cornelius and Macdonald (2008).

## Background

The familiar UK tertiary education landscape of cutbacks, smaller staff teams and restructured administrative support was the backdrop for the creation of a different kind of communication and tutoring system at University of Dundee. The prevalent belief (Fidishun n.d.; Richardson, Long, and Woodley 2003; Yorke 2004; Zembylas 2008) suggested that online learners essentially require a personal tutor to overcome feelings of isolation and uncertainty caused by distance and lack of peers physically learning alongside them; prior to the advent of TQFE-Tutor, the TQFE teaching team belonged to the same school of thought. The concept of the collective TQFE-Tutor as a sustainable model emerged in response to the shrinking academic team, halving from eight full-time equivalent staff to just four in a period of five years (nine tutors are currently employed on the programme, with varying portions of time allocated, from a half day per week up to full-time).

A pilot study conducted within the programme in 2009/2010 suggested that a blog might usefully be employed for the teaching team to manage some sustainable communication with the cohort collectively and following upon the success of that trial, in 2010/2011 the TQFE-Tutor blog/email/microblog system was launched, applying to each the collective principles which had proved useful on the pilot blog. Since then, all tutoring on the programme has been conducted via TQFE-Tutor. Programme participants are very positive about the support they receive from TQFE-Tutor and appreciate the speedy turnaround times afforded by the system. The team is able to guarantee a response to any enquiry – to the generic email or blog – within two working days (see Figure 1 for the logo by which all TQFE-Tutor utilities are badged).

### *The many roles of the online tutor*

The authors recognise the fundamental role of online programme communications in the support of learners, especially in the context of distance learning. TQFE-Tutor allows for a seamless approach as far as the programme participants are concerned – all their enquiries and submissions being dealt with in a timely and consistent way, while the tutor team maintains an overall awareness of the learner experience, through the shared utilities. The system facilitates the various roles the online tutor has to undertake, as described by Markel (1999 in McLoughlin and Lee 2010):

> [the] major role of the teacher is arguably to facilitate this dynamic learning process, assisting learners in drawing their own links between their learning and the 'real world'; other roles may be that of 'consultant', 'guide' and 'resource provider'.


Figure 1. TQFE-Tutor logo.

Much has been written about the changing role and relationships between online tutors and learners. Discussing the role of the online lecturer, Rice (2011, elaborating on earlier work by Collison *et al*. 2000) argues:

> Rather than the Sage on the Stage or Guide on the Side, you're going to see a growing embrace of the Sage on the Side model. The need for an instructor with high-quality, in-depth domain knowledge (The Sage) will never go away.

It is clear that when it comes to e-learning, another raft of skills is required of the subject experts, those necessary for successful teaching and communicating in the online environment (Morrison 2012).

In an environment where email is very much the norm, a further onerous role, that of personal correspondent, frequently falls to the personal tutor. In the context of the TQFE programme pre-innovation, there were more than 40 co-correspondents (participants) in each personal tutor's group, necessitating the fielding of huge numbers of emails daily. Programme participants were not inclined to seek their own answers to questions when they could bat the relevant question – in an email – to a tutor who would feel obliged to respond. In some cases participants appeared to develop an unhealthy dependency on the individual personal tutor rather than becoming independent learners, emailing long messages several times a day. In addition, participant feedback suggested that not all participants received the support they felt they needed.

A major advantage of having a teaching team comprised of a large number of academics is the wide and diverse range of knowledge, experience and skills such a team collectively holds. However, a team profile of staff with different time commitments on a programme can also be a weakness, particularly in the online context. For instance, email may not be dealt with in a timely way when the tutor has other commitments. This could also be stressful for the personal tutor, accruing an increasing stream of emails requiring attention. Because TQFE-Tutor is staffed on a roster basis, long waits for learners are eradicated and there is an equitable sharing of the full tutoring role, including all correspondence.

### *Putting the team at the centre of their own professional development*

The "rules of engagement" for academics on TQFE-Tutor roster duties are underpinned by a series of Frequently Asked Questions (FAQs) which have been collectively drawn up by the team and are updated as necessary, following on from discussion at periodic team meetings. The involvement of the teaching team in all aspects of the development has promoted "ownership" of the TQFE-Tutor utilities and for positive team values to emerge and develop. All team members are encouraged to contribute to the continuing development of the utilities; all have remarked upon professional development gains from the system.

In addition to collective "ownership" of TQFE-Tutor by the team, there is professional development in the more dynamic and on-going sense for all of the team to keep moving with the different sectors and student groups that they (and/or the TQFE participants, who are also lecturers) have, to avoid what Julia Fotheringham referred to as "the danger of educational inertia" (in a presentation on e-pedagogy at University of Dundee, 2012). Many university staff may have been teaching and assessing in a fairly similar way for many years while around them the cultural, political, social, technological world is constantly developing and evolving. Enthusiastic

"early adopters" of technological innovation, like the TQFE programme team at University of Dundee, concur with Staker's (2011) view that:

> online learning has the potential to be a disruptive force that will transform the ... structure that has dominated ... into a new model that is student-centric, highly personalized for each learner, and more productive. (Staker 2011)

TQFE-Tutor enables the teaching team to keep abreast of online learning developments. It opens opportunities for continuous professional development (CPD) through peer work using such tools as JING, Adobe connect, Fireworks, blogs and so on, not removed from the context of teaching and promoting learning but ensconced within it. Through various strands of the TQFE-Tutor system team members are able to review each other's work and find better ways to foster and encourage learning online and at a distance.

### *A typical shift on TQFE-Tutor*

While at certain times of the academic year such as close to assessment deadlines several staff are needed simultaneously to deal with a high volume of enquiries to TQFE-Tutor, an average three hour shift may include answering 10–12 emails, responding to two or three blog postings and monitoring the arrival of assessments within the Virtual Learning Environments (VLEs) submission system (SafeAssign). The emails and/or blog postings may include confirmation of assessment submission and require a simple reply with the relevant marker copied in. There may be queries about submissions, teaching observation arrangements or how to access something such as recordings of online tutorials. Other messages may report a broken hyperlink in the online learning materials or include a request for an extension due to sensitive family issues. A programme participant may be confused by or disagree with assessment feedback or may want to know more about a theory they do not understand. In all these cases, while copying in others as appropriate, the duty tutor works out, implements and communicates the solution, switching between the roles of facilitator of the learning process, supporter and resource provider (Markel 1999, in McLoughlin and Lee 2010). In this way a "needy" participant benefits from collective support and the workload is shared evenly.

### *Evaluating the TQFE-Tutor system*

In academic session 2011/2012, when the new TQFE-Tutor system was launched on the TQFE programme, it won University of Dundee's Honorary Graduates' Award for Innovative Teaching. The usual end of module questionnaires were used to evaluate the TQFE-Tutor system and it was clear that it had been a success as far as the programme participants were concerned. Anecdotal evidence also began to emerge, recognising the value of the system as a sustainable model and about its efficacy in delivering informal professional development to its academic team. With the support of funding from JISC's Assessment and Feedback programme, a project ran throughout the academic session 2011/2012 – *Evaluating feedback for e-learning: centralised tutors*, or *EFFECT* – with the objective of robustly evaluating the system, to probe deeper into the informal preliminary findings, potentially enabling further streamlining and providing lessons which may be useful for others involved in online

programme development and delivery. The study below grew out of the EFFECT project and considers the potential of the TQFE-Tutor model for professional development use.

## Method

Data were collected from two different sources: (1) a focus group discussion with three members of the programme team (S1, S2 and S3), facilitated by one of the current authors (F) and (2) an interview with a new member of the team (S4), also conducted by author F. Both events were recorded and the recordings transcribed. Drawing on Ritchie and Spencer's (1994) framework analysis and the work of Srivastava and Thomson (2009), the two recordings were reviewed several times for the authors to familiarise themselves with the content and to draw up a thematic framework.

For the focus group, the following questions/prompts were used:

(1) What development opportunities does the TQFE-Tutor offer and do you personally consider them to be beneficial?
(2) How do the benefits of TQFE-Tutor measure up against any informal staff development available on other programmes you teach on, in the college sector or here in the University?
(3) Could TQFE-Tutor provide further opportunities for the team? Either other things we could be doing on the blog, or the email system that could improve our staff development?
(4) What can be done to future proof the system against institutional and other external changes?

In the case of the interview, the interviewee (S4) was encouraged to talk about the effect of TQFE-Tutor upon her experience as a new tutor on the programme.

### *Reliability issues*

The facilitator of the focus group and the interview (i.e. the sources of both data sets discussed below) is the Programme Director of the TQFE programme, so could be regarded as predisposed to find favourable evidence about TQFE-Tutor. Similarly, bias was possible on the part of the team members who took part in the study; they may not have felt able to express negative opinions in the presence of the Programme Director. However, everyone who took part in the study – facilitator and participants alike – was aware of the potential precariousness of their positions as "insiders", i.e. those with specialist knowledge of the research topic. In the view of the authors, this insider knowledge does not invalidate the research. This is a small study evaluating the TQFE-Tutor system: at this stage in its evolution, only team members have sufficient knowledge about it to proffer useful opinions on the topic.

## Discussion

Grouped under "strengths" and "weaknesses", seven different subthemes emerged from the data; see Figure 2. Each of the subthemes is discussed below.


Figure 2. TQFE-Tutor for professional development: framework.

***Transparency and consistency***

It was recognised that as well as benefits to the learners (alluded to above), the transparency and consistency TQFE-Tutor engenders is advantageous to the tutor team and a major strength of the system. "It's not the secret garden syndrome" S1 remarked; "there's a transparency to what we're doing". S3 concurred:

> . . . on another distance learning programme I work on, very part-time and there it's very much that each member of staff has their module and their marking . . . people want to feel they're not exposed in any way, but there's no real benefit in learning from that.

It is a common characteristic of online programmes for there to be a good deal of private email correspondence between tutor and learner. Where pastoral guidance is concerned it is understandable for this correspondence to be conducted privately (in the occasional instances where this is necessary one-to-one support is available via the TQFE-Tutor system too), but it is less easy to see any reason for privacy in matters relating to the content of the programme of study. In fact in the authors' opinion, it is often the case that this kind of discussion could be much to the benefit of many within the cohort if it was conducted openly. There is of course a strong case for protecting learners, who may not want to expose a perceived weakness to the cohort and of course these matters should be dealt with sensitively. However, as the focus group discussion strongly indicated, it was very useful to have the opportunity to see all the queries and each other's responses to the same. The collective TQFE-Tutor system impels the sharing of good practice – the focus group recognised that this led to a valuable consistency of approach across the team – vital to the success of an online programme.

As a relatively new university lecturer S4 was clear that she was able to gain a good understanding of marking practices from interaction with, and observation of, tutors who had been teaching in HE for longer, including being able to "borrow useful phrases" especially ideas on how to phrase critical feedback while keeping a participant feeling motivated and encouraged. She spoke positively about the benefits for her of working alongside more experienced colleagues who had the overview and knowledge about the academic cycle of the programme. Even more important to her was the opportunity provided by TQFE-Tutor to read several of the team members' marking and feedback on the same module, when she came to marking her own assignments. While a mentor-tutor is in place for new lecturers, providing the "clinical supervision" recognised as useful for new online tutors (Bennett and Marsh 2002), the wider perspective gained by such an open and transparent approach was very helpful in opening up a range of feedback and feed-forward and avoiding any particular preoccupations which the individual mentor may have.

Such benefits singled out for comment by S4 are not limited to new members of staff, as is clear from the focus group with the more established staff members: S3 remarked, "I looked at one [email] and thought, "that's a difficult one to answer" ... it had all kinds of things brought up in it and I thought how can you begin to unravel all that and I looked a couple of hours later and you'd replied to it". The facilitator commented, "We know what the rules are, but sometimes it's difficult to construct a diplomatic and brief email"; the idea of compiling a bank of email responses surfaced during the focus group discussion too and is one that the team plans to develop further.

### *Collegiality*

The focus group explored the idea of some of their own social needs being met by TQFE-Tutor, the system providing a sense of belongingness that was not previously present. "You do feel in touch. Although I'm not up [in Dundee] much, I do still feel in touch with the rest of the team and there is contact" (S1); "it does keep you ... part of that bigger picture" (S3). It is widely recognised that a lot of staff development happens informally – so-called "water cooler" conversations – and these opportunities are frequently lost in the context of online programme delivery. As Cornelius and MacDonald (2008) discuss in the context of the Open University, opportunities for such serendipitous staff discussion must happen online in an online programme and this is what TQFE-Tutor offers.

When posting on the TQFE-Tutor blog, S4 felt that her response was in line with the team response, made "in the spirit of a group of people"; she described a "... feeling of unity", identifying with TQFE-Tutor as an entity unifying the various programme tutors.

### *Knowledge of cohort*

Compared with the old personal tutor system, where a staff member's knowledge of the cohort was limited to their own allocation of tutees, TQFE-Tutor enables a much broader understanding of the whole year group. S2 commented, "You see more of issues from other perspectives ... it's like we're all appreciating what each other are dealing with". This of course chimes with idea of collegiality (discussed above), but is also about gaining useful insights into the student body. S3 went on to remark:

> ... rather than focusing on your own marking group or your own participants ... you see more of issues from other perspectives ... I think that for me has been really beneficial. To make me; well, we're all responsible for the full cohort and their problems or issues, their successes.

Speaking about the TQFE-Tutor blog, S4 explained that the collective TQFE-Tutor approach affords a full view of the cohort:

> ... rather than just my own marking group who may not be those who are the very capable ones, happy to ask questions and communicate online. It is an advantage for all staff to see learners engaging and responding online and helps to motivate tutors as well as benefiting those participants who want the answers but are less confident about asking online-as in any group.

Widening this out into the full team, with the "bigger picture" afforded by TQFE-Tutor, all members have opportunities to spot trends and/or common misunderstandings and adapt materials appropriately, offering learners dynamic support.

### *Time saving*

The many time saving benefits of TQFE-Tutor were returned to time and again in the focus group discussion and in the interview. Various members remarked on the repetitions that are avoided by the use of TQFE-Tutor. The answer to an email query from one participant may be posted on the blog (without of course identifying the participant), for all to learn from: not just learners, but frequently the programme staff too. If a participant asks TQFE-Tutor for advice on recommended reading about a particular topic, the duty tutor's suggestions are shared with all via a blog posting, which may also subsequently be supplemented/improved by (blog) comments from learners and programme staff. Thereafter, enquiries on that topic may be referred to the relevant blog page. In the focus group, S2 commented on the valuable time saved by not having to "reinvent[ing] the wheel all the time" – referring again to the useful transparency of the system. S4 remarked that the central organisation of all relevant information – "one place for everything" – on TQFE-Tutor meant that no time was wasted searching through drives or folders.

### *Resilience*

Focus group members spoke very positively about TQFE-Tutor's resilience. S3 remarked, "... if one of the team should go off sick... someone can just step into that role". Previously staff absence had often caused major disruption for the team; tutoring correspondence having been undertaken "privately" in its entirety between personal tutor and learner, remaining closed to colleagues during a staff absence. S4's comments concurred on this theme, commenting that in her work on other programmes any absences result in a build-up; communication with her students stops until she returns to tackle it, "pick up threads". In contrast, she recognised that with TQFE-Tutor the participants would not even know if anyone was absent. Seamless cover through shift swapping takes pressure off individuals and when absentees return it is easy to catch up as there is an "e-trail" in the folders. This means less stress for team members and consequently better support for learners.

Another aspect of the system's resilience – and with particular resonance in the context of staff development – emerges from the team all having to learn new skills as an everyday part of their jobs as part of the TQFE-Tutor staff roster. S1 commented on how she herself had been required "to learn how to post things on the blog" whereas tasks like this formerly fell only to those staff who were recognised within the team as having advanced IT skills.

### *Weakness*

#### *Adherence to FAQs*

Protocols provided in the FAQs must be adhered to by all. "Private" correspondence between markers and participants, conducted via the marker's own email account (and hence not visible to the rest of the team), must be avoided; in the words of the

facilitator of the focus group, "... it relies on everybody sticking to the protocols – very heavily". While TQFE-Tutor has helped minimise the impact of a "maverick marker" on individual participants, the tutor on duty needs to follow protocol closely, to file, forward or reply to messages correctly and refer to the FAQs when unsure. An incoming piece of marking filed without copying the marker in, a report filed incorrectly or a folder mislaid can all cause problems. A duty tutor not reading the "backstory" in a participant's folder in the email account could result in the giving of inappropriate guidance or conflicting advice such as granting a further extension when a final deadline has been fixed, or adopting the wrong tone for example in the case of a family bereavement or mental health issues.

*Necessity of team ethos*

Members of the focus group discussed the issue that whilst in some respects at least, CPD ought to be attractive to all professionals, not everyone is motivated to the same extent to learn new skills. Some staff may become complacent, feeling their subject expertise is sufficient and the constantly changing new IT skills required for the online tutoring role too demanding. The success of TQFE-Tutor entirely depends on a strong team ethos and where this is absent the system breaks down.

*Over-dependence on email*

A continuing over-dependency on email correspondence has been noted and developments are in place to encourage further blog use to enable questions and solutions to be seen by all participants. Aware that some participants do need targeted support and an early identification of study support needs, a diagnostic strategy for extra support is being developed to attune the nature of the task to the perspective of the student (Jonassen 1994).

*Increase in administration*

As TQFE-Tutor becomes more widely known in the college sector here in Scotland, general enquiries of the kind formerly sent to administration – for instance regarding application procedures – are also now arriving in the TQFE-Tutor inbox. Staff are aware of a potential risk of academic staff taking on additional administrative tasks, more suited to a clerical support role.

## Conclusion

A range of strengths and weaknesses emerged from the study. The staff team recognise that TQFE-Tutor has provided a lot of fresh opportunities for informal professional development. By opening access to one another's tutoring, team members experience the online equivalent of peer observation of teaching, and additionally receive a useful overview of the whole student cohort. TQFE-Tutor has engendered a welcome sense of belongingness in a team which rarely meets face-to-face. The time savings it offers are highly valued by the team, as is the resilience of the model. On the other hand, the team recognises some weaknesses too: a continuing over-dependence on email by some participants; the potential problem of individual members of the team not sharing the team ethos and adhering to the FAQs and a potential increase in

administrative correspondence. Having identified these aspects of the system, the team is working towards reinforcing the strengths and minimising the weaknesses.

TQFE-Tutor underlines the importance of the "continuous" part of CPD. Engaging with current and future online learners necessitates staff keeping informed and conversant with an ever-changing field. This constant change presents challenges to online programme teams, but also the exhilaration and intellectual stimulation of being part of a contemporary transformation of education provision. The TQFE-Tutor system introduces new ideas and supports not only programme participants but also tutor team members in making sense of these for themselves (see Driver *et al*. 1994). The online tutor's place of work is online and TQFE-Tutor ensures that professional development opportunities are located there too – as advocated by commentators such as Boud (1999) and more recently Cornelius and Macdonald (2008). Morrison (2012) writes of the need for "... a new academic, one that doesn't use the teaching f2f classroom as the yardstick, but incorporates and adapts pedagogy to the changing tools". By enabling colleagues to help each other "to become sophisticated and even expert" (University of New South Wales n.d.) in online pedagogy, TQFE-Tutor has been instrumental in developing a team of "new academics". For this and other reasons, the authors warmly commend the centralisation of communication and tutoring to other online programmes.

## References


Bennett, S. & Marsh, D. (2002) 'Are we expecting online tutors to run before they can walk?', *Innovations in Education and Teaching International*, vol. 39, no. 1, pp. 14–20.

Boud, D. (1999) 'Situating academic development in professional work: using peer learning', *International Journal for Academic Development*, vol. 4, no. 1, pp. 3–10.

Collison, G., *et al*. (2000) *Facilitating Online Learning: Effective Strategies for Moderators*, Atwood Publishing, Madison.

Cornelius, S. & Macdonald, J. (2008) 'Online informal professional development for distance tutors: experiences from The Open University in Scotland', *Open Learning: The Journal of Open, Distance and e-Learning*, vol. 23, no. 1, pp. 43–55.

Driver, R., *et al*. (1994) 'Constructing scientific knowledge in the classroom', *Educational Researcher*, vol. 23, no. 7, pp. 5–12.

Fidishun, D. (n.d.) *Andragogy and Technology: Integrating Adult Learning Theory as We Teach with Technology*, Available at: http://frank.mtsu.edu/~itconf/proceed00/fidishun.htm.

Garrison, R. & Anderson, T. (2003) *E-learning in the 21st Century a Framework for Research and Practice*, RoutledgeFalmer, Oxon.

Garrison, D. R., Anderson, T. & Archer, W. (1999) 'Critical inquiry in a text-based environment: computer conferencing in higher education', *The Internet and Higher Education*, vol. 2, no. 2–3, pp. 87–105.

Garrison, R. & Cleveland-Innes, M. (2005) 'Facilitating cognitive presence in online learning: interaction is not enough', *The American Journal of Distance Education*, vol. 19, no. 3, pp. 122–148.

Jonassen, D. H. (1994) 'Thinking technology: towards a constructivist design model', *Educational Technology*, vol. 34, no. 4, pp. 34–37.

McLoughlin, C. & Lee, M. (2010) 'Personalised and self-regulated learning in the Web 2.0 era: international exemplars of innovative pedagogy using social software', *Australasian Journal of Educational Technology*, vol. 26, no. 1, pp. 28–43.

Morrison, D. (2012) 'New online teaching model: sage-on-the-side', *Online learning insights* [blog], Available at: http://onlinelearninginsights.wordpress.com/2012/02/20/new-online-teaching-model-sage-on-the-side/

Rice, C. (2011) *Campus Technology 2012: What's Hot, What's Not,* Available at: http://campustechnology.com/Articles/2011/12/29/2012-Whats-Hot-Whats-Not.aspx?sc_lang=en&Page=4.

Richardson, J. T. E., Long, G. L. & Woodley, A. (2003) 'Academic engagement and perceptions of quality in distance education', *Open Learning*, vol. 18, no. 3, pp. 223–244.
Ritchie, J. & Spencer, L. (1994) 'Qualitative data analysis for applied policy research' in *Analyzing Qualitative Data*, eds A. Bryman & R. G. Burgess, Taylor & Francis, London, pp. 173–194.
Srivastava, A. & Thomson, S. B. (2009) 'Framework analysis: a qualitative methodology for applied policy research', *JOAAG*, vol. 4, no. 2, Available at: http://joaag.com/uploads/06_Research_Note_Srivastava_and_Thomson_4_2_.pdf
Staker, H. (2011) *The Rise of K12 Blended Learning*, Available at: http://www.innosightinstitute.org/innosight/wp-content/uploads/2011/05/The-Rise-of-K-12-Blended-Learning.pdf
University of New South Wales (n.d.) *Why is online teaching important?* Available at: http://youtu.be/EDULQMR6wJs
Yorke, M. (2004) 'Retention persistence and success in on campus higher education and their enhancement in open and distance learning', *Open Learning*, vol. 19, no. 1, pp. 19–32.
Zembylas, M. (2008) 'Adult learners' emotions in online learning', *Distance Education*, vol. 29, no. 1, pp. 71–87.

# Secrets of mlearning failures: confronting reality

Thomas Cochrane*

*Centre for Teaching and Learning, Auckland University of Teaching, Auckland, NZ*

*(Received 27 February 2012; final version received 14 June 2012)*

Having implemented and evaluated over 35 mlearning projects in a variety of contexts in higher education over the past 6 years the researcher is ready to share the untold secret: not all mlearning projects succeed! This article critiques three of the researcher's mlearning projects that can be classed as "failures" and compares them to successful projects to draw out critical implications for mlearning project design and implementation to avoid common pitfalls leading to potential project failure. This article uses the researcher's six critical success factors identified across the 35 mlearning projects to evaluate these three projects, and concludes that projects resulting in "no significant difference" in pedagogical outcomes are the result of attempts to shoehorn old pedagogies into new technologies. Lecturer professional development and sustained collaborative support are critical to fostering new pedagogies utilising the unique affordances of mobile devices.

**Keywords:** mlearning; pedagogy; heutagogy

## Introduction

This article is based on the researcher's experience of longitudinal participatory action research in mobile learning from 2006 to 2012 (Cochrane 2011). While the researcher has published over 75 articles (conference papers, journal papers, book chapters and workshops) based on these projects over the years, most of these have focused upon the project outcomes that had successful impact upon pedagogy in a variety of contexts. However, the identification of key critical incidents and understanding of the benefits of mlearning have often come from critical reflection on the "mistakes" or failures of these projects that then led to the redesign and implementation of subsequent iterations. The goal of the research that surrounded these projects was to explore the potential of mlearning as a catalyst for enabling social constructivist pedagogy. Hence while the researcher acknowledges that there are many other pedagogical approaches beyond social constructivism it was the explicit chosen foundation for the research projects and therefore project success was defined as enabling a pedagogical shift from instructivism to social constructivism. The research was situated within the context of the establishment of a new institutional elearning strategy (Cochrane 2010a) named the "living curriculum" that was effectively based on social constructivism, and launched with a institution-wide "roadshow" entitled "Kaleidoscope" in July 2011 with several of the researcher's "successful" mlearning projects showcased:

*Corresponding author. Email: thomas.cochrane@aut.ac.nz

ISBN 978-91-977071-4-5 (print), 978-91-977071-5-2 (online)

http://dx.doi.org/10.3402/rlt.v20i0.19186

- http://youtu.be/MtDdEcA1EIE
- http://youtu.be/KdBsnxHEeFw

### *No significant difference*

Reeves (2005, 2009) argues that even when educational technology projects are described as successful often the results and impact of such projects reveal "no significant difference" on pedagogical outcomes when compared to more traditional teaching and learning approaches, because there has been no explicit design for pedagogical change within these projects. While the potential for innovation and pedagogical change afforded by mlearning is mooted by researchers, for example: (Cook 2010; Herrington *et al*. 2009; Laurillard 2007; Kukulska-Hulme 2010), the evidence is often ephemeral (Pachler, Bachmair, and Cook 2010). In their review of 112 innovative mobile learning projects published between 2002 and 2007, Frohberg, Goth and Schwabe (2009) found that only 5% of these projects focused upon social learning, less than 4% required higher level thinking, with 89% targeting novice learners, and only 10% facilitated user-generated content. In contrast to the majority of mlearning projects, the researcher has been interested in transforming pedagogy from teacher-directed towards social constructivism using mlearning as a catalyst to enable student-generated content and student-generated learning contexts. The Pedagogy-Andragogy-Heutagogy (PAH) continuum (Blaschke 2012; Luckin *et al*. 2010) has been used by the researcher as a critical framework to measure how much pedagogical change each mlearning project has achieved, with each project evidencing a move along the PAH continuum (or not). Thus one indicator of achieving "significant difference" has been the evidence of a change in pedagogy (from teacher-directed pedagogy to student-centred andragogy and ultimately student-directed or negotiated heutagogy) as an outcome of each project.

### *New research methodologies*

To date the majority of mlearning research has used traditional research methodologies with a focus upon predominantly small-scale descriptive case studies with little evaluation and reflection witnessed (Wingkvist and Ericsson 2009). A review of MLearn2007 and 2008 papers (Wingkvist and Ericsson 2009) found that an action research methodology was used by only 5% of these papers. Traxler (2011) commenting upon the impact of mlearning observes:

> These achievements have usually been focused on pedagogy and technology, and have often been part of the research work of universities and institutes, separate from mainstream teaching and learning. Consequently, most of this research and development has been proof-of-concept, project-based, fixed-term and small-scale with little consideration of how to embed, sustain or scale up. (Traxler 2011)

Reeves (2005) makes a case for new educational technology research methodologies that move away from comparative control-based studies that usually result in "no significant difference" to research methodologies that leverage sustained collaboration between researchers and practitioners exploring the unique affordances of new technologies within unique contexts based on reflective enquiry. Reeves (2009) promotes design-based research as such a potential transformational research methodology. Design-based methodologies in mlearning research have

been championed by Herrington *et al*. (2009). Similar in approach to that of a design-based research methodology advocated by Reeves, the researcher used a participatory action research methodology for all of the 35 mlearning projects from 2006 to 2012. This involved a collaborative partnership between the researcher and each of the participating lecturers in each mlearning project. Many of these partnerships have extended over several mlearning project iterations spanning several years, for example (Cochrane 2010a; Cochrane and Bateman 2010; Cochrane and Rhodes 2011).

*Critical success factors*

Critical reflection upon the design, implementation and outcomes of the researcher's 35 mlearning projects have led to the identification and refinement of six critical success factors for mobile web 2.0 project implementation (Cochrane 2010b; Cochrane 2012):

(1) The pedagogical integration of the technology into the course and assessment.
(2) Lecturer modelling of the pedagogical use of the tools.
(3) Creating a supportive learning community.
(4) Appropriate choice of mobile devices and web 2.0 social software.
(5) The need for technological and pedagogical support for matching the unique affordances of mobile web 2.0 with social constructivist learning paradigms.
(6) Creating sustained interaction that explicitly scaffolds the development of ontological shifts, that is the reconceptualisation of what it means to teach and learn within social constructivist paradigms, both for the lecturers and the students. The use of a structured and sustained intentional community of practice around each project was found to facilitate these ontological shifts.

## Examples of mlearning project failure

This section outlines three examples of "failed" mlearning projects and critiques them using the researchers "critical success factors" as a framework to analyse why these projects failed to achieve a significant pedagogical shift towards social constructivism.

### *Diploma of Landscape Design 2008*

The 2008 Diploma of Landscape Design project followed two successful previous mlearning project iterations in 2006 and 2007 within the course. The previous mlearning projects were collaborative partnerships between the researcher and a second year course lecturer and focused upon an annual national flower show contest where teams of students designed and constructed themed landscape designs for the show. The students used eportfolios and cameraphones to record and share their project decisions and progress. The 2008 project involved the addition of a second lecturer from the department in the collaborative research and was based on an elective investigative field trip to Japan, for which the participants were required to be able to fund the cost of the trip themselves. This added cost factor effectively limited

the participants to a small group of students who could afford the trip with the resulting age range of the participants being from 42 to 69, with an average age of 55. Not all of the students participating in the Japan trip volunteered to be involved in the mobile web 2.0 project. The Japan trip ended up with a total of 15 students and 2 course lecturers, with 6 of the students participating in the mobile web 2.0 project. All of the mobile web 2.0 participants were part-time students who had either part-time or full-time jobs related to landscape design, this resulted in a markedly different student profile to that of the previous projects where the majority of students had been in their early 20s. The 2008 student participants had very little previous experience of web 2.0 or mobile technologies (apart from traditional standard cellphone use), and significantly less experience than previous student groups, and student participants had particularly demonstrated a lack of engagement with web 2.0 tools prior to their involvement in the mobile web 2.0 projects. This had implications for the level of pedagogical and technical support required to make the project successful.

The 2007 mobile web 2.0 project identified the need to get lecturers and students up to speed with the mobile web 2.0 technologies before the course project entered critical time-consuming stages. The early integration of the use of the mobile web 2.0 tools and the development of a regular weekly community of practice (COP) were highlighted as potential ways of supporting the mobile web 2.0 projects. Therefore, the researcher and lecturers planned to establish a COP with the students, lecturers and the researcher as the technology steward in semester one in preparation for the elective course beginning in semester two 2008. However, the course participants were all part-time students and were reluctant to attend the COP sessions before the start of the course. Hence COP sessions were limited to four introductory sessions in semester one, followed by a three month break, then four more COP sessions in the month leading up to the trip to Japan in semester two. Key elements of cultivating a COP as emphasised by Wenger, McDermott and Snyder (2002) were compromised by this approach, including: a lack of sustained engagement leading to weak development of a sense of community, a lack of modelling of the expected communities practices by the lecturers leading to the students remaining on the periphery of the group and a resultant reverting to the COP to effectively become workshop sessions rather than forming the core of a developing COP. The first four COP sessions were held in the researcher's computer lab, while the second set of COP sessions were held in a very noisy shared computer lab space, neither of which were conducive to the students' forming a sense of group space or belonging. The 2008 group did not establish a sense of community identity until they were together on the trip to Japan, where they spent significant time together. At this point there was little opportunity for the technology steward to help the group as they encountered technical issues while in Japan with unexpected limited WiFi connectivity options, and as a result several of the student participants, and one of the lecturers, struggled to integrate the mobile web 2.0 technologies into their workflows.

The sonyericsson P1i UIQ-based smartphone was chosen for the 2008 project based on feedback from the 2007 project that indicated better text entry options were need for students. However, the profile of the 2008 students did not suit the rather complex UIQ operating system, and thus the smartphone interface presented a barrier to mlearning adoption.

*Key successes*

The project achieved the following significant outcomes.

- Highlighted the importance of the establishment of a sustained COP around the project
- Establishment of participant eportfolios
- Enhanced communication during the fieldtrip to Japan
- Expanded the reach of the mlearning COP by including a second lecturer from the department, and this was built upon in a subsequent project in 2009 (Cochrane *et al*. 2009)

*Key failures*

The project failed in the following aspects.

- Inappropriate choice of mobile device for the participant demographic
- Unforeseen limited WiFi connectivity during the fieldtrip to Japan
- Participants did not value the use of paid 3G connectivity, preferring editing and uploading media via a desktop or laptop
- The reliance upon a limited number of sessions in a shared computer lab was not conducive to nurturing the COP
- Lecturers defaulted to established workflows rather than maximising mobile affordances, and therefore did not model the use of mobile tools
- Lack of course integration of the project, as the project became an optional extra for voluntary participants

***Bachelor of Architecture 2009***

The 2009 Bachelor of Architecture mlearning project was the first foray into the integration of mobile and web 2.0 tools within the course. The Bachelor of Architecture year-two course mlearning project drew upon the lessons learned from the previous Landscape Design, Product Design and Contemporary Music mlearning projects. Having heard about the previous mlearning projects, lecturers within the school of Architecture at Unitec had expressed interest in exploring the potential of mlearning within their courses. Thus the researcher brainstormed the possibilities with the architecture technology lecturer who then partnered with the researcher to facilitate the instigation of an architecture-based mlearning project in 2009. The Architecture technology lecturer identified the second year architecture course with 115 students as a potential target for the proposed 2009 mlearning project. The Bachelor of Architecture 2009 project used the Nokia XM5800 smartphone and the Dell Mini9 netbook. The project began by initiating a pre-project Architecture lecturer COP cultivated by a weekly meeting of the participants at one of the Campus Café's. Participants brought along their mobile devices and discussed pedagogical and technical issues around the use of mlearning tools facilitated by the researcher.

As reflections on the previous mlearning projects had established that critical success factors for implementing mlearning included the level of integration of the technology into the course and assessment, the negotiated plan was to include the use

of moblogging within the second year Architecture compulsory Studio course as a new form of documenting, sharing and critiquing students' individual and group design projects. However, the studio-coordinator lecturer responsible for setting the assessments for the course declined to be involved in the lecturer COP and essentially vetoed the integration of mlearning into the course assessment. Discussions held between the researcher, the COP participants and the studio-coordinating lecturer did not mange to bridge this impasse. The reasons cited by the coordinating lecturer were: "Architecture is not interested in process, only the final design, and therefore design journaling will not benefit the course", and secondly "In the Studio course the face-to-face interaction is of primary importance". While both of these assumptions were hotly debated, the coordinating lecturer refused to be persuaded. From the researcher's perspective, it appeared the root of the dispute was really about the threat of the project to the centralised control imposed upon the course by the coordinating lecturer. Within the context of the research, the ontological leap (Chi and Hausmann 2003) from lecturer-focused pedagogy to a social constructivist student-centred pedagogy facilitated by mobile web 2.0 was too much for the coordinating lecturer to bridge. The potential for mobile web 2.0 to create or enhance context-independent learning communities (Cook *et al*. 2007; Cook, Pachler, and Bradley 2008) was beyond the lecturer's experience and ability to conceptualise. Thus the "disruptive" nature of mlearning (Sharples 2001; Stead 2007) was viewed by the coordinating lecturer in a negative light, rather than positively as it had been found to be within previous projects. However, the lecturers who had been involved in the COP were keen to continue the project. Thus the mlearning project became a voluntary option for the second year Architecture students rather than integrated into the course assessment as had been planned, but was promoted and supported by the lecturers involved in the architecture COP (six of the nine second year lecturers). While this was a definite setback for the project, it was decided to go ahead as a proof-of-concept exploration anticipating that the student response would be positive and facilitate a re-think by the non-participating lecturers for 2010.

*Key successes*

The project achieved the following significant outcomes.

- Collaborative partnerships were established that were built upon in subsequent projects in 2010 and 2011 (Cochrane and Rhodes 2011)
- Over a third of the course students voluntarily participated in the project and established course eportfolios

*Key failures*

The project failed in the following aspects.

- No course assessment integration
- Several key lecturers refused to engage in the project
- Lecturer presuppositions of student technology ownership were proven false, leading to inappropriate choice of supporting technologies

***Bachelor of Computing 2010***

The 2010 Bachelor of Computing mlearning project was the first attempt at the integration of mobile and web 2.0 tools within the department. The elective course was introduced and designed in the first half of 2010 to explore student mobile application development, specifically the development of iOS applications for the iPhone. The course presented a unique opportunity for the researcher to work collaboratively with the course lecturers to design and implement new pedagogical approaches within the department that leveraged the unique affordances of mobile web 2.0. The elective course was severely under-funded, with only one Macintosh iMac and two iPhones available for the 25 course students to share for iOS development. Consequently the researcher agreed to supply the course with 25 iPhones and 25 "hackintoshed" netbooks (netbooks that booted from a custom installation of OSX on USB memory sticks) for the students and three lecturers to borrow and use as their own throughout the length of the course. The researcher and course lecturers then spent the first semester collaboratively designing the new course curriculum to not only cover iOS development, but to also embed the use of mobile web 2.0 tools throughout the delivery of the course and to establish a learning community that could facilitate interaction, sharing of student-generated content and formative feedback beyond the classroom via Twitter, student blogs, wiki pages, web-based presentations (for example using http://prezi.com), and a course Moodle hub for administration. The use of interactive communications technology was particularly important for the course as the iOS development expert lecturer lived 400 km away and therefore planned remote lecture interaction with the students. Thus the specific outcomes of the co-designed course stated: This course provides us with a unique opportunity to use technology in our teaching and learning.

- The learning outcomes of the course require students to develop an application for a mobile phone.
- We will be using Web conferencing to bring the Wellington-based industry expert into the classroom.
- We will be using mobile technologies as a vehicle for supporting the learning experience of the students.

However, while spending the first semester collaboratively designing and developing the course, there was no time allocated to developing the lecturers' experience or capability for using mobile web 2.0 tools themselves. Consequently, unbeknown to the researcher, the lecturers reverted to their previous course delivery methodologies rather than appropriating or embedding the use of mobile web 2.0 to explore new pedagogies. Thus the first class consisted of the researcher handing out iPhones and netbooks to the participants, followed by a the handing out of a completely revised version of the course outline that specified the course requirements as:

- The learning outcomes of the course require students to develop an application for a mobile phone.
- Students will hand-in written progress reports.
- Students will present their projects to the class using PowerPoint.
- Remote lecturing will use in-class telephone audio conferencing and real-time screen-sharing for iOS coding examples.

Very little thought had been given by the lecturers to appropriately scaffolding the students into iOS development or of the presentation or network requirements of the course. For example: the course was the first experience of Mac OS for the majority of students (and two of the course lecturers), whose previous computing experience had been solely Windows-based, there was no time allocation during classes for exploring the use of mobile web 2.0 tools for communication and collaboration, and no interaction with students via these tools beyond the classroom by the lecturers. The researcher attempted to compensate for these omissions by attending the classes, helping students with their basic OSX issues, providing short tutorials on mobile web 2.0 tools and web-based presentation tools and working with the IT department to install wifi access, laptop connectivity to the classroom projector and an audio system for class presentations. However, the synchronous communication tools used by the lecturers proved to be unreliable and ineffectual for class interaction. Discussions between the researcher and course lecturers revealed that the lecturers did not want to use asynchronous communication and collaboration tools such as Twitter or blogging as they did not have time to learn how to use them or understand the pedagogical benefits, also the final year students were expected to be self-motivated and self-directed with minimal lecturer contact beyond the classes. Student blogs and Twitter use were belatedly added to the course, but received only sporadic uptake from students. Although several student teams did eventually produce some very creative iOS applications and some voluntarily engaged with the mobile web 2.0 tools demonstrated by the researcher, overall the course was regarded as a lost opportunity by the researcher.

*Key successes*

The project achieved the following significant outcomes.

- Several student teams produced creative iOS applications
- The collaborative partnership supplied the necessary hardware to run the course
- Lecturer and student participants were exposed to the potential of mobile web 2.0 even though they did not integrate its use within the course

*Key failures*

The project failed in the following aspects.

- Lecturers defaulted to established pedagogies
- There was no integration of mobile web 2.0 affordances in the delivery or assessment of the course
- No establishment of a supportive learning community beyond the face-to-face class time
- A trusted collaborative partnership between the researcher and the course lecturers was not established
- There was no establishment of sustained exploration of mlearning in the department

**Discussion**

The three projects reinforced the researchers belief that designing for pedagogical change enabled by technology is crucial for moving beyond the phenomena of no significant difference. Critical in this design is the establishment of pedagogical and technological support strategies. Creating a truly collaborative partnership between educational technology stewards or researchers and course lecturers well before implementing pedagogical change with students is one way to support lecturer professional development and buy-in. Choosing appropriate technologies for each unique student cohort is also important, and a focus upon supporting student-owned devices and providing appropriate flexible learning spaces that bridge formal and informal learning is ultimately the way forward. Achieving this is often a long-term commitment, seldom reached within a single iteration of a project implementation. While the Diploma of Landscape Design and Bachelor of Architecture projects developed into further successful iterations, the lack of commitment to change from the Bachelor of Computing lecturers did not sustain further attempts.

A sustained collaborative partnership between the researcher and discipline-based lecturers provides a staged and scaffolded approach to what is effectively apprenticing lecturers into a community of scholarship of teaching and learning and the appropriation of new educational technologies.

***Critical success factors***

These three projects demonstrate that lecturer professional development and sustained collaborative support are critical to fostering new pedagogies utilising the unique affordances of mobile devices. The model adopted by the researcher across the 35 mlearning projects to achieve this was to establish a COP (Lave and Wenger 1991; Wenger 1998) of the participating course lecturers as a catalyst for exploring new teaching and learning frameworks for social constructivist pedagogy in tertiary teaching and learning (Cochrane 2010a). The goal was to provide the Lecturers with an authentic experience of the development of a learning community enabled by technology that would then be implemented and modelled by the Lecturers within the course itself. In all three of the illustrative cases the main failure was to not establish a supporting COP including all of the key lecturers involved in the projects.

The researcher therefore suggests that the implementation of "successful" mlearning projects that result in significant pedagogical change can effectively be supported by collaboration between the project leader (course lecturers) and an academic researcher/advisor taking on the role of the technology steward (Wenger, White, and Smith 2009) within a COP. Table 1 provides an outline of an indicative implementation strategy for an example mlearning project. Note that while the context of this research was enabling social constructivist pedagogy, other learning paradigms can be added or substituted according to the chosen project goals.

This approach involves a significant time and trust commitment from the participants that needs to be clearly articulated right from the start of any mlearning project, however the effort involved can be justified by the potential benefits and evidence of significant pedagogical change from successful implementations, and

Table 1. Example mlearning roll-out timeframe.

| Mlearning project stages | Timeframe | Process and outcome |
|---|---|---|
| Establish weekly COP with lecturers and technology steward.<br>Establish support requirements.<br>Completion of an initial survey that explores participants prior pedagogical beliefs and practice.<br>Establish lecturer eportfolios.<br>Establish a collaborative research agenda and research questions, and establish ethics consent procedures. | Semester 1 | Staff reflect upon their prior pedagogical beliefs and practice.<br>Staff share their current course outlines and assessment strategies for collaborative editing via Google Docs.<br>Staff develop competency with mlearning.<br>Staff explore mlearning pedagogies.<br>Staff develop pedagogical mlearning activities based on social constructivist pedagogies. |
| Mlearning projects with staff and students.<br>Implementation of the mlearning activities within each course and assessment. | Semester 2 | Students establish mlearning eportfolios.<br>Increased student engagement.<br>Flexible delivery.<br>Facilitating social constructivist pedagogies and bridging learning contexts. |
| Lecturers publish and present case studies based on project implementation, these then inform the design of the following iteration of the project. | End of Semester 2 and beginning of following Semester | Collaborative research writing based on prior and redeveloped course outlines and outcomes via Google Docs.<br>Conference, Journal publications and symposia presentations. |

balanced against the huge time and resource loss of a needless project failure. Potential outcomes of COP supported mlearning projects for the participants include:

- Participation in an authentic COP.
- Development of a professional eportfolio.
- Publication and sharing of a peer reviewed research output based on their experience and the resultant changes in their pedagogical practice and the impact of these changes on their students' learning.
- Development of new assessment and learning activities enabling student-generated content and student-generated contexts via student-owned mobile and web 2.0 tools.

The three example case studies illustrate that when this collaborative COP was not established effectively then these outcomes were not explicitly achieved within the project and therefore this was a factor in the failure of these projects to enable any significant pedagogical change.

## Conclusion

Often the most significant breakthroughs in pedagogical transformation resulting from participatory action research are those borne of experiences of failure and critical reflection upon the surrounding issues. However, these "failed" projects are

usually not the subject of research papers, rather their successful successors are. This article confronts the reality of educational technology interventions by sharing some of the valuable lessons learnt from failed mlearning projects that have then successfully informed the design and implementation of subsequent projects. The researcher has found that often the first initial foray into mlearning project implementations within a new educational context represent large learning curves for the participants that result in project failure or demonstrate no significant pedagogical difference, but these projects can inform subsequent successful iterations. Sustained pedagogical and technological support are critical to scaffold the lecturers and students reconceptualisations of teaching and learning enabled by mobile web 2.0.

## References


Blaschke, L. M. (2012) 'Heutagogy and lifelong learning: a review of heutagogical practice and self-determined learning', *The International Review of Research in Open and Distance Learning*, vol. 13, pp. 56–71.

Chi, M. & Hausmann, R. (2003) 'Do radical discoveries require ontological shifts?', in *International Handbook on Innovation*, eds L. Shavinina & R. Sternberg, Elsevier Science Ltd, New York, pp. 430–444.

Cochrane, T. (2010a) 'Beyond the Yellow Brick Road: mobile web 2.0 informing a new institutional elearning strategy', *Special Issue 'The Transformational Impact of Learning technology' of ALT-J, Research in Learning Technology*, vol. 18, pp. 221–231.

Cochrane, T. (2010b) 'Exploring mobile learning success factors', *ALT-J, Research in Learning Technology*, vol. 18, pp. 133–148.

Cochrane, T. (2011) 'mLearning: why? What? Where? How?' in *Proceedings of the 28th ASCILITE Conference, ASCILITE 2011: Changing Demands, changing Directions*, eds G. Williams, P. Statham, N. Brown & B. Cleland, The University of Tasmania, Hobart, pp. 250–262.

Cochrane, T. (2012) 'An mlearning journey: mobile web 2.0 critical success factors', *International Journal of Handheld Computing Research (IJHCR)*, vol. 3, pp. 44–57.

Cochrane, T. & Bateman, R. (2010). 'Reflections on 3 years of mlearning implementation (2007–2009)', in *Proceedings of the IADIS International Conference Mobile Learning 2010, 19–21 March 2010 Porto*, eds I. A. Sánchez, & P. Isaias, IADIS international Association for Development of the Information Society, Portugal, pp. 181–188.

Cochrane, T., Bateman, R., Cliffin, P., Gardner, J., Henderson, I. & Holloway, S. (2009) 'Mobilizing learning: Mobile Web 2.0 scenarios in tertiary education', in *EDULEARN09 the International Conference on Education and New Learning Technologies*, eds L. G. Chova, D. M. Beleguer & I. C. Torres. (International Association of Technology, Education and Development (IATED), Barcelona.

Cochrane, T. & Rhodes, D. (2011) 'iArchi[tech]ture: heutagogical approaches to education facilitated by mlearning integration,' In *Proceedings of the International Conference on Information and Communication Technologies in Education ICICTE 2011*, eds K. Fernstrom and C. Tsolakidis. University of the Fraser Valley and the University of the Aegean, Rodos Palace Hotel, Rhodes.

Cook, J. (2010) 'Mobile phones as mediating tools within augmented contexts for development', *International Journal of Mobile and Blended Learning*, vol. 2, pp. 1–12.

Cook, J. *et al*. (2007) 'Generating learner contexts with mobile devices', in *Mobile Learning: Towards a Research Agenda*, ed. N. Pachler, WLE Centre, Institute of Education, London, pp. 55–74.

Cook, J., Pachler, N. & Bradley, C. (2008) 'Bridging the gap? Mobile phones at the interface between informal and formal learning', *Journal of the Research Center for Educational Technology (RCET)*, vol. 4, pp. 3–18.

Frohberg, D., Goth, C. & Schwabe, G. (2009) 'Mobile learning projects : a critical analysis of the state of the art', *Journal of Computer Assisted Learning*, vol. 25, pp. 307–331.

Herrington, J., *et al*. eds (2009) *New Technologies, New Pedagogies: mobile Learning in Higher Education,* Faculty of Education, University of Wollongong, Wollongong.

Kukulska-Hulme, A. (2010) 'Mobile learning as a catalyst for change', *Open Learning: The Journal of Open and Distance Learning*, vol. 25, pp. 181–185.

Laurillard, D. (2007) 'Pedagogcal forms of mobile learning: framing research questions', in *Mobile Learning: Towards a Research Agenda*, ed. N. Pachler, WLE Centre, Institute of Education, London.

Lave, J. & Wenger, E. (1991) *Situated Learning: Legitimate Peripheral Participation*, Cambridge University Press, Cambridge.

Luckin, R., *et al*. (2010) 'Learner-generated contexts: a framework to support the effective use of technology for learning', in *Web 2.0-Based E-Learning: Applying Social Informatics for Tertiary Teaching*, eds M. Lee & C. Mcloughlin, IGI Global, Hershey, PA.

Pachler, N., Bachmair, B. & Cook, J. (2010) *Mobile Learning: Structures, Agency, Practices*, Springer, London.

Reeves, T. (2005) 'No significant differences revisited: a historical perspective on the research informing contemporary online learning', in *Online Learning: Personal Reflections on the Transformation of Education*, ed. G. Kearsley, Educational Technology Publications, Englewood Cliffs, NJ, pp. 299–308.

Reeves, T. (2009) 'The application of ''design research'' to e-learning', *The First International Conference for e-Learning and Distance Learning.* Ministry of Education, Riyadh.

Sharples, M. (2001) 'Disruptive devices: mobile technology for conversational learning', *International Journal of Continuing Education and Lifelong Learning*, vol. 12, pp. 504–520.

Stead, G. (2007) *Mobile Learning: The Devices may be Small, but Their Impact isn't. M-Learning Symposium*, WLE Centre, Institute of Education, London.

Traxler, J. (2011) 'Introduction', in *Making Mobile Learning Work: Case Studies of Practice*, eds J. Traxler & J. Wishart, ESCalate, University of Bristol, Graduate School of Education, Bristol, pp. 4–12.

Wenger, E. (1998) *Communities of Practice: Learning, Meaning, and Identity*, Cambridge University Press, Cambridge.

Wenger, E., Mcdermott, R. & Snyder, W. (2002) *Cultivating Communities of Practice: A Guide to Managing Knowledge*, Harvard Business School Press, Boston.

Wenger, E., White, N. & Smith, J. (2009) *Digital Habitats: Stewarding Technology for Communities*, CPsquare, Portland, Oregon.

Wingkvist, A. & Ericsson, M. (2009) 'Current practice in mobile learning: a survey of research method and purpose', in *MLearn 2009: 8th World Conference on Mobile and Contextual Learning*, eds D. Metcalf, A. Hamilton & C. Graffeo, The University of Central Florida, Florida.

# Journal of astonishment – a tool to increase satisfaction with exchange programmes

Claus H. Reinhardt[a]* and Evelyne N. Rosen[b]

[a]*Department of Biology, Training College Cologne Claudiusstr, Cologne, Germany;*
[b]*International Foreign Students Department, University Lille 3, Villeneuve d'Ascq cedex, France*

*(Received 25 February 2012; final version received 8 July 2012)*

Many medical students use exchange programmes to enrich their portfolio. However, such a confrontation with reality can be challenging because custom and practice sometimes differ radically between countries. Exchange students post specific peculiarities, as encountered by them abroad, onto the medical exchange website. They can ask for the community's help and are expected to describe the (preliminary) solution that they have found. The "journal of astonishment" is structured by country and is designed not only to provide help for current exchange students but also to prepare future students for their stay abroad. Upon conclusion of the exchange, its satisfaction to both student and host institution is evaluated. Following the intervention, non-illness related drop out rates decreased by nearly 30% and student satisfaction improved by 1.7 points on a 10-point satisfaction scale. Host academic institution satisfaction also increased. Postings from the community were considered helpful. Female students especially benefited from the exchange website when preparing for their exchange. The journal of astonishment thus helps students better to select and prepare for an exchange with a particular academic institution. Moreover, the interactive web-based platform can provide spontaneous assistance with problem handling. The journal of astonishment is a low-cost tool that enhances student and host academic institution satisfaction.

**Keywords:** confronting reality; problem solving; addressing institutional problems; moving learners

## Introduction

Many aspects of university teaching and learning have become virtual. Most universities use learning platforms and there are blended learning concepts and computer-assisted assessment forms (Hall *et al*. 2012). However, there is still at least one aspect for highly successful studies which cannot yet be completed virtually, a stay abroad (Byram 2008). Many students report how fascinating this confrontation with a foreign culture has been, but some complain of having encountered insurmountable problems forcing some of them to terminate their stay prematurely (Reinhardt 2009).

At the same time, most academic host institutions are content with their exchange students. Some, however, complain about students who do not comply with their standards.

*Corresponding author. Email: drcreinhar@aol.com

ISBN 978-91-977071-4-5 (print), 978-91-977071-5-2 (online)


http://dx.doi.org/10.3402/rlt.v20i0.19185

We asked our exchange students what the causes of their problems were: The most frequently delivered answer was that they had a false impression of what the exchange and the exchange university would be like.

Additionally, there were many differences that could cause problems at all stages of the stay (Murphy-Lejeune 2008). Examples from the planning stage include: to whom to address the letter of motivation; which institution eventually can host the exchange so that it will be recognised by the sending university; and the way housing is organised and the nature and standards of accommodation are. Once abroad new problems arise: who takes on responsibility for the exchange student; which academic institutions can offer help in the event of problems; and where such institutions are situated.

However, even if these basic fundamentals are managed there are still a lot of potential surprises to come. Many medical students go abroad during their compulsory internship. During this year they are expected to participate actively in the service: on the ward, in the emergency unit and the operating theatre. Even though there are global standards in medicine, procedures at home and abroad may well differ. For example, hands will always be disinfected before surgical interventions, but the means and steps of disinfection can vary. Insufficient disinfection is life threatening for patients. Therefore, local rules of disinfection have to be obeyed strictly. An exchange student who is to participate in a surgical intervention and who is not familiar with the local disinfection procedure can seriously endanger patients or at least delay the start of the intervention because in order to undergo a second procedure of disinfection. What a negative start of an exchange it would be if the operating professor has to wait for the exchange student to catch up with the disinfecting procedure! Depending on the (bad) temper of this professor some exchanges may never recover from this early mistake (Reinhardt 2009).

Moreover, there may be a wide range of tasks which an exchange student is expected to undertake. Some are expected to "shadow" an experienced doctor, others are expected to run the emergency unit alone with a doctor on call. But what makes it really difficult is that what is fine and challenging for one student who has a lot of experience because the student has worked as a nurse before, can be an excessive task for others who, prior to their exchange, focussed on research.

In addition, countries have different customs. Against the background of World War II, German students can sometimes experience hostility especially from elderly or intoxicated patients. Some exchange students have no problems in "sharing" these views, some are ready to pretend they come from a different country, some can successfully "hide" their nationality and finally for some this is unacceptable.

In some Roman Catholic countries, secular physicians have developed rather strange customs in the past to separate themselves from sisters. What can be exciting especially for certain male students can be completely unacceptable to female or students with committed religious views.

Thus there are many reasons why even high performance exchange-students can fail. Unfortunately the sort of information described above cannot be found in travel guides (Murphy-Lejeune 2008). Even former exchange students' (oral) reports can be misleading because of different inter-individual perceptions.

## Approach

In order to bridge this information gap we tried three different approaches over a period of one year. Each provided the specific information described above to exchange institutions for our medical exchange students. A total of 107 students were included.

Each approach was advertised over the intranet for medical students and during one compulsory lecture regarding internships. Due to varying previous response rates in the past, we asked students going abroad for a 100€ deposit until such time as they had posted their individual report or their journal of astonishment. Students who were not able to pay the deposit had to designate a faculty warrantor.

Upon conclusion of the exchange, the satisfaction of all students and all host institutions was evaluated.

### *First approach: paper report*

Thirty-seven exchange students were asked to write a short report on their stay abroad. The printed reports were gathered in the student exchange bureau where they were held in readiness as Q&A documents for consultation.

### *Second approach: web-based report*

Thirty-nine exchange students were asked to write a short report on their stay, too. Once approval had been obtained, their written report was posted on the exchange website of the medical intranet. This exchange website could be consulted by all student members of the intranet.

### *Third approach: "journal of astonishment blog"*

Thirty-one exchange students were asked to write a "journal of astonishment". The "journal of astonishment" is a tool from linguistic sciences. This journal focuses on what is different in the exchange institution when compared with in the sending institution (Develotte 2006). Moreover, the exchange students were asked how they handled the differences. These "journals of astonishment" were posted to a blog on the medical intranet. This pilot blog was created using the Mahara software. Mahara is open source software for ePortfolios.[1] Mahara offered two major advantages. First this software can be integrated in Moodle. Second there are many ways of managing the access (Murphy 2011). A group for each exchange country was generated in Mahara. Exchange students were invited to post, as by them abroad, to the appropriate Mahara group. In addition to the second approach the web-blog offered to exchange students abroad the possibility to ask for the community's help with specific peculiarities encountered.

Future exchange students could access the blog in order to prepare for their stay. Moreover 6 months after return from their stay abroad the exchange institution was also granted access to the specific journal of astonishment.

One hundred and three exchange students were then asked to evaluate approaches 1–3.

## Results

More than 90% of students returned a suitable report or journal of astonishment. Return rates of each of the three approaches were comparable.

The overall number of evaluating students (103) was sufficient validly to compare satisfaction rates of each approach. Moreover, many host institutions were not present in all three approaches. Therefore, we present satisfaction rates and drop out rates in the form of a summary. Specific remarks for each approach are presented later in this article.

Since reports or "journals of astonishment" were provided, non-illness related drop out rates decreased considerably (by almost 30%). The questionnaire revealed that overall satisfaction with the exchange increased by 1.7 points on a 10-point satisfaction scale. All students were grateful for this novel form of information gathering regardless of whether it came in the shape of paper reports, web-based reports or the "journal of astonishment" blog.

### *Common remarks regarding the paper report and the web-based report*

As mentioned above, students were content with the reports in general. However, the specificity of the written reports was not conclusive. Even when it came to highly frequented exchange-institutions, students pointed out that essential information was missing.

### *Specific remarks regarding the paper report*

Apart from the common remark mentioned above, students complained that during peak hours, future exchange students had to queue to consult the copies on display. Moreover, the exchange office staff protested that when copies got lost it was rather painstaking to produce new ones.

### *Specific remarks regarding the web-based report*

Beyond the aforementioned remark, students were delighted about this form of presentation. They appreciated the fact that they could consult the website at home irrespective of the student exchange office's opening hours.

### *Specific remarks regarding the journal of astonishment blog*

Students appreciated that in addition to the web-based report journals of astonishment focussed on peculiarities (rather than the choice of bars to visit). Moreover, students acknowledged the IT-possibility of asking the community for help. However, over 50% of those who asked for help stated that they either did not receive community help at all, or that the type of advice they did receive was not useful.

Six months after completion, additional individual blogs were made accessible to the respective host institution. More than 75% appreciated this unique chance to find out how their institution was perceived from an international student point of view.

**Discussion**

The "journal of astonishment" offered several advantages over the other forms of reports stated above.

Most students preferred the focus on peculiarities. However, some students sadly missed non-specific information such as a hint towards the "in" bars, restaurants, etc. On the other hand, when we asked former exchange students how useful these non-specific information had been, many of them stated that tastes differ anyway and that many locations had changed over time. The technical possibility of asking the community for help as such is worthwhile. However, more than 50% of students stated that either no comment had been offered at all or that the comments given were not too helpful. The problems of the blog were that we did not have a significant number of bloggers overall and that for many institutions competent bloggers were not available. For these reasons we consider that we might in future issue a certificate which confirms participation in the blog which can form part of the individual student portfolio (Stefani, Mason, and Pegler 2007). We hope that this certificate might foster students to participate more. Moreover, we intend to encourage the faculty to enclose an obligatory paragraph in certificates for exchange students who come to our university stating whether they had participated in the blog.

Another solution could be to encourage several universities to create one common blog. However, in either case adequate technical support will be necessary. Even for our pilot blog, the loss of an enthusiastic and technically experienced student who served as administrator almost blocked the blog when important maintenance work on the faculty website was underway. This proves that sufficient funding is, as usual, a crucial point.

A further advantage of the blog was that we were able to use some of the medical problems encountered abroad as exercises in our regular medical courses (Hanson 2011): Learning teams of students had to compare the well known (to them) German procedure with the foreign one. They had to do literature research and analyse advantages, disadvantages and the crux of the matter. Apart from this exciting learning opportunity we hope that this procedure will advertise the exchange blog and will encourage more students to consider an exchange.

The fact that exchange universities were granted access to the relevant journal of astonishments 6 months after conclusion of the exchange was in most cases appreciated by the exchange universities. We chose this 6-month delay to ensure that students who criticised some peculiarities of practice or experience would know that they could not suffer from any retribution from the host institution.

Making the respective "journal of astonishment" accessible to the host institution implied that former exchange students had to translate their journals of astonishment into the local language or into English.

Moreover, we asked our students to give constructive and reflective feedback (Wetmore *et al*. 2010), even if they were less satisfied with their exchange. This work was in some aspects delicate, because on the one hand (and most importantly) we do not want to censor our students, but at the same time we do not want to offend exchange universities. We found two solutions to this problem: First we asked our students to write their journal for the exchange university in the first-person-perspective only. Second in (one) case of important complaints, the exchange office contacted the correspondent exchange university directly. Some universities asked whether they could comment on the journals of astonishment. We acceded to this

request but we also requested that the universities offered constructive feedback and also uses the first-person-(plural)-perspective in order to avoid ongoing accusations and counter-accusations. The comments posted were very constructive and most of them proposed useful alternatives to the criticised issues.

We recommended to the medical faculty that all exchange students visiting our university ought to write a journal of astonishment also. We propose that their journals are then posted to the exchange website on equal terms. This means that they will have an immediate acknowledgement on their internship certificate that they have participated in this quality circle. Moreover, the access to their journal of astonishment is also delayed for 6 months upon closure of the internship. We hope that these comments can serve as valuable feedback in order to make our faculty more attractive to foreign students.

The 100€ deposit request was the most widely discussed issue regarding this project. Due to some unfortunate experience at the beginning of this project we felt we had to impose this measure. Students and lecturers complained about the distrust this implies. Moreover, particularly prior to going abroad, some students protested that they were not able to deposit such an amount of money. However, this project is dependent on high return rates. A solution to this dilemma was the waiver of the deposit, when a faculty warrantor was designated.

## Conclusion

All three approaches (paper report, web-based report, "journal of astonishment-blog") were appreciated by our students and helped to decrease non-illness related drop out rates.

The "journal of astonishment" pilot blog was the most appreciated approach. The "journal of astonishment" especially helped our students select and prepare for an exchange at a particular academic institution. Moreover, the interactive web-based platform can provide spontaneous help with the handling of problems. This blog is a rather low-cost tool which enhances student and host academic institution satisfaction. However, prior to installing this tool sufficient funding and proper maintenance needs to be provided. A deposit or a faculty warrantor proved to be beneficial to encourage all exchange students to post their journals. In order to provide enough blogs and bloggers we suggest that a joint-blog of several universities or a nationwide one be set up.

## Note

1. Mahara open source eportfolio at http://Mahara.org/ last accessed 20/06/2012.

## References

Byram, M. (2008) 'The 'Value' of academic mobility', in *Students, Staff and Academic Mobility in Higher Education*, eds M. Byram & F. Dervin, Cambridge Scholars Press, Newcastle, pp. 31–47.

Develotte, C. (2006) 'Le Journal d'étonnement', *Lidil*, 34 [online] Available at: http://lidil.revues.org/index25.html

Hall, P., *et al*. (2012) 'Developing a sustainable electronic portfolio (ePortfolio) program that fosters reflective practice and incorporates CanMEDS competencies into the undergraduate medical curriculum', *Academic Medicine*, vol. 87, pp. 744–751.

Hanson, K. (2011) 'Blog enabled peer-to-peer learning', *Dental Hygiene*, vol. 85, pp. 6–12.

Murphy, E. (2011) *Mahara 1.4 Cookbook*, Packt Publishing, Birmingham.
Murphy-Lejeune, E. (2008) 'The student experience of mobility, a contrasting score', in *Students, Staff and Academic Mobility in Higher Education*, eds M. Byram & F. Dervin, Cambridge Scholars Press, Newcastle, pp. 12–30.
Reinhardt, C. (2009) 'Pour une application des trois compétences du CECR en classe', *Le Français dans le monde*, vol. 45, pp. 45–53.
Stefani, L., Mason, R. & Pegler, C. (2007) *The Educational Potential of E-Portfolios: Supporting Personal Development and Reflective Learning (Connecting with E-Learning)*, Routledge Chapman & Hall, New York.
Wetmore, A. O., Boyd, L. D., Bowen, D. M. & Pattillo, R. E. (2010) 'Reflective blogs in clinical education to promote critical thinking in dental hygiene students', *Dental Education*, vol. 74, pp. 1337–1350.

# Beauty and the iPod – a story of contrasts and the use of podcasting in vocational education – Nail Technology

Catherine Naamani[a]* and Louise Taylor[b]

[a]*Centre for Excellence in Learning and Teaching, University of Glamorgan, Pontypridd, UK;*
[b]*Hairdressing and Beauty Therapy, Ebbw Vale Campus, Coleg Gwent, UK*

*(Received 9 March 2012; final version received 29 May 2012)*

This paper takes a case study approach to provide evidence of the benefits of podcasting as a tool used to support a vocational qualification in the subject area of Hairdressing and Beauty Therapy (Nail Technology). It reflects on the experiences of both the lecturer and the students and concludes that podcasting is a valuable tool, supporting a range of learner needs and abilities. The paper presents the journey made by one Further Education (FE) lecturer and her students as they discover that by using freely available resources, such as open source software and low cost, handheld technologies, they learn more effectively, are more engaged and are able to share what they have created with their peers, future cohorts of students and through platforms such as PodOmatic and iTunes, the world. The paper demonstrates that both the creation process and the final product (the podcast itself) are equally valuable in engaging the learners by supporting self- and peer-assessment and through providing timely feedback. The paper suggests areas for further research and evaluation of using this technology in vocational education.

**Keywords:** podcasting; enthusing Learners; vocational education; handheld devices; FE

## Introduction

In the UK, adults are increasingly using mobile and handheld devices to access the Internet at times and places to suit them (Ofcom 2010). This growth in the use of mobile devices has prompted educationalists to explore how they can promote more flexible and relevant opportunities to enhance learning and teaching, with attention being given to the role of mobile learning as a way of promoting inclusivity and greater learner focus. Podcasting is one of the tools available to support this. Research into the use of podcasting in post-compulsory education tends to focus on examples in Higher Education with little evidence of podcasting being used in Further Education (FE) settings, particularly in vocational education. This paper presents a case study where podcasting is being used to support key components of a vocational qualification in the subject area of Hairdressing and Beauty Therapy (Nail Technology) and presents the journey made by one FE lecturer and her students as they discover that by using freely available resources, such as open source software and handheld technologies, they learn more effectively, are more engaged and are able to share what they have created not only with their peers, but also with

*Corresponding author. Email: cnaamani@glam.ac.uk

ISBN 978-91-977071-4-5 (print), 978-91-977071-5-2 (online)

http://dx.doi.org/10.3402/rlt.v20i0.19188

future cohorts of students and, through freely available platforms such as PodOmatic and iTunes, potentially with the world.

## Context

The students involved in the case study were studying a Level 2 Diploma in the vocational area of Nail Technology and were based at a further education college in the Heads of the Valleys area in South Wales (UK learners are expected to achieve Level 2 qualifications on school-leaving age, that is, when they reach age 16). The area faces particularly high levels of economic inactivity and low educational attainment, coupled with poor telecommunications links in some areas (Welsh Government 2006). In order to address this, the Welsh Government has funded an ambitious 15 year strategy to drive regeneration in the region, a key theme being the development of the Heads of the Valleys Education Programme, which aims to ensure that people living in the area have access to a wide range of relevant academic and vocational qualifications, which will encourage progression to higher education and promote lifelong learning (Welsh Government 2007). The development of Information and Communications Technology (ICT) skills is seen as core to improving people's employability and the effective use of technology in learning and teaching as a means of engaging young people in education, a key challenge given the poor infrastructure in the area.

## The literature

Stephen Heppell (2010) challenges our concept of the traditional classroom where "content is king" and "knowledge is delivered" suggesting that in today's world, "knowledge is constructed, and deconstructed, in social networks and 180 degree relationships exchange wisdoms". He goes on to suggest that technology has had a major role to play in this transformation, reflecting on the point that:

> . . . for our young post-Google generation email is unfashionably what your dad does, technology lives in a pocket, and life in an Office sounds like a sentence. (Heppell 2010)

Heppell's view is shared by Skiba and Barton (2006) and Duncan-Howell and Lee (2007), who suggest that students growing up in the last decades of the twentieth Century have had access to digital technologies in ways that previously were not possible. They are Prensky's renowned "digital natives" (Prensky 2001) who are forcing "educators [. . .] to grapple with what *form and shape* learning will look like in tertiary settings in the next few decades" (Duncan-Howell and Lee 2007, p. 223). A key component in this learning revolution is the growth of handheld technologies, which have the potential to have a great impact on learning by facilitating opportunities for mobile learning (m-learning), which has advantages over e-learning because it extends beyond the classroom, creating more flexible, personal and collaborative learning environments (Naismith *et al*. 2006; Evans 2008). Learning is taken to the learner and the boundaries between formal and informal learning become blurred (Campbell 2005; Duncan-Howell and Lee 2007).

Much of the research into the use of mobile technologies tends to focus on specific curriculum areas (Allen 2006; Frantangeli 2009, cited in Lauritzen 2010; Naismith *et al*. 2006) while Lauritzen (2010) indicates that research into the use of these technologies in vocational education has been non-existent. Likewise

Duncan-Howell and Lee (2007) report that there has been limited research on projects on m-learning in further and higher education. Indeed, in the authors' experience, within further education especially, the emphasis is placed on e-learning and the use of Virtual Learning Environments (VLEs). The review of the relevant literature in this paper consequently focuses primarily on those authors reporting on the use of podcasting in a vocational education setting.

The term "podcasting" was first used by Ben Hammersley (2004), reporting on the increasing variety of relatively, cheap, easily accessible and portable tools designed for online publishing. The term was derived from Apple's trademark iPod. Today, podcasts can be played on almost any device that supports the MP3-format. More recently, Frydenburg (2008, pp. 3–4) suggests that the term might more usefully be referred to as an acronym for "personal on-demand", a reflection of the immediacy of a medium "which allows individualized content to be 'broadcast' to one's [own] device simply by downloading it". This is further personalised where users choose to subscribe to an Really Simple Syndication (RSS) feed, which "pushes" subscribed content to the user through an aggregator such as iTunes rather than them have to manually search for updated content (Campbell 2005).

The benefits of podcasting for both learning and teaching are widely reported with many researchers (Chan and Lee 2005; Evans 2008; Hargis and Wilson 2005, cited in Dale 2007; Roschelle 2003) commenting on its flexibility, spontaneity and capacity to engage learners, a view reiterated by Covill and Gill (2008, p. 1) who describe podcasts as valuable teaching resources "which provide a flexible and engaging learning environment and help to accommodate a wider variety of learning styles". They go on to suggest that podcasting can also support a richer learning experience and more learner-centred opportunities for assessment and feedback. Such an approach supports Petty's (2007) concept of "active learning", where learning becomes more authentic and relevant to the needs of the learner.

The social aspect of podcasting is discussed by Dale (2007, p. 49) who contrasts the use of podcasting in a social context, where it has enabled users to become "amateur broadcasters from the comfort of their own homes" with its potential in an academic context where he suggests it can support innovative and creative opportunities for more flexible learning, catering for a wide range of learning styles and developing skills such as communication and critical thinking. Significantly, he remarks on the view that "From a user-creator perspective, Podcasting offers a degree of self-empowerment, control and autonomy" (Dale 2007, p. 50), reinforcing the role of the user, or in this case, the learner, in using podcasting in education. This view is shared by Baird and Fisher (2006) and Huann and Thong (2006, in Barry and Abt 2007), amongst others.

The benefits of using podcasting to support teaching are not universally agreed however, with some researchers commenting on the disbenefits and areas of concern. Dale (2007) counsels against using podcasting purely as an alternative to face-to-face contact, suggesting that their role is as an enhancement to other forms of learning and one which responds well to a student body with increasingly high expectations of technology. In a similar vein, Allen (2006), Becher-Young (2009, cited in Lauritzen 2010) and Frantangeli (2009, cited in Lauritzen 2010) express the fear amongst educators that increasing use of podcasting will have a negative impact on attendance and attainment, a view which contrasts with Deal (2007) and Evans (2008) who report that most students perceive podcasts as a tool for reviewing lectures, rather than as an opportunity to miss them altogether. Similarly, the findings of Janssen

(2009, cited in Lauritzen 2010) and Brittain *et al*. (2006) suggest that the use of podcasting as a review and revision tool had a positive effect on exam results. Students report that "... podcasts [are] efficient, effective, engaging and easily received learning tools for revision" (Evans 2008, p. 497).

The challenge remains, however, in developing the use of mobile technologies and podcasting so as to "improve [...] pedagogical approaches to information processing and conceptual learning" (Hargis and Wilson 2005, cited in Dale, 2007, p. 51). Barry and Abt (2007), Deal (2007) and McLean and White (2009) remind us that successful podcasting is dependent on the aim of the activity taking place and that considerations must include the articulation of clear learning outcomes coupled with well defined expectations for the learner while Duncan-Howell and Lee (2007, p. 223) warn that:

> the use of M-Learning tools themselves does not guarantee their potential being realised. The key to success is the ability of educators to design and develop pedagogically sound opportunities and environments that enhances learning.

Undoubtedly, from a teaching perspective, the use of podcasts to save time (Knight 2006), to provide revision material (Barry and Abt 2007) or to disseminate course material (Frydenburg 2008) can have a positive impact on the learner experience. However, in reflecting on the use of podcasting as a tool for learners, researchers suggest that handing over the creation of content to the students can have even greater impact. Atkinson (2006), Barry and Abt (2007) and Frydenburg (2008) all report of the positive impact of podcasting to support learning and see the role of the learner as key in the process. The suggestion is, where learners create their own podcasts, greater collaboration is promoted while the "social" aspect of podcasting encourages increased dialogue and sharing both of which support innovative approaches to assessment and feedback. The development of ICT skills is seen as a bonus.

## Method

The aim of this research is to assess the benefits of podcasting as a tool used to support a vocational subject (Nail Technology) and to consider the impact that a change of approach in teaching method has had in a particular classroom setting. It was important to undertake the research with a relatively small cohort of students initially, to ensure that access to technology would not be a barrier, to facilitate group management and in view of the proportion of the programme identified for the study. The findings are analysed using a combination of methods – a case study of the experience of the student cohort supported by informal interviews, and an action research approach which evaluates the impact the introduction of podcasting has had in a particular education setting.

The FE lecturer was studying a Level 7 module, *The Pedagogical Application of ICT in Learning and Teaching*, which is designed to engage those working in schools and colleges with ICT as a tool to enhance learning, teaching and assessment. The focus of the module is on the use of the technologies and approaches made possible by the development of ubiquitous ICT in the classroom context. The module is especially relevant to the aims of the Heads of the Valleys Education Programme as it aims to improve both the ICT skills of the students and supports teachers and

lecturers to explore the pedagogical underpinnings of using ICT to engage and enhance learning and teaching.

A core component of the module is the design of a learning activity using JISC's Effective Practice Planner (JISC 2004), which prompts teachers to place the learners at the centre of the learning design, thus supporting the research in this area. When considering the design of a learning activity incorporating modern technology to act as an easily accessible revision and catch up tool/resource that would support the learner and tutor, podcasting seemed to be quite an innovative approach that would suit the needs outlined. It also allowed the opportunity for both the learner and tutor to delve into the m-learning.

As we have indicated, the cohort that participated in the podcasting activity was working towards a Diploma in Nail Technology at Level 2, which is a vocationally related qualification (VRQ). The cohort comprised seven learners aged 18 and under, two in the middle age range at 21 and 23 years old and two more mature learners at age 27 and 31; 11 learners in total. All were female with English as their first language and computer literate. The group generally had a high level of motivation to achieve, although a few lower level learners appeared to lose interest in tasks very easily. Retention and attendance, historically, is a problem and motivation to undertake revision outside of the classroom can also be problematic. The students work well in group tasks and in student led activities and tend to enjoy hands on activities.

The learning objectives for the podcasting activity were for two groups within the cohort to prepare for, design and produce a podcast to demonstrate their understanding of knowledge delivered in Term one. The rational being, as Frydenburg (2008) indicates, that podcasting is an even more powerful tool when students are responsible for the content creation, conducted in this way. Utilising a blended learning approach, the podcast was embedded into the College Virtual Learning Environment (Moodle), as well as, an RSS feed from PodOmatic, the start of the bank of podcasting resources for staff and students in forthcoming academic years.

There were no special requirements for the activity as the resources were readily available onsite; the preparatory work for the podcast took place in a classroom environment and recording took place in a quieter area via a laptop with microphone (student mobile phones or any other audio recording device could be utilised) using Camtasia Studio software (Audacity could be utilised). This was also used for editing and production. Access to the Internet (IT suite/Wi-Fi) was needed in order to connect to the host *PodOmatic* and to link via RSS feed to the VLE.

As indicated by the research (Dale 2007), it is suggested that podcasting caters for a wide range of learning styles and preferences. A VARK (Visual, Auditory, Read/Write, Kinaesthetic) questionnaire (Fleming 2011) is already adopted by the College to build up an understanding of a student's profile as part of the induction programme and to support differentiated learning. A review of the students' profiles determined that eight of the cohort showed a multimodal VARK preference, one a multimodal VAR with another an RK preference. One learner demonstrated a strong preference towards Read/Write (R/W).

Learners in the cohort were familiar with the differentiated groups they were assigned to for group work, arranged by their learning preference, attention span, characters and literacy assessment levels (the majority work at Level 1). The rationale being the Level 2 learners are additional support to the tutor and the Level 1 learners in their assigned groups. These predetermined differentiated groups were utilised

for the podcasting activity. Using this approach, combined with the information gathered on learning preferences, Level 2 learners were assigned "Pod Captain" roles, in which they captained their group and reported to the tutor. Other set roles, that is, scribe, timekeeper and presenter, were negotiated and assigned by the group members.

Barry and Abt's Podcasting Model (2007) was adopted to develop the podcasts. This model poses a series of questions that the tutor should consider before embarking on using podcasting and the associated technology in their teaching and learning. These include the aim of the activity, key pedagogical considerations such as type of podcast, target audience and format, the impact of the podcasts on learning and any technical issues.

The students were able to access the completed podcasts both via *PodOmatic* and on the college VLE. This approach ensured that all students were able to access the resources and while Evans (2008) suggests that maximum benefit comes from downloading podcasts onto a portable device, it was important to make sure that students without portable devices were not prevented from accessing material.

**Outcomes**

Generally, the learners mixed and worked well in their assigned groups. The more extrovert learners tended to be the presenters, while the more introverted tended to be the scribe. The clearly defined objectives and roles, as Kirkwood and Price (2005, cited in Barry and Abt 2007) suggest, ensured learners were clear on what they were supposed to do, why they were expected to do it and how it would enhance their learning. The process and finished product allowed assessment of knowledge and student performance. Learning took place predominantly through the podcast creation and group work activity, but also through the finished podcasts. Essential Skills in Communication and ICT along with Key Skills in Working with others and Improving Own Learning Performance were developed. The activity also gave motivation for revision. The activity created a self-correcting classroom; the process and product allowed an opportunity for misconceptions to be detected and for learning errors and omissions to be diagnosed. The activity provided opportunities for correction with the learners checking for their own, and each other's mistakes and omissions through self- and peer-assessment. Peer discussion, tutor feedback and other "reality checks" assisted with alleviating learning errors and omissions.

This was a constructivist approach, which required the learners to develop constructs and form their own meaning or interpretation of the outlined material. It also made the learning and revision more fun, interesting and interactive. The activity adopted an active learning approach; multimodal that supports all learning preferences, blends well with the learning environment and suits the learners and meets their needs i.e. active learning, learning by doing. The activity was inclusive to all via allocated roles in groupings.

Group 1 produced an excellent podcast that was succinct, well presented, humorous and easy to listen to. Group 2, although they produced a very good podcast, eventually needed to edit and re-record in some areas due to incorrect knowledge divulged. It was not as succinct with little humorous effect and monotonous in comparison with the podcast created by Group 1. This produced the desired effect however, by creating a self-correcting classroom with the learners

able to demonstrate autonomy via the measurement of correct knowledge on the podcast recording and through group work discussions. Measurement through competency in online tests, in the main programme area, is possible, as Brittain *et al*. (2006) found 85% of his survey respondents said podcasting had a positive effect on their exam grades. Whilst online test results can be cast as a measurement against the podcasting activity the author was not able to determine this at present due to time restrictions, but would be possible with future cohorts.

The activity, generally, was very successful. Two podcasts out of the three that were planned were developed and put onto the *PodOmatic* platform and college VLE. The learners really enjoyed assigning themselves the group roles and most excelled in these roles. Confidence and familiarity with the methods and tools played a big part in this first trial; confidence grew as the activity developed and tended to improve further with repetition of task. Difficulties were encountered, however, where the use of technologies such as *PodOmatic* were blocked by the college firewall, limiting the benefits of using this platform as a "push-pull" technology. Similarly the institution's policy of placing all resources onto the VLE meant that it wasn't possible to use technology such as iTunes.

## Feedback from the learners

The voice of the presenter played a big role, as suggested by the learners; it needed to be exciting and easy to listen to. The presenter could be, in future, be decided between the tutor and the group and as Dale (2007) suggests, a "how to" guide and full induction into using podcasts would be beneficial. Humour of the presenter was described by the learners as an important feature.

> I really enjoyed making the podcast ... it was funny listening back to our podcasts. I think it is better when the presenter is funny too, makes it better to listen to not so boring. (student comment)

The length of the podcast should not be too long; Dale (2007) suggests 6–9 minutes to be a reasonable duration. In the authors' view, informed by learner feedback, it would be beneficial to reduce this further to 3–5 minutes. Again this could be outlined in the podcast guidelines. The impact of the finished product, that is, a catch-up tool could not be fully measured with this cohort. This could be gauged, with better perspective, with a new cohort of learners. One learner added.

> I thought that the podcasting was good for revision ... I'm not sure how much I would listen again to the finished podcast we made. (student comment)

In the future, it would be beneficial to trail the use of handheld devices to record podcasts and download directly in class to mobile devices.

> I'd probably listen to the podcast on my phone if I missed a lesson. (student comment)

## Reflections

Obstacles to overcome include accessibility issues and that of the institution's firewall restrictions. The firewall restricted access to the podcast on *PodOmatic* when embedded on the VLE and accessed from within the institution. In spite of this limitation, it was felt to be an essential aspect of the study that learners should be able to access the podcasts on a handheld device such as a Smartphones. In the

future, the feasibility of utilising Smartphones for students to record and upload on their own devices and deploy onto larger platform such as iTunes U will be explored. Such an approach would be beneficial in providing a framework for sharing resources more widely in a cost-efficient way with other learners, practitioners and the extended.

## Conclusions

While the group size was small, the findings of this study appear to confirm what we have read in the literature, namely that podcasting in education is a valuable tool, supporting peer-assessment and revision and providing immediate feedback to both learners and lecturers as to the level of understanding achieved. Similarly, as indicated by the research, the process of allowing the learners to create the podcast is as beneficial as the product itself; it promotes effective group work by building on the different strengths in a group and caters for different learning styles. Consequently, the activity becomes entirely learner-focused and learner-led. To ensure their success, however, podcasts need to be clearly structured and where students are creating the podcasts, aims need to be clear. In addition, while for this study the group's ICT skills were generally good, it is advisable to provide technical support for students on using the software and guidance on what constitutes a "good" podcast, for example, podcasts should be short and the presenting style should be up-beat and engaging. In this way, the activity supports the development of wider skills that go beyond ICT.

The indications are that this approach lends itself well to other vocational subject areas and by encouraging and supporting learners to bring and use their own devices, the approach becomes more easily scalable. It is, however, important to be aware of institutional policies in using particular hardware or software. As has been indicated, in the case of this study, the chosen platform for sharing the podcasts, *PodOmatic*, was in fact blocked by the college firewall and many of the benefits associated with podcasting, such as subscription to RSS feeds or publication to a wider audience, were lost because of the policy to place all resources within the college VLE. It is, therefore, important to involve IT support while planning your activity as while institutional policy might be viewed as inhibiting innovation and potentially accessibility, their early involvement may help overcome some of these barriers and ensure that learners are able to access the tools more easily.

## Future plans

Future cohorts will now have podcasts available for review and those undertaking future podcast activities will now have a sample podcast to aspire to, to create or improve upon. Evaluation will focus on the extent to which these resources are used for learning and revision in combination with their impact on student attainment in the online tests which form part of the end-of-unit summative assessment criteria. It will also be important to consider the extent to which the success of the first cohort of students is a result of the novelty factor or is this an approach which continues to engage and motivate future cohorts. Other themes for further research will include providing opportunities for learners to use their own devices to create podcasts as well as to access them, therefore empowering the learner to an even greater extent;

and given the encouraging feedback from this study, exploring the extent to which the use of podcasting can be expanded to include other vocational areas.

## References


Allen, B. (2006) 'Podcasting in education an intellectual biography', [online] Available at: http://education.transbat.com/courses/eme6405/IntelBioFinalPaper.pdf

Atkinson, R. (2006) 'Podcasting: do you really need to know?' *HERDSA News,* vol. 28, no. 3, [online], Available at: http://www.roger-atkinson.id.au/pubs/herdsa-news/28-3.html

Baird, D. E. & Fisher, M. (2006) 'Neomillennial user experience design strategies: utilizing social networking media to support "Always On" learning styles', *Journal of Educational Technology Systems*, vol. 34, no. 1, pp. 5–32.

Barry, T. & Abt, G. (2007) 'A strategy for using podcasts for teaching and learning in the biosciences available through the centre for bioscience', [online] Available at: www.bioscience.heacademy.ac.uk/ftp/tdf/barrystrategy.pdf

Brittain, S., *et al.* (2006) 'Podcasting lectures', *EDUCAUSE Quarterly*, vol. 29, no. 3, 24–31, [online] Available from: http://www.educause.edu/EDUCAUSE+Quarterly/EDUCAUSEQuarterlyMagazineVolum/PodcastingLectures/157413

Campbell, G. (2005) 'There's something in the air: podcasting in education', *EDUCAUSE Review*, vol. 6, [online] Available at: http://www.educause.edu/EDUCAUSE+Review/EDUCAUSEReviewMagazineVolume40/TheresSomethingintheAirPodcast/158014

Chan, A. & Lee, M. (2005) 'An MP3 a day keeps the worries away – exploring the use of podcasting to address preconceptions and alleviate pre-class anxiety amongst undergraduate information technology students', *Student Experience Conference*, Charles Stuart University, [online] Available at: http://citeseerx.ist.psu.edu/viewdoc/summary?doi=10.1.1.115.1023

Covill, D. & Gill, D. S. (2008) 'Using podcasts and videocasts to complement traditional teaching methods Social purpose and creativity – integrating learning in the real world', *Articles from the Learning and Teaching Conference*, University of Brighton, pp. 60–66, [online] Available at: http://eprints.brighton.ac.uk/7701/

Dale, C. (2007) 'Strategies for Using podcasting to support student learning', *Journal of Hospitality, Leisure, Sport and Tourism Education*, vol. 6, no. 1, pp. 49–57.

Deal, A. (2007) 'A Teaching with technology white paper; podcasting', [online] Available at: http://www.cmu.edu/teaching/resources/PublicationsArchives/StudiesWhitepapers/Podcasting_Jun07.pdf

Duncan-Howell, J. & Lee, K. T. (2007) 'M-learning: finding a place for mobile technologies within tertiary educational settings', *Ascilite,* Singapore 2007, Available at: http://www.ascilite.org.au/conferences/singapore07/procs/duncan-howell.pdf

Evans, C. (2008) 'The effectiveness of m-learning in the form of podcast revision lecturers in higher education', *Computers & Education*, vol. 50, no. 2, pp. 491–498.

Fleming, N. (2001). *VARK a guide to learning styles,* [online] Available at: http://www.vark-learn.com/english/page.asp?p=faq

Frydenberg, M. (2008) 'Principles and pedagogy: the two PS of podcasting in the information technology classroom', *Information Systems Education Journal*, vol. 6, no. 6, pp. 1–11.

Hammersley, B. (2004) 'Audible revolution', *The Guardian*, [online] Available at: http://www.guardian.co.uk/media/2004/feb/12/broadcasting.digitalmedia

Heppell, S. (2010) 'Learning, yearning and earning: why 21st century learning is transforming schools, organisations and markets (keynote address)', *Learning Technologies Conference*, Olympia, London, [online] Available at: http://dp-x2.com/channels/learningtech/index.php?option=com_datpresenter_archive&expsec=102

Huann, T. Y. & Thong, M. K. (2006) *Audioblogging and Podcasting in Education*, Ministry of Education Singapore, [online], Available at: http://scholar.google.co.uk/scholar?hl=en&q=huann+thong&as_sdt=0%2C5&as_ylo=&as_vis=0

JISC. (2006) *Effective Practice Planner*, [online] Available at: http://www.jisc.ac.uk/media/documents/programmes/elearningpedagogy/planner.doc

Knight, R. (2006) 'Podcast pedagogy divides opinion at US universities', *Financial Times*, [online], Available at: http://www.ft.com/cms/s/2/904272e4-9997-11da-a8c3-0000779e2340.html#axzz1iEFeirc5

Lauritzen, L. (2010) *The use of video podcasts as a supplement to lecturers and demonstrations in a traditional hands–on vocational education laboratory environment*, Unpublished Topic Paper for PhD Thesis, Northcentral University, [online], Available at: http://ncu.lauritzenfamily.net/LauritzenLRSH9101E-Activity_8-TopicPaper.pdf

McLean, D. & White, E. R. (2009) 'Two approaches to podcasting use in the classroom', *MERLOT Journal of Online Learning and Teaching*, vol. 5, no. 2, pp. 336–347.

Naismith, L. *et al.* (2006) 'Mobile Technologies and Learning literature review', *Futurelab*, [online], Available at: http://www.futurelab.org.uk/resources/mobile-technologies-and-learning-literature-review

Ofcom. (2010) *Facts & Figures*, [online] Available at: http://media.ofcom.org.uk/facts

Petty, G. (2004) *Active Learning*, [online], Available at: http://www.geoffpetty.com/activelearning.html

Prensky, M. (2001) 'Digital natives, digital immigrants part 1', *On the Horizon*, vol. 9, no. 5, pp. 1–6.

Roschelle, J. (2003) 'Keynote paper: unlocking the learning value of wireless mobile devices', *Journal of Computer Assisted Learning*, vol. 19, no. 3, pp. 260–272.

Skiba, D. & Barton, A. (2006) 'Adapting your teaching to accommodate the net generation of learners', *The Online Journal of Issues in Nursing*, vol. 11, no. 2, Manuscript 4.

Welsh Government. (2006) *Turning Heads: A Strategy for the Heads of the Valleys 2020,* [online], Available at: http://wales.gov.uk/deet/publications/bande/hotv/turningheads/turningheadse.pdf?lang=en

Welsh Government. (2007) *Heads of the Valleys Programme,* [online], Available at: http://wales.gov.uk/topics/businessandeconomy/regeneration/strategicareas/HofV/?lang=en

# "Don't affect the share price": social media policy in higher education as reputation management

Tony McNeill*

*Academic Development Centre, Kingston University, Kingston, UK*

*(Received 12 March 2012; final version received 14 June 2012)*

The last 5 years have seen a growing number of universities use social media services such as Twitter, Facebook and YouTube to engage with past, present and prospective students. More recently still, a number of universities have published policy or guidance documents on the use of social media for a range of university-related purposes including learning, teaching and assessment. This study considers the social media policies of 14 universities in the United Kingdom (UK) that are currently in the public domain. It addresses some of the ways in which Higher Education Institutions (HEIs) are responding to both the positive potential of social media as well as its perceived threats. Drawing inspiration, if not actual method, from critical discourse analysis, this study argues that marketisation has been the main policy driver with many social media policies being developed to promote university "brands" as well as protect institutional reputation. The creation and implementation of social media policies are therefore playing a role in helping universities manage both the risks and the benefits of social media in the context of an increasingly marketised Higher Education (HE) environment in which protecting institutional reputation has become a priority. However, in the defence of the metaphorical institutional "share price", some policies constrain both academic autonomy and the possibilities for innovation and risk-taking.

**Keywords:** policy; social media; openness; sharing; academic autonomy; research; thought piece

## Introduction

The study offers an analysis of the social media policies of 14 universities in the UK (see Appendix for list). It is not a study of implementation and does not draw on interview data from those responsible for devising policy. Its focus is primarily on policy texts and what the discourse of those texts might be said to reveal about the state of higher education in the UK. I will argue that, starting from around 2009, a number of universities have developed social media policies that, whilst providing some level of staff guidance, are mainly about enhancing university "brands" and protecting institutional reputation. I will argue that social media policy appears to be less informed by an awareness of the implications for learning made possible by new forms of digital culture and is more informed by the discourse of marketisation and "new managerialism". Although many of the social media policies are appropriate for the purposes of corporate communication, they are, at best, problematic when

*Corresponding author. Email: a.mcneill@kingston.ac.uk

ISBN 978-91-977071-4-5 (print), 978-91-977071-5-2 (online)

http://dx.doi.org/10.3402/rlt.v20i0.19194

applied to the messier business of learning, teaching and assessment. At worst, some of the social media policies analysed place serious constraints on academic autonomy and the possibilities for innovation, openness and sharing.

## Researcher positionality

I am currently Principal Lecturer in Learning Technology at a medium-sized post-'92 university in the south of England. I am based, not in a faculty, but in a central department dedicated to academic staff development and to the making and implementation of the University's Learning, Teaching and Assessment Strategy. Although, I have not been directly involved in developing institutional social media policy, I am in regular contact with colleagues – notably those from both Information Services and Marketing – who are. As such, I might be said to enjoy something of the epistemological privilege of being an "insider" researcher and am therefore able to gain insights which, as Lankshear and Knobel (2006) remind us, "are *sights* from the *in*side" (pp. 247–248).

I should also add that I am, for primarily professional purposes, a regular user of social media. However, when I use social media am I representing myself or my institution? My initial answer is, of course, myself. However, is it really possible to blog or to tweet, for example, in a wholly individual capacity that does not invoke in any way one's institutional affiliation? When I post an uncomplimentary tweet about current HE policy (see Figure 1), I do so as an individual academic expressing a personal opinion to those who follow me.

However, might my tweet be perceived to be representing an institutional or possibly departmental viewpoint? In using social media to articulate a position hostile to a government policy that I may later have to help implement, am I not undermining the work of my department or institution? It is an ambiguous area that, as I will argue, clearly defined social media policies seek to address.

My research for this study proceeds from the hunch that the making of social media policy in higher education is a response to the perceived threat of reputational damage to institutions caused by unregulated and unsupervised social media use by both staff and students. Although, I will also argue that advising staff of Intellectual Property Rights (IPR), copyright, liability, data protection issues and general good practice are an important part of social media policy, for many institutions the main – but often hidden – purpose is to protect universities' reputation in the context of a competitive HE market in which "brand value" is key. Derek Morrison, associate head of e-learning at the Higher Education Academy, in an exchange quoted in the *Times Higher Education Supplement*, offers the following advice to


Figure 1. Tweet articulating personal opinion.

academics considering using social media: "[t]he simple rule for everyone should be 'don't affect the share price', no matter what technology you are using" (Corbyn 2008). As I will argue in more detail later, it is the metaphorical "share price" or reputation that enables universities to recruit students and, in the context of differential tuition fees, to charge the maximum possible. This is why the reputation or "brand" needs to be carefully managed.

## What is social media and why does it matter to HE?

Social media is the term used to designate online services characterised by a high degree of collaboration, interaction and content sharing. Social media tends now to be the term used in preference to Web 2.0 and encompasses such varied technologies as blogs, wikis, social networking sites such as Facebook, as well as media sharing services such as YouTube and Flickr.

Social media has lowered the threshold technological barriers to creating online spaces, facilitating conversation and sharing information. However, this greater ease brings with it potential threats. Might online spaces and digital communication tools allow academic staff to articulate statements or publish media at variance with institutional policy or in some way detrimental to institutional reputation? There have certainly been high-profile cases (Ringmar 2007) in recent years. Of equal concern is the possibility that social media sites might become spaces in which staff and students – past, present and potential – post defamatory or inflammatory comments that are harmful to a university's reputation?

Although social media offer many great opportunities to connect and engage with a range of users, it is also regarded by many with a degree of caution. This is because blogs or Facebook pages, for example, tend not to be hosted on institutional systems such as the university intranet, the institutional Virtual Learning Environment (VLE) or official web sites. Social media therefore fall outside of the institutional policies and management control mechanisms. Staff use of social media might be perceived to be circumventing university controls in ways that may present themselves, their students and their institution with unacceptable levels of risk. The need to manage the risks attendant upon such uncontrolled and decentralised uses of social media services informs, to a degree, the making of social media policy in higher education. Although other policies relating to the use of internet-based technologies exist – around university computing and telecommunications facilities, data protection, intellectual property rights and staff and student disciplinary policies to name just a few examples – some institutions have responded to both the new challenges and the new threats by developing explicit social media policies for staff and, in some the cases, for students as well.

## Marketisation as the key policy driver

Shattock (2006) has argued that from the late 1970s onwards, higher education policy has been driven exclusively from the "outside inwards" with internally generated policy-making being increasingly sidelined as the state takes over the lion's share of its development. He argues that "the state has taken over policy making because the insider organs that once generated policies have been weakened or no longer exist" (p. 138). The context of higher education policy-making in the UK then is very much driven by the priorities of government; its drivers are external rather than internal.

The main driver behind the development of a range of policies in UK HEIs has been successive governments' commitment to restructure higher education provision along market principles (Brown 2011; Levidow 2002; Lynch 2006). The principal national HE policy driver informing policy – including "micro" policies such as an institution's social media policy – is, therefore, the marketisation of higher education.

I am using the term "marketisation" to designate the movement towards the commodification of academic education, a movement that seek to refashion the relationship between academics and students along the lines of a service provider and a consumer. Marketisation is, as Furedi (2011) points out, "as much a political/ideological process as an economic phenomenon" (p. 2) in so far as it is symptomatic of the neo-liberal weakening of the state and the concomitant stress on the value of higher education to the individual as consumer who expects a "return" on his/her time and financial. The knowledge developed or acquired at university is now less a public good and more a commodity to be capitalised on or traded in on the employment market.

The marketisation of HE has highlighted the need for universities to stand out from their competitors by offering a distinctive "brand proposition" (Chapleo 2005, 2006; Nguyen and LeBlanc 2001). Brown (2011) argues that "the growth of marketing functions is inevitable and essential" (p. 36) and that, over the last decade or so marketing and communications departments have seen their influence grow. In this context it is clear why the use of social media too might need to be professionally managed in order to protect and enhance institutional reputation.

## Literature review

To date, there has been no research conducted on the production and implementation of social media policy in higher education either nationally or internationally. The blogosphere is full of posts – mainly from the USA – on how to create social media policy but there has so far been no analysis of what is admittedly an emergent genre of policy text. However, since the early 1990s some academics have began to study the both the marketisation of higher education as well as the degree to which the discourse of marketisation had begun to inflect the language used in university texts. For example, Fairclough (1993) has analysed the "colonisation of discourse by promotion" (p. 142) in university job advertisements; Pearce (2004) the marketisation of discourse about education in general election manifestos; Askehave (2007) the language of international prospectuses and Quinn (2012) staff resistance to the discourse of academic staff development. It is within the intellectual context of the critique of the discourse of marketisation that I locate this study.

## Methods and methodology

This study of social media policy documents broadly adopts the analytical approach of critical discourse analysis (CDA). CDA views the use of language as a form of social practice. All forms of social practice are tied to specific historical contexts and are the means by which existing social relations are reproduced or contested. CDA seeks to make visible the ways in which institutions and their discourse shape our identities. As Fairclough (1992) has written, "'critical' implies showing connections and causes that are hidden" (p. 9). CDA therefore attends to the ways in which language serves different interests. When "doing" CDA one might, for example,

interrogate whose interests are being served by a particular text. My starting hunch – that policy was a response to senior management's anxiety about unregulated social media use that sought to manage or control academic freedoms – drew me towards this type of analytical approach.

## Sampling method

My sample corpus is derived from the 14 social media policies available online that I was able to locate between early October 2011 and late May 2012. My search involved typing in a number of search strings – e.g. "social media policy HE", "Web 2.0 policy HE", "social networking policy HE" – into the Google search engine and following up the relevant search results. I also used my main Twitter account to tweet a request for information on and links to social media policy documents from UK-based HEIs. I found 13 of the 14 policies as a result of using a search engine and just one additional new policy (in addition to two duplicates) as a result of the tweeted request.

By chance rather than by design, my convenience sampling has the appearance of purposive, non-probability sampling (Ritchie and Lewis 2003, pp. 77–108) in so far as the 14 institutions with publicly accessible policy documents represent a broad cross-section of the different types of university in the UK: those chartered in the nineteenth century (e.g. University of Durham) through to "red brick" (e.g. University of Bristol), plate glass (e.g. University of Essex) and "new" or "post-'92" universities (e.g. University of Central Lancashire). I was not able to locate any social media policy documents from an "ancient" university such as the University of Oxford or the University of Edinburgh so the sample cannot be said to be wholly representative of the HE sector in the UK. Although it may be the case that these institutions have social media policies that are accessible only to staff, it would be interesting to conduct further research into the apparent absence of social media policies from "ancient" universities – in the main elite institutions – with a view to exploring the degree to which they feel they do not require the sort of "brand management" other universities do.

Having selected a corpus of texts, I was interested in discovering which department had responsibility for producing the policy, what the stated purposes of the policy were, whose interests were being protected and the degree to which policy had been "colonised", as it were, by the discourse of marketisation.

## The location of policy-making

A key question I wished to consider when analysing policy was the location of that policy-making. Which department or unit has primary responsibility for creating policy? With the exception of four universities, most policies were accessed from either the human resources pages or the marketing pages of the universities' web sites (Figure 2).

The location of policy is a clear indicator of which department has the strongest strategic interest in developing social media policy. What is obvious from the admittedly small sample is that the marketing and communications teams currently have the largest stake in developing social media policy. This is because these teams are more actively engaged in protecting or enhancing institutional reputation. Moreover, marketing and communications services appear to have a better grasp of

| Marketing (7/14) | HR (3/14) | Other (4/14) |
|---|---|---|
| Aberystwyth University | University of Central Lancashire | Heriot Watt University |
| University College London | Durham University | University of Essex |
| University of Glamorgan | University of Surrey | Open University |
| University of Huddersfield | | Robert Gordon University |
| University of Leicester | | |
| Liverpool John Moores University | | |
| Oxford Brookes University | | |

Figure 2. The location of social media policy.

how to use social media as it is now plays an important role in how private-sector companies develop their brand.

Where policy was produced by marketing and communications departments, the influence of marketing discourse was, predictably, most prevalent. For example, the University of Leicester's social media policy states that:

> Social media presents an opportunity but also a challenge for *brand and reputation management*. [emphasis mine]

Moreover, a sidebar to the left of the policy text links to a page on the "University's Brand Proposition" which explains to readers the "need for an underpinning market proposition" to differentiate the University of Leicester from other institutions in a competitive marketplace. The Open University's social media position paper develops this idea by arguing that brand identity is constructed, at least in part, by public "conversations" on social media services:

> An organisation's brand is moving from being what it says it is on its website or in its adverts and brochures to being what its customers (or those who have experienced the company) say it is and tell other people it is. Frequently the arena for these conversations comprises the social media tools and technologies identified above.

Many of the policies adopt the explicit language of the market by describing students as "customers" and the institution as a "service provider". The social media guidance from Liverpool John Moore's University (LJMU) provides one example of this:

> It is important to be mindful that we may attract negative as well as positive comments. Correct handling of such comments can serve to promote LJMU as a responsive, helpful organisation that aims for *high levels of customer service*. [emphasis mine]

We can discern then, in these policy documents, use of a discursive repertoire drawn from marketing and the underpinning concepts of the university as both brand as well as service provider.

Equally interesting are the three institutions whose human resources departments were responsible for policy-making. Unlike marketing departments, it is less clear to me what claim to expertise HR departments might have in the area of social media. However, HR departments are generally the originating source for disciplinary policies and, as such, tend to contextualise social media use in terms of potential misconduct. There's a stress in the policies emanating from HR departments, therefore, on compliance and on managerial structures.


Figure 3. University of Surrey social media policy word cloud.

For example, the University of Surrey's social media policy is a two-page PDF document that adopts a defensive stance and stresses reputational risks. This policy is clearly about defining acceptable and unacceptable behaviour and offers – in contrast to most of the other policies – little advice to staff on what might constitute good practice:

> ... serious misuse of Social Networking sites that has a negative impact on the University may be regarded as a disciplinary offence. An individual is free to talk about the University. However instances where the University is brought into disrepute may constitute misconduct or gross misconduct and disciplinary action will be applied.

Using an online concordancing tool (http://www.spaceless.com/concordancer.php) and setting it to remove the 1000 most common words and to display only words which appear on four or more occasions produced the following word cloud – a frequency-weighted list or textual histogram – of the University of Surrey's social media policy (Figure 3).

The dominant word is "university", suggestive of a document whose purpose is to protect institutional interests above all else. Moreover, other frequently used terms invoke institutional hierarchies – "employees" and "manager" – and also contractual obligations ("employment" and "disciplinary"). This is a document redolent of the discourse of the "new managerialism" (Deem 1998; Deem and Brehony 2005): there is a stress on compliance with policy, following the necessary procedures and seeking permission from those with appropriate managerial authority.

## Social media policy as reputation management

In nine policy documents, explicit reference was made to the importance of institutional reputation at or near the very beginning of the text:

> This guidance is designed to bring your attention to the measures within the University of Central Lancashire (UCLan) which are designed to protect you from abuse by a colleague via a social networking site and to protect the *reputation* [emphasis mine] of your employer.

> The purpose of this guidance is to protect the *reputation* [emphasis mine] of employees of Durham University and the University as a whole from abuse via staff usage of social networking and personal internet sites.

Other policies avoid direct use of the term "reputation", preferring instead alternatives (e.g. "interests") or near synonyms (e.g. "integrity") as in the example below:

> The purpose of the social media policy is to promote the *interests* [emphasis mine] of the University of Glamorgan within the realms of social media whilst protecting the *integrity* [emphasis mine] of the University and maintaining a consistently high standard of communication with internal and external users.

The idea of institutional reputation is something invoked by the perceived threat of social media being used in ways which bring the university into "disrepute" as in the following example from the University of Huddersfield:

> Anybody is free to talk about the University on social media sites. However, please be aware that disparaging or untrue remarks which may bring the University, its staff or students into *disrepute* [emphasis mine] may constitute misconduct and disciplinary action may be applied.

Three policies – from Oxford Brookes University, University College London and the University of Essex – do not refer to reputation as such although the concept is implicit in the verbs used. For example, the Oxford Brookes University social media policy begins:

> The university is keen to encourage its staff to actively engage in the use of social networking to *promote* [emphasis mine] and communicate on behalf of Oxford Brookes.

The verb "promote" invokes the marketing possibilities of social media use and therefore may be interpreted as strengthening or enhancing the Oxford Brookes "brand". In the "general usage policy" section there is explicit reference to the "[u]se of the Oxford Brookes Brand" and to staff requirement to "comply with the corporate branding guidelines". There is very clear evidence in this policy, therefore, of marketing discourse.

The University of Essex's social media policy uses another verb in its opening paragraph:

The purpose of these social media guidelines is as follows:

- to encourage good practice
- to *protect* [emphasis mine] the University, its staff and students
- to clarify where and how existing policies and guidelines apply to social media
- to promote effective and innovative use of social media as part of the University's activities

The University of Essex's social media policy is much less inflected by marketing discourse than that of Oxford Brookes. However, what is less clear are the threats from which the university needs protecting. The reader is left to infer meaning and my interpretation is that the threats are both legal but also reputational. Damage to reputation then, is the tacit threat from which the University requires protection.

**Policy levers**

The term "policy lever" refers to the potential actions an organisation might take to influence behaviour. In the cases of some, although certainly not all of the social media policies, the lever is potential disciplinary action in cases of infringement or breach of policy (e.g. University of Glamorgan, Heriot-Watt University, University of Huddersfield, University of Surrey). Two examples will suffice to give a sense of the register used and sanctions invoked:

> Staff whose use of Web 2.0 services, whether for work or private use, exposes the University to risk of legal liability, operational, financial or reputational loss may be subject to disciplinary sanctions. (Heriot-Watt University)

> Unless there are specific concerns about the nature of your job, you are free to talk about UCLan on your site. However, you must avoid bringing the University into disrepute in any way, as this may constitute gross misconduct as listed in the Disciplinary Procedure in the staff handbook. (UCLan)

Those institutional whose policies invoke formal disciplinary action, I would argue, exercise what Trow (1994) calls "hard managerialism" characterised by more authoritarian language and by systems of rewards and sanctions accorded to staff based on their compliance or non-compliance with policy.

Another feature of these policies is the requirement to register social media use with either one's line manager or a central department (marketing, web team or information services) as in the following example from the University of Central Lancashire:

> If you already have a social networking site or intend to initiate one which indicates in any way that you work at UCLan you should inform your manager.

Such rules place social media use under strict managerial control or else under supervision of a specialist department. Aberystwyth University, for example, requires all proposals for the use of social media for learning and teaching purposes with an anticipated life-span of over four months to be submitted to the Social Media Officer and, if required, reviewed by the Social Media Group. The Open University justifies a similar requirement in its policy by claiming that engagement with different "communities" is "undertaken with a common voice and does not contribute a plurality of, or conflicting, messages".

In some universities, a more collegial tone is taken with colleagues encouraged to register their social media use with a central university department as an option rewarded by advice and regular updates as in the following example from University College, London:

> **Get in touch with us!** Let us know what you've set up: we'll add you to the list of UCL social media users on this site, and also try to keep you up to date with central social media developments.

These policies might be seen as exemplifying what Trow (1994) terms "soft managerialism" insofar as they seek the agreement and consent of colleagues and are therefore more compatible with collegiality than "hard managerialist" approaches. Although the more collegial tone comes as something of a relief when compared to the more authoritarian discourse of other policy texts, the underlying aims are to influence the nature of staff interactions and to create a centralised list of social media use that may be monitored and could, potentially, be required to close down.

## Conclusion

An alternative title to this study might have been "the presentation of universities in everyday life". The allusion to Goffman's (1959) dramaturgical theory is deliberate: his argument that individuals are engaged in what they hope to be a flawless and convincing performance to audiences whilst keeping the messy business of contradiction firmly back stage seems relevant to the ways universities seek to present themselves in the best possible light to a diverse audience including potential applicants, alumni, on-course students and employers. Social media – for better or

worse – has the potential to trouble institutions' attempts to project a unified and controlled image of themselves to the world. Therefore, many social media policies are about seizing control of what Goffman calls "impression management" imposing from the top-down as it were a repertoire of preferred presentational strategies (use of corporate branding, tone, disclaimers, etc.).

I have not wanted to argue that producing social media policy is a "bad thing" *per se*. Indeed, I have learnt much from reading the documents, some of which have been full of constructive advice that I will share with interested colleagues. Also, it is unfair to present all social media policies as a homogeneous monolithic bloc; some adopt a more collegial register and offer support and advice whilst others wrest control of social media away from academic staff and wield the threat of disciplinary action. Rather, I have wanted to draw attention to the ways in which even a micro-policy is informed by a dominant policy driver such as the marketisation of higher education.

Finally – and, for me, most importantly – I have wanted to highlight the potential tensions between the academic ideals of openness and the freedom to act and to write as we see fit with social media policies that limit our academic autonomy. I have attempted to argue that policies constrain as much as they enable our possibilities for action. Is perhaps the greatest risk posed by the more restrictive of the social media policies analysed that, in the name of maintaining the metaphorical university share price, they also inhibit innovation?

## References


Askehave, I. (2007) 'The impact of marketization on higher education genres – the international student prospectus as a case in point', *Discourse Studies*, vol. 9, no. 6, pp. 723–742.

Brown, R. (2011) 'The march of the market', in *The Marketization of Higher Education and the Student as Consumer*, eds M. Molesworth, E. Nixon & R. Scullion, Routledge, London, pp. 11–24.

Chapleo, C. (2005) 'Do universities have 'Successful' Brands?', *International Journal of Educational Advancement*, vol. 6, no. 1, pp. 54–64.

Chapleo, C. (2006) 'Barriers to brand building in UK universities?', *International Journal of Nonprofit and Voluntary Sector Marketing*, vol. 12, no. 1, pp. 23–32.

Corbyn, Z. (2008) 'By the blog: academics tread carefully', *Times Higher Education Supplement*, [online] Available at: http://www.timeshighereducation.co.uk/story.asp?storycode=403827

Deem, R. (1998) "New managerialism' and higher education: the management of performances and cultures in universities in the United Kingdom', *International Studies in Sociology of Education*, vol. 8, no. 1, pp. 47–70.

Deem, R. & Brehony, K. J. (2005) 'Management as ideology: the case of 'new managerialism' in higher education', *Oxford Review of Education*, vol. 31, no. 2, pp. 217–235.

Fairclough, N. (1992) *Discourse and Social Change*, Polity Press, Cambridge.

Fairclough, N. (1993) 'Critical discourse analysis and the marketization of public discourse: the universities', *Discourse and Society*, vol. 4, no. 2, pp. 133–168.

Furedi, F. (2011) 'Introduction', in *The Marketization of Higher Education and the Student as Consumer*, eds M. Molesworth, E. Nixon & R. Scullion, Routledge, London, pp. 1–8.

Goffman, E. (1959) *The Presentation of Self in Everyday Life*, Doubleday, New York.

Lankshear, C. & Knobel, M. (2006) *New Literacies: Everyday Practices and Classroom Learning*, 2nd edn, Open University Press, Buckingham.

Levidow, L. (2002) 'Marketizing higher education: neoliberal strategies and counter-strategies', in *The Virtual University? Knowledge, Markets and Management*, eds K. Robins & F. Webster, Oxford University Press, Oxford, pp. 227–248.

Lynch, K. (2006) 'Neo-liberalism and Marketisation: the implications for higher education', *European Educational Research Journal*, vol. 5, no. 1, pp. 1–17.
Nguyen, N. & LeBlanc, G. (2001) 'Image and reputation of higher education institutions in students retention decisions', *The International Journal of Educational Management*, vol. 15, no. 6, pp. 303–311.
Pearce, M. (2004) 'The marketization of discourse about education in UK general election manifestos', *Text*, vol. 24, no. 2, pp. 245–265.
Quinn, L. (2012) 'Understanding resistance: an analysis of discourses in academic staff development', *Studies in Higher Education*, vol. 37, no. 1, pp. 69–83.
Ringmar, E. (2007) *A Blogger's Manifesto: Free Speech and Censorship in the Age of the Internet*, Anthem Press, London.
Ritchie, J. & Lewis, J., eds (2003) *Qualitative Research Practice: A Guide for Social Science Students and Researchers*, Sage, London.
Shattock, M. (2006) 'Policy drivers in UK higher education in historical perspective: 'Inside Out', 'Outside In' and the contribution of research', *Higher Education Quarterly*, vol. 60, no. 2, pp. 130–140.
Trow, M. (1994) 'Managerialism and the academic profession: the case of England', *Higher Education Policy*, vol. 7, no. 2, pp. 11–18.

## Appendix: List of publicly-accessible social media policies and their locations

Aberystwyth University. http://www.aber.ac.uk/en/media/social-media-policy-by-Russ.pdf

University of Central Lancashire (UCLAN). http://www.uclan.ac.uk/information/services/hr/hr_guidance_employees/social_networking.php

University College London (UCL). http://www.ucl.ac.uk/social-media/

Durham University. http://www.dur.ac.uk/hr/policies/social/

University of Essex. http://www.essex.ac.uk/digital_media/policy.aspx

University of Glamorgan. http://msr.glam.ac.uk/documents/download/52/

Heriot Watt University. http://www.hw.ac.uk/webteam/about/service/social-media.htm

University of Huddersfield. http://www2.hud.ac.uk/shared/shared_vcowg/docs/policies/Social_Networking_Policy.pdf

University of Leicester. http://www2.le.ac.uk/offices/marketing/marcomms/communications/social

Liverpool John Moores University. http://www.ljmu.ac.uk/corporatecommunications/102249.htm

Open University. http://www8.open.ac.uk/about/ebusiness/files/ebusiness/file/ecms/web-content/ou-social-media-position.pdf

Oxford Brookes University. http://www.brookes.ac.uk/staff/marketing/web/socialmedia/policy

Robert Gordon University. http://www.rgu.ac.uk/staff/administration-and-professional-departments/livewire/social-media-toolkit

University of Surrey. http://www.surrey.ac.uk/about/corporate/policies/social_network_policy.pdf

# Participatory pattern workshops: a methodology for open learning design inquiry

Yishay Mor[a]*, Steven Warburton[b] and Niall Winters[c]

[a]*Institute of Educational Technology, Open University, Milton Keynes, UK;* [b]*International Programmes, University of London, London, UK;* [c]*Institute of Education, University of London, London, UK*

*(Received 12 March 2012; final version received 17 June 2012)*

In order to promote pedagogically informed use of technology, educators need to develop an active, inquisitive, design-oriented mindset. Design Patterns have been demonstrated as powerful mediators of theory-praxis conversations yet widespread adoption by the practitioner community remains a challenge. Over several years, the authors and their colleagues have facilitated many workshops in which participants shared experiences, captured these as design narratives, extracting design patterns, and applied them to novel teaching challenges represented as design scenarios. This paper presents the core elements of the methodology that emerged from these workshops: the Participatory Patterns Workshops (PPW) methodology.

**Keywords:** design patterns; design narratives; scenarios; workshops; methodology

## Introduction

The wealth of open and readily available information and the accelerated evolution of learning technologies offer learners and educators unprecedented opportunities, but also increasingly complex challenges. Educators are no longer learners' primary source of knowledge. Instead, they need to carefully craft the conditions for learners to inquire, explore, analyse, synthesise and collaboratively construct knowledge from the wide variety of sources available to them. This realisation is promoting a shift in the perceived role of educators, from conduits of knowledge to *designers of learning experiences* (Laurillard 2008). Several studies (Voogt *et al.* 2011) demonstrate the value of engaging in design for teachers' professional development. Extensive research over the last decade highlights the complexity of learning design and the design of learning technologies (Mor and Winters 2008). This complexity calls for novel approaches to the articulation, validation, sharing and application of design knowledge, i.e. experience of the learning design process. While design patterns can be viewed as "solutions to problems" we instead focus on their development as a way to support theory-praxis conversations (Goodyear, de Laat, and Lally 2006). This process is challenging, hence the need for our pattern workshop methodology.

This paper emerges from the work of the Learning Patterns (lp.noe-kaleidoscope.org) and Planet (patternlanguagenetwork.org) projects. Over several years, the authors and their colleagues in these projects have facilitated workshops in which

*Corresponding author. Email: Yishay.Mor@open.ac.uk

ISBN 978-91-977071-4-5 (print), 978-91-977071-5-2 (online)


http://dx.doi.org/10.3402/rlt.v20i0.19197

participants shared experiences, extracted design patterns from these and applied them to novel challenges (Winters and Mor 2009). This paper presents the core elements of the methodology which emerged from these workshops: the *Participatory Methodology for Practical Patterns* – practical in the sense of "related to practice", and participatory in the sense that they are recorded by the practitioners from their own experience.

## Background

In order to enable a culture of critical, informed and reflective design practice we need a linguistic framework for communicating *design knowledge*: the knowledge of the characteristic features of a domain of practice, the challenges which inhabit it and the established methods of resolving them. Several representations have been proposed to this effect: design narratives (Mor *et al.* 2010), design principles and design patterns (Mor and Winters 2008; Retalis, Bachfischer, and Goodyear 2010). The PPW methodology utilises two of these – design narratives and design patterns, and projects the first into the future, to form a third representation – design scenarios.

*Design narratives* are accounts of critical events from a personal, phenomenological perspective. They focus on design in the sense of problem solving, describing a problem in the chosen domain, the actions taken to resolve it and their unfolding effects. They provide an account of the history and evolution of a design over time, including the research context, the tools and activities designed and the results of users' interactions with these. They portray the complete path leading to an educational innovation, not just its final form – including failed attempts and the modifications they espoused. Narratives are specific by nature, posing implicit general claims by offering compelling exemplars. In order to open these general claims for critical discussion, and link them into composite structures, the design knowledge embedded in these narratives needs to be distilled in the form of design patterns. Where narratives and patterns provide a potent combination in terms of describing past design experiences, scenarios complete the picture by projecting design claims into the future. Scenarios are hypothesised narrative, articulating a design challenge in its context and proposing a possible solution for it.

Design narratives harness the power of a fundamental innate mechanism by which we organise our experiences to derive and share meanings. Bruner (1991) highlighted the epistemic force of narrative. Humans use narrative as a means of organising their experiences and making sense of them. Schank and Abelson (1975) call for a shift towards a functional view of knowledge, as Schank (1995) explains: "intelligence is really about understanding what has happened well enough to be able to predict when it may happen again" (p. 1). Such knowledge is constructed by indexing narratives of self and others' experiences, and mapping them to structures already in memory. Design narratives focus on describing a challenge of relevance to the audience and proposing a course of action for resolving it. A template and example are available at: http://www.ld-grid.org/resources/representations-and-languages/design-narratives.

Mor and Winters (2008) provide a review of pattern approaches in educational design and research. The D*esign patterns* paradigm (Alexander, Ishikawa, and Silverstein 1977) was developed as a form of design language within architecture. This was done with the explicit aim of externalising knowledge to allow the

accumulation and generalisation of solutions and to allow all members of a community or design group to participate in discussions relating to design. These patterns were organised into coherent systems called *pattern languages* where patterns are related to each other. The original definition of a design pattern positions it as a high-level specification of a method of design which specifies the context of discussion, the particulars of the problem, and how these can be addressed by the designated design instruments. A pattern has three facets: descriptive, normative, and communicative. It is an analytic form, used to describe design situations and solutions; a meta-design tool, used to highlight key issues and dictate a method of resolving them; and a communicative tool enabling different communities to discuss design issues and solutions. The core of a design pattern can be seen as a local functional statement: "for problem P, under circumstances C, solution S has been known to work". Such a structure reads like a direct generalisation of the narrative form, when that narrative is a record of a problem solving effort – in other words, a design narrative. The modest nature of design patterns can also be seen as an expression of a pragmatist philosophy, suggested by several authors as the foundation of design-based research. This philosophy supports the notion of ontological innovations, which derive from the need to address the gap between practice and theory. Design patterns were described as abstractions of expert knowledge; they generalise from successful practice without detaching from its context. As such, they offer a two-way bridge between practice and theory: opening practical wisdom to theoretical scrutiny and allowing theory to be projected into practice. A template and links to some pattern collections are available at: http://www.ld-grid.org/resources/representations-and-languages/design-patterns.

Design narratives represent design knowledge extracted from empirical evidence, capturing and interpreting the designers' experience. Design patterns attempt to organise this knowledge into complex modular structures. This paper started with an identification of design knowledge. The ultimate test of any expression of design knowledge is in its success to articulate and address novel challenges in the specified domain of practice.

Design scenarios offer a suitable representation for projecting design claims into the future, posing hypothetical statements regarding potential challenges and possible solutions. They borrow the form of design narratives, adapting it from an account of documented past events to a description of imagined future ones. The context describes a current, existing situation, which is perturbed by the introduction of new material, social and intentional elements such as new technologies, new practices or new objectives. Consequently, the challenge component may describe an existing conflict of forces, which is altered by the introduction of new contextual elements. The protagonists in a design scenario do not need to refer to specific individuals in the real world, but they must describe persons who could convincingly be present in the domain of practice being explored and be ascribed with the intentions and social relations included in the described context.

At the heart of a design scenario are a sequence of actions the protagonists may take to achieve their objectives. These actions, event and consequent results are driven by the qualities of new artefacts introduced into the context. Thus, they express a design claim: that introducing such artefacts into such a context may induce such results. However, this claim is stated in a thickly grounded form, submitting it to

elaborate scrutiny. A template and links to some examples are available at: http://www.ld-grid.org/resources/representations-and-languages/design-scenarios.

The claim embodied in a design scenario can be judged theoretically, heuristically and empirically. Theoretical assessment would evaluate the statements in the scenario by comparing them to prior knowledge, in other words, aligning them with the relevant literature and documented case studies. Heuristic evaluation borrows from usability research, where a group of experts assess a particular design using a given rubric. Reeves *et al.* (2002) offer an example of applying this method to e-learning design. Finally, empirical evaluation consists of implementing the proposed design, introducing the new artefacts into the domain of practice, observing real participants reaction to them and comparing their actions to the ones in the scenario – in essence this is the standard evaluation phase of a design experiment.

## Workshop patterns

The Participatory Patterns Workshops methodology is represented in its own terms; as a language of pedagogical design patterns. At the heart of the methodology is the Participatory Pattern Workshops pattern, which describes the interrelation between three Collaborative Reflection Workshops: a Design Narratives Workshop, a Design Patterns Workshop and a Design Scenarios Workshop. Apart from these, the language includes a "toolkit" of support patterns, which address critical points in the process or specific recurring needs (Figure 1).

| | |
|---|---|
| **Participatory Pattern Workshops** | The *Participatory Methodology for Practical Design Patterns* is a process by which communities of practitioners can collaboratively reflect on the challenges they face and the methods for addressing them. The outcome of the process is a set of design narratives, design patterns and future scenarios situated in a particular domain of practice. At the heart of this process are three Collaborative Reflection Workshops. |
| **Collaborative Reflection Workshop** | Elicit design knowledge by sharing, analysing and scrutinising personal experiences. This is the base structure, the "super-pattern" for all workshops. |
| **Design Narratives Workshop** | Engender collaborative reflection among practitioners by a structured process of sharing stories. |
| **Design Patterns Workshop** | Use comparative analysis of design narratives to define proto-patterns.[1] Elaborate the proto-patterns to alpha-state patterns,[2] by articulating the problem, context, core of the solution and related patterns. |
| **Design Scenarios Workshop** | Put patterns to the test by applying them to novel problems in real contexts. |

## Support toolkit patterns

The support patterns are invoked as needed in the course of the various workshops.

| | |
|---|---|
| **Draw and tell** | In a conversational activity, start off by a structured task in which participants represent a personal reflection in drawing and present it to the group. The subject of the task should be related to the theme of discussion at an abstract level so that it inspires the ensuing conversation. |

| | |
|---|---|
| **Paper 2.0** | Paper is a wonderful technology, but Web 2.0 has some nice features. Why not combine the best of both? |
| **Three Hats** | I tell a story, you write it down, and she will present it. |
| **This reminds me of ...** | Provoke collaborative reflection on a design narrative or scenario by asking peers to suggest similar stories. |
| **Table-top Concept Mapping** | Establish a shared vocabulary by negotiating a concept map of the problem domain. |
| **Force Mapping** | Alexander defines a pattern as equivalent to a diagram resolving a set of interacting and conflicting forces. Many pattern authors see the articulation of forces and relations as key to the problem description. Groups of authors are asked to represent forces as icons and draw the links between them. |
| **Pattern Mapping** | Groups create and compare visual maps of an emerging pattern language. |
| **Poster Session** | At the end of a group activity, each group produces a poster presenting its work and hangs it on the wall. Each group in turn stands before its poster and presents its work to the rest. |

These patterns are described in detail in Mor, Winters, and Warburton (2010), including templates for narratives an patterns, and links to exemplar presentations. Below we provide an outline of the main patterns.

### Participatory pattern workshops

The *Participatory Methodology for Practical Design Patterns* is a process by which communities of practitioners can collaboratively reflect on the challenges they face and the methods for addressing them. The outcome of the process is a set of design narratives, design patterns and design scenarios situated in a particular domain of practice. This pattern is an "envelope" for the rest of the patterns in this paper, and the context described here is the baseline for all the others.

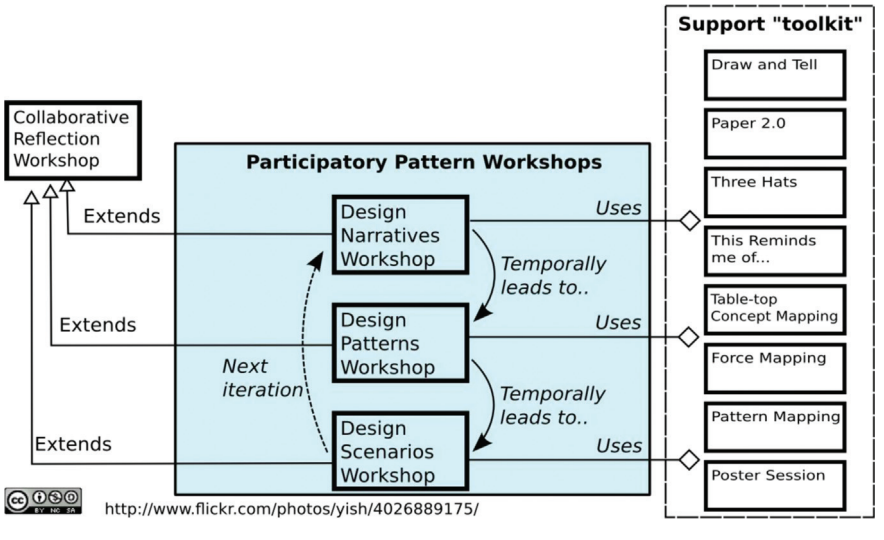



Figure 1. Map of patterns in the language.

***Problem***

In order to elicit powerful and contemporary design patterns from communities of practitioners, and make these patterns useful for broad audiences, we need a structured process of guided design-level conversation, leading participants from their personal experiences to coherent pattern languages.

***Context***

The methodology is aimed at interdisciplinary communities of practitioners engaged in collaborative reflection on a common theme of their practice. These can be ad-hoc communities e.g. participants in a workshop, but a sense of community is nonetheless a prerequisite, in the sense of a common commitment to an inquisitive process and a genuine attempt to establish a shared discourse.

The methodology assumes a *blended* setting; at its heart it is a series of workshops of 4–8 hours. In between these, participants communicate and develop their ideas using an on-line collaborative authoring system. During workshops, participants refer to the on-line materials or use the system for archiving their work for later reference.

***Solution***

The methodology is based on two fundamental assumptions: *we are all experts*, and *we are all designers*. This methodology utilises *narrative epistemology*: practitioners are prompted to recount their experiences as design narratives, and discuss these with their peers. The construction and discussion of these narratives are scaffolded by a set of tools and activities to extract transferable and verifiable elements of design knowledge in the form of *design patterns*.

This methodology defines a process by which individuals and groups elicit structured design knowledge from their experience through a series of open yet directed activities. In an ideal setting, this process would have the following phases:

- Sharing expertise through structured stories of problems in the target domain and their resolution.
- Scrutinising and refinement of these stories by guided conversation with peers.
- Comparative analysis with respect to similar cases.
- Extraction of common features across similar cases, in terms of problem, context and method of solution.
- Grouping triplets of context, problem and solution as proto-patterns.
- Articulation of problem description by collaborative mapping of forces.
- Collaborative composition of a map of key concepts emerging from the cases and the analysis.
- Articulation of alpha-state design patterns based on the proto-patterns using the vocabulary derived from the concept mapping.
- Developing these patterns to beta-state, by providing support, in the form of triangulating cases and theoretical rationale.
- Introduction of novel problems, in the form of future scenarios.
- Validating the patterns and demonstrating their use by applying them to the scenarios.

This process is realised by a series of Collaborative Reflection Workshops, typically A Design Narratives Workshop, A Design Patterns Workshop and A Design Scenarios Workshop.

**Collaborative reflection workshop**

Elicit design knowledge by sharing, analysing and scrutinising personal experiences. This is a meta-pattern, defining the common structure for the three workshops.

***Problem***

Technology-infused social practices produce complex and dynamic problems. Addressing such problems requires on-going design-level conversation between designers and practitioners involved in diverse aspects of the problem domain. Such a conversation is most effective when it is grounded in actual experiences, concrete problems, relevant to the participant's current work, which have been solved or are still pending solution.

In order for such a discussion to be fruitful, it needs to be open, trusting and convivial. At the same time it should be critical, focused and output-directed. These qualities tend to create conflicting forces, in particular in ad-hoc communities, which cannot rely on established norms and relationships.

***Context***

This pattern assumes a co-located (on-site) half- to full-day workshop with 20–40 participants, and with a collaborative authoring system to support a-synchronous contributions before, during and after the workshop. However, it has been adapted to smaller or larger groups, and to a shorter time-frame, and to a distributed location event using technology-mediated conferencing.

***Solution***

Identify a theme of interest within the domain of practice. This theme should be focused enough to assume that it would draw people who can benefit from each others' experiences, and wide enough to support rich examples and dilemmas.

Convene a workshop where participants work in groups to explore the selected theme through sharing personal experience. Use a digital collaborative medium to establish rapport and set the scene before the event, by introducing the workshop methodology, asking participants to introduce themselves and share significant events. At the event, alternate between plenary sessions and group work. Each group selects a contribution of one of its members, elaborates and scrutinises it in a structured discussion. Converge to a plenary, in which each group presents its work. Conclude with a feedback and reflection discussion, in which participants recap their experience from the day. After the workshop, provide a medium for follow-up discussions and refinement of the artefacts produced on the day.

**Design narratives workshop**

Engender collaborative reflection among practitioners by a structured process of sharing stories.

***Problem***

While everyone enjoys a good story, not everyone trusts their ability to tell a good story. People who base their confidence on a professional image often hesitate to share personal stories in public.

When people are induced to share stories, they tend to harness them to three interleaved goals: understanding the world in which they operate, establishing their identity, and identifying methods of problem solving ("where am I, who am I, how do I get where I want?"). In order to establish a productive design-level conversation, we need to subdue the first two and amplify the latter.

***Context***

This workshop will typically be the first in a series, followed by a Design Patterns Workshop and a Design Scenarios Workshop. If run as a one-off event, it would be modified to include elements of the other two workshops.

***Solution***

Establish a case-driven discussion of common problems and solutions in the target domain, by facilitating a Collaborative Reflection Workshop, focused on participants' stories of their own experiences. The discussion is instigated by prompting participants to post their design narratives in a shared space. It culminates at a workshop, where the scenarios are analysed by groups of 3–6 participants. After the workshop, participants and facilitators revisit the cases, patterns and scenarios that were discussed.

Instruct participants to contribute a story from their own experience, using a common template. Working in groups, lead participants to examine, compare, interpret and analyse these stories using a set of guiding questions.

A template may be provided in order to guide the construction of design narratives. An example template is available at http://goo.gl/HELaC.

**Design patterns workshop**

Use comparative analysis of design narratives to refine candidate patterns. Elaborate the candidate patterns to full patterns, by articulating the problem, context, core of the solution and related patterns.

***Problem***

Design Narratives Workshops guide practitioners in articulating problem-solving narratives from their experience. Narratives are a fundamental form of capturing and communicating knowledge. Yet they fall short in several accounts:

- The endpoint of a narrative, its central message, is always implied. In order to expose it to scrutiny it needs to be made explicit.
- Narratives are loosely structured, and thus do not lend themselves to modularisation.
- Practitioners reporting on their experience often take critical factors for granted, both in terms of the context and in terms of the key actions they took.

Design patterns provide a semi-structured form which exposes the gaps and hidden messages in the design narratives, while eliminating superfluous detail. However, the transition from design narratives to patterns might seem insurmountable for the uninitiated. Many pattern communities rely on "pattern scouts", experienced pattern authors who mine practitioners' stories for potential patterns. While this approach may guarantee quality, it does not scale, and it looses the intimate knowledge of a first person account.

***Context***

This workshop is typically a second in a series. Ideally workshop participants should have conducted a Design Narratives Workshop prior to the event, but alternatively the two workshops can be combined to one. A community dominated by experienced software designers might choose to start from this workshop, drawing on design narratives collected from other sources.

***Solution***

Facilitating a Collaborative Reflection Workshop which shifts the conversation from a case-driven discussion to a pattern-based discussion of common problems and solutions in the target domain. Present groups with design narratives from a previous Design Narratives Workshop and prompt them to compare the cases and identify recurring patterns. Guide them in articulating these patterns in full.

First, ask the groups to present a short portrayal of the new pattern, by providing:

- Name
- Short description
- Illustration

Next, guide them in using a pattern template. An Exemplar template can be found at: http://goo.gl/eyZQU.

**Design scenarios workshop**

Put patterns to the test by applying them to novel real problems in real contexts. Guide practitioners trough a structured, quasi-scientific process of identifying an educational challenge, describing the context in which it is situated and devising a pedagogically sound solution for it.

***Problem***

Design patterns provide a powerful language for such a conversation, enabling stakeholders to identify potential problems as early as possible and make an informed choice of solutions. Paradoxically, often as more expert knowledge is embedded in a pattern language it becomes less accessible to novices. In order for patterns to be used effectively by their prospective audience, they need to be presented in an approachable manner.

Furthermore, many patterns suffer from lack of validation; while they may seem compelling, this impression is not backed by unbiased empirical evidence. This reduces the audiences' confidence in patterns and creates a second obstacle to their adoption.

Such problems can be overcome by careful editing of patterns and pattern languages. Yet, with the abundance of candidate patterns which can emerge from any design discussion, for example at a Design Patterns Workshop, we need a mechanism for prioritising efforts.

***Context***

Although this workshop would typically be the third in a series, following a Design Narratives Workshop and a Design Patterns Workshop, alternative combinations may be more fruitful in some cases. For example, one option would be to start from scenarios and then select cases that seem to share similar problems. Alternatively, a one-off 2-day event could be organised as a Design Narratives Workshop followed by a Scenarios Workshop, leaving the patterns implicit.

***Solution***

Establish a scenario-driven discussion of design narratives and design patterns in a domain of practice, by facilitating a Collaborative Reflection Workshop in which participants share concrete problems in the form of future scenarios, compare them to past cases, and identify the patterns most applicable to form a solution. The discussion is instigated by prompting participants to post their scenarios in a shared space. It culminates at a workshop, where the scenarios are analysed by groups of 3–6 participants. After the workshop, participants and facilitators revisit the cases, patterns and scenarios which were discussed.

- Instruct participants to contribute a rich description of a real challenge they are confronted with in their practice, using a template, which prompts them to specify the situation, or context of the challenge and educational task – the objectives to achieve or problem to solve.
- Guide the participants in locating and reviewing relevant case studies and design narratives, and identifying appropriate design patterns.
- Describe a possible solution, based on applying the selected patterns.
- Note how the patterns themselves evolved in the process.

The template should provide additional slots for capturing these outputs, thus producing a coherent description of the problem and its proposed resolution.

After the workshop prompt participants to publish any new design narratives, patterns and scenarios that emerged on the day, add details and artefacts (images, illustrations, diagrams, links, etc.) to their scenarios and comment on the patterns, noting questions which have emerged from the discussion.

## Results

The Learning Patterns project produced around 25 design narratives and 150 patterns, 50 of them at a beta or release level of maturity. However, with the exception of Mor *et al.* (2010) few of them have been officially published. The pattern language network site lists over a hundred design narratives, close to 30 design patterns and 13 scenarios. This project engendered several strands of published work that included the formative e-assessment strand (Daly *et al.* 2010; Mor *et al.* 2010), which produced nine design narratives, five of which were selected for publication, and 10 patterns gathered during the JISC-funded FEASST project. Later work spread into the domain of virtual worlds and during the EC funded MUVEnation project teachers and educational researchers produced 28 design patterns, over 80 case stories and more that 20 design scenarios in the use of virtual worlds for learning and teaching (Warburton 2009). Finally, during the Rhizome project, a group of experts were brought together in the production of 11 design patterns and more than 25 case stories in the domain of digital identity management (Warburton 2010).

Recently, the methodology has been used with promising results by the ML4D project in the domain of mobile learning for development.

## Discussion

Our account is based on scores of workshops conducted in a wide range of settings and targeting a variety of audiences. Nevertheless, the question of scalability and extendibility needs to be considered. How robust is the methodology described here to the constraints of particular situations? How much does it rely on our personal qualities as facilitators? When would it be effective, and when would be an overkill?

Our experience spans instances where one, two or three of us have been involved in facilitating workshops, often in collaboration with other colleagues. These ranged from one-off, half-day events, to series of three to five full-day workshops, and with between 20 and 40 participants in each event. As this is the first publication of this methodology, we do not yet have independent accounts from others who have tried it, which would lend it further credibility.

This broad base of evidence would suggest that the methodology is robust and versatile. Although it has presented here as a monolith, it is in fact modular – and has been successfully adapted, e.g. by running a stand-alone scenarios workshop, or a combined narratives and patterns workshop.

Participatory workshops are probably not the most cost-effective means of collecting and disseminating design knowledge. Any participatory process by definition is a time-intensive activity. On the other hand, the workshops offer participants significant personal benefits, in terms of their professional development, and they produce outputs which reflect the social and individual knowledge assets of participants.

This methodology is not "a tool for all trades". Mor (forthcoming) describes a related methodology which is more suitable for individuals or teams conducting

extensive research or development projects. The participatory pattern methodology is most effective in eliciting the "design Zeitgeist" of a professional community, while enhancing the design discourse within that community.

## Conclusions

The methodology presented above is a product of our collaborative reflection on scores of workshops conducted over several years. These workshops ranged from one-off events of several hours to series of three to five encounters, each one up to a full day. Each event or series was dedicated to a particular theme, and its primary outputs were relevant to the participants interested in that theme. These outputs included design narratives, design patterns and design scenarios of varied maturity. They also included the intangible experience of the participants and the insights they derived from them, allowing them to perceive their domain with a new perspective: a design view which transcends the clutter of daily detail, but is still readily applicable for them and their peers. It is here that the power of design patterns becomes visible via their non-prescriptive nature, which allows experts to share their knowledge without imposing a singular method of solution.

The methodology has since been used by several groups with notable success including FEASST (feedback and assessment), MUVENation (immersive virtual worlds), Rhizome (digital identity) and the ML4D (learning design) projects. Naturally, each instance presented its unique conditions and constraints, and thus, in true Alexandrian fashion, each of these patterns "describes a problem which occurs over and over again in our environment, and then describes the core of the solution to that problem, in such a way that you can use this solution a million times over, without ever doing it the same way twice" (Alexander, Ishikawa, and Silverstein 1977).

## Acknowledgements

The Pattern Language Network (Planet) project was funded by JISC. The Learning Patterns was a Jointly Executed Integrating Research Project of the Kaleidoscope Network of Excellence. Additional support via Eduserv funded Rhizome project and JISC funded formative e-assessment project.

## Notes

1. Proto-patterns represent the first iteration of a pattern that captures the basic elements of the problem, solution and context.
2. Alpha-state denotes patterns that have undergone refinement through a number of iterations to a state where they can be released for general use and testing by designers.

## References

Alexander, C., Ishikawa, S. & Silverstein, M. (1977) *A Pattern Language: Towns, Buildings, Construction*, Oxford University Press, New York, NY.

Bruner, J. (1991) 'The Narrative Construction of Reality', *Critical Inquiry,* vol. 18. *Harvard Lectures*, Harvard University Press, Cambridge, MA. pp. 1–21. Available at: http://www.semiootika.ee/sygiskool/tekstid/bruner.pdf.

Daly, C., *et al*. (2010) 'Exploring formative e-assessment: using case stories and design patterns', *Assessment & Evaluation in Higher Education*, vol. 35, no. 5, pp. 619–636.

Goodyear, P., de Laat, M. & Lally, V. (2006) 'Using pattern languages to mediate theory-praxis conversations in design for networked learning', *ALT-J*, vol. 14, no. 3, pp. 211–223.

Laurillard, D. (2008) 'The teacher as action researcher: using technology to capture pedagogic form', *Studies in Higher Education*, vol. 33, no. 2, pp. 139–154.

Mor, Y. (forthcoming) 'SNaP! Re-using, sharing and communicating designs and design knowledge using Scenarios, Narratives and Patterns', in *Handbook of Design in Educational Technology*, eds R. Luckin, P. Goodyear, B. Grabowski, S. Puntambekar, N. Winters & J. Underwood, Routledge.

Mor, Y., *et al.* (2010) 'Formative e-Assessment: case stories, design patterns and future scenarios', in *Problems Investigations of E-Learning Patterns: Context Factors Solutions*, eds C. Kohls & J. Wedekind, Information Science Publishing, Hershey, PA, pp. 199–219.

Mor, Y. & Winters, N. (2008) 'Participatory design in open education: a workshop model for developing a pattern language', *Journal of Interactive Media*, Special Issue. Available at: http://www-jime.open.ac.uk/article/2008-13/350

Mor, Y., Winters, N. & Warburton, S. (2010) Participating Pattern Workshops: Resource Kit. Available at: www.warburton.typepad.com/files/ppw_2_1.pdf

Retalis, S., Bachfischer, A. & Goodyear, P. (2010) 'Design patterns for technology-enhanced learning: achievments and opportunities', in *Technology-Enhanced Learning: Design Patterns and Pattern Languages*, eds S. Retalis & P. Goodyear, Sense, Rotterdam, pp. 311–318.

Reeves, T. C., *et al.* (2002) 'Usability and instructional design heuristics for e-learning evaluation', in *Proceedings of World Conference on Educational Multimedia, Hypermedia and Telecommunications*, eds P. Barker & S. Rebelsky, AACE, Chesapeake, VA, pp. 1615–1621.

Schank, R. (1995) *Tell Me a Story: Narrative and Intelligence*, Northwestern University Press, Evanston, IL.

Schank, R. C. & Abelson, R. P. (1975) 'Scripts, plans and knowledge', in *Thinking: Readings in Cognitive Science, Proceedings of the Fourth International Joint Conference on Artificial Intelligence*, eds P. N. Johnson-Laird & P. C. Wason, USSR, Tbilisi, pp. 151–157.

Voogt, J. *et al*. (2011) 'Teacher learning in collaborative curriculum design', *Teaching and Teacher Education*, vol. 27, no. 8, pp. 1235–1244.

Warburton, S. (2009) 'WP4c Report on Design Patterns for Virtual Worlds', Available at: http://dl.dropbox.com/u/4424450/KCL_v6_MUVENATIONDesignPatternsWP4.pdf

Warburton, S. ed. (2010) *Digital Identity Matters.* King's College London, London. Available at: http://digitaldisruptions.org/rhizome/wp-content/uploads/2010/06/rhiz08_DigitalIdentityMatters.pdf

Winters, N. & Mor, Y. (2009) 'Dealing with abstraction: case study generalisation as a method for eliciting design patterns', *Computers in Human Behavior*, vol. 25, no. 5, pp. 1079–1088.

# An empirically grounded framework to guide blogging for digital scholarship

Tania Heap[a]* and Shailey Minocha[b]

[a]*Centre for Research in Education and Educational Technology, The Open University, Walton Hall, Milton Keynes, UK;* [b]*Computing Department, The Open University, Walton Hall, Milton Keynes, UK*

*(Received 12 March 2012; final version received 30 May 2012)*

This research project investigated how openness and sharing of knowledge are manifested through scholarly blogging. We aimed to identify the academics' and researchers' motivations for starting a blog; the contribution of blogging to their personal and professional development; and any challenges. Twenty-six participants were recruited. A pre-interview questionnaire was first emailed to the participants to collect background information. An initial unstructured interview was conducted by email, followed by a synchronous semi-structured interview. Textual and visual extracts of blog content were also collected. The datasets were analysed using different techniques. The findings revealed varied reasons for blogging. Some academics/researchers began a blog for its accessibility to self and others. Blogging aided the academics' and researchers' personal and professional development in several ways. Bloggers can quickly reach a wider audience compared to other forms of academic publishing. Among the challenges, there were concerns over validity of online content. Based on previous scholarship models and on our findings, we have derived an empirically grounded framework of blog use in academia and research. The framework describes how characteristics of digital scholarship such as openness and sharing are manifested through blogging. The framework can be used to guide academics and researchers who are interested in taking up blogging as a scholarly practice.

**Keywords:** academic blogging; research blogging; openness; digital scholarship; open scholarship

## Introduction

We investigated the blogging practices of individual academics and researchers. We looked at the motivations for their starting and maintaining a blog as part of their scholarly practice. We also examined the benefits and challenges of blogging in academia and research.

The empirical investigations involved collating experiences of participants in different higher education institutions (HEIs) and countries, and from varied subject-disciplines. Our research builds on previous studies on the use of social software in education, and on blogging in particular, which have generally been small-scale.

The concept of "digital scholarship" is increasingly being used to refer to the use of social software in academia and research. Examples of social software tools are blogs, wikis, micro-blogging (e.g. Twitter), social-networking platforms

*Corresponding author. Email: t.p.heap@open.ac.uk

ISBN 978-91-977071-4-5 (print), 978-91-977071-5-2 (online)


http://dx.doi.org/10.3402/rlt.v20i0.19195

(e.g. Facebook, Linkedin, Academia.edu). Digital scholarship is acknowledged as happening, but there are still reservations about recognising it for promotion, tenure and funding (e.g. Cheverie, Boettcher, and Buschman 2009; Weller 2011).

In this paper, we present an empirically grounded framework of blog use in academia and research. The framework describes how characteristics of digital scholarship such as openness and sharing of knowledge are manifested through blogging. The framework can guide and inform academics and researchers who are interested in taking up blogging as a scholarly practice.

### *Blogging in educational contexts*

Blogs, that is, web pages used as online journals or diaries, have been around since the mid-1990s, but were initially more popular in journalism and business contexts (Bruns 2007). Since the early 2000s blogs have been embraced in education, and several studies have been carried out since then to investigate the effectiveness of blogs in teaching and learning.

Previous research on blogging has included studies on several categories of students: secondary, undergraduate, postgraduate, distance-learners, professional trainees. The effectiveness of blogging in facilitating several skills and activities has been well demonstrated: for personal reflection (e.g. Xie, Fengfeng, and Sharma 2008), collaborative working (e.g. McLoughlin and Lee 2008), developing writing skills (e.g. Warschauer 2010) and flexible usage of blogs to suit the individual blogger's needs, such as a space for reflection, to seek peer support, or both (e.g. Kerawalla *et al*. 2008).

Challenges in blogging relate to concerns over privacy and ownership of ideas (Armstrong and Franklin 2008). There are privacy issues if bloggers write under their true identity and are not careful about disclosing personal information, such as where they live. Blogging under a pseudonym or being cautious about revealing personal information can help minimise these challenges. Also, if a blog is in the public domain, it is possible for readers to access ideas and pass them as their own, particularly if some of the readers are blogging anonymously (Ellison and Wu 2008).

There are some limitations in the existing research on blogging in educational contexts.

Most social software initiatives in education are generally small-scale, led by an individual educator and situated within a single course or a module (Minocha 2009a). A number of case studies of social software use have been reported in the literature, but these have involved small samples, often conducted by the researcher within their institution (e.g. Kirkup 2010; Mortensen and Walker 2002; Ward and West 2008). Most of these studies have been conducted in English-speaking countries, with few exceptions (see reports by Armstrong and Franklin 2008; Sim and Hew 2010).

Studies that have investigated the role of blogging in research have focussed on early-career researchers, that is, doctoral and post-doctoral researchers (e.g. Ferguson, Clough, and Hosein 2010; Minocha and Kerawalla 2010; Ward and West 2008). There is still some conservatism in recognising the phenomenon of "digital scholarship", of which blogging is a part, towards tenure, promotion and funding (e.g. Cheverie, Boettcher, and Buschman 2009; Kirkup 2010; Weller 2011). There is also no agreement as yet on the effective ways of measuring the impact of digital

scholarship on the user's own practice and the wider community (Priem and Hemminger 2010).

In the next section, we discuss the concept of scholarship and its characteristics in the digital or social software age.

### *Defining scholarship in the digital age*

Boyer (1990) developed a conceptual framework which defines "scholarship" as a combination of teaching and research activities. In particular, he suggests four dimensions to define scholarship: discovery, integration, application and teaching.

The first two dimensions indicate the development of new knowledge from one discipline (discovery) and from an interdisciplinary area (integration). Application refers to engagement within and outside academia in relation to the scholar's works. Teaching refers to all activities associated with preparing, assessing and supporting students' learning.

However, Boyer's (1990) framework focuses on the practice of individual scholars. It can explain the practice of a scholar working in the humanities. It is less useful to understand the practice of scholars working in teams, such as natural scientists, and those engaging with social media (Pearce *et al*. 2010; Weller 2011). Also, Boyer considers research and teaching as two separate entities, suggesting that the creation of new knowledge (discovery) becomes a part of teaching. This implies that the teacher has a more directional role (Garnett and Ecclesfield 2011) rather than being seen as a facilitator which is how educators are engaging with social software (Minocha 2009b).

Boyer's dimensions constitute an appropriate starting point for researching digital scholarship (Weller 2011). However, his scholarship model had validity over a decade ago: it, on its own, cannot explain the ethos of this new form of scholarship, particularly the "open" approach of social software (Garnett and Ecclesfield 2011; Pearce *et al*. 2010). Pearce *et al*. (2010) elaborated on Boyer's (1990) model to theorise a form of digital/open scholarship, arguing that it is:

> more than just using information and communication technologies to research, teach and collaborate, but it is embracing the open values, ideology and potential of technologies born of peer-to-peer networking and wiki ways of working in order to benefit both the academy and society.

In relation to the first two of Boyer's dimensions, "discovery" and "integration", Pearce *et al*. (2010) argue that social software renders research data available to a wider public. As regards "application", new knowledge and findings are increasingly disseminated in blogs, through wikis, and in online open access journals. Considering "teaching", social software tools allow for teaching materials to be easily shared within the online public domain.

However, there is a lack of empirical evidence on how the openness and sharing manifested in blogging can influence academia, research and scholarship. Our research aimed to investigate blogging as an academic practice and to understand how it can impact on the learning technology community. In this paper, we present an empirically grounded framework which is one of our research outcomes. The framework can be applied to inform academics and researchers about blogging as a scholarly activity within the realm of digital scholarship.

**Research questions (RQs)**

We addressed the following RQs to investigate the effectiveness and challenges of blogging for academics and researchers:

**RQ1: Why do academics and researchers engage in blogging?**
RQ1: Focuses on what motivates academics and researchers to start and maintain a blog.
**RQ2: How does blogging contribute to the academics' and researchers' personal and professional development?**
RQ2: Looks at the possible benefits of blogging for an individual academic and/or researcher, e.g. developing research-related skills, promoting work, making an impact.
**RQ3: What challenges do academics and researchers face with blogging?**
RQ3: Investigates the concerns of academics and researchers, or any precautionary measures they consider.

**Research methodology**

Twenty-six academics/researcher bloggers were recruited between February 2010 and May 2011. The majority of participants were affiliated with UK institutions, but over a third came from other countries, mostly from outside Europe and from non-English speaking (e.g. Ethiopia, Japan, Mexico) areas.

The RQs were investigated using a range of methods as explained below.

***Collecting data***

Five datasets were collected. A questionnaire was first administered to collect background information about the bloggers. Then, an initial unstructured interview involving one open-ended question was conducted by email. A follow-on semi-structured interview was carried out on Skype (http://www.skype.com) or by telephone. Blog content was collected in parallel: written and visual extracts, such as pictures embedded on the blog.

***Analysing data***

The data from pre-interview questionnaires were analysed to draw a profile of the sample in diagrammatic form (i.e. pie charts of country of origin or affiliation, subject disciplines, uses of other social software). The unstructured interview was analysed using descriptive phenomenology. The follow-on semi-structured interview was analysed using inductive thematic analysis. Written extracts of blog entries were analysed using discourse analysis (ethnography of communication). Visual extracts were analysed using thematic/saliency analysis (see Table 1).

A multi-method approach for data analyses was employed to combine the strengths of each technique. Descriptive phenomenology helps uncover the psychological experience, through coherent narratives (Langdridge 2007). Thematic analysis identifies the recurrent patterns in the sample and which are most relevant to the RQs. Inductive or thematic analysis is not bound to one theoretical or methodological framework (Braun and Clarke 2006), and our research too draws from more than one analytical paradigm. Saliency analysis looks at the importance of the theme

Table 1. Artefacts collected and data analysis techniques.

| Artefact | Analytical technique |
|---|---|
| Pre-interview questionnaire | Quantitative analysis |
| Unstructured interview | Descriptive phenomenological psychology |
| Semi-structured interview | Inductive thematic analysis |
| Blog content analysis: textual data | Discourse analysis (ethnography of communication) |
| Blog content analysis: visual data | Thematic analysis (with saliency analysis) |

for one participant, and for the RQs even if it may not be recurrent (Buetow 2010). Discourse analysis focuses on the meanings of language and linguistic styles. The approach of ethnography of communication, in particular, tries to identify socio-cultural patterns in the speech of a community (academic blogging and bloggers) and what forms of communication are important to the community, and this should emerge from their blogging style and content (Saville-Troike 2003).

### *A conceptual model for the semi-structured interview*

The semi-structured interview was the most important artefact for collecting data in that it, through synchronous interactions with the participant, allowed us to expand on or clarify information collected from other artefacts. A conceptual model was applied to provide some structure to the interview geared towards answering the RQs and to maintain a direction in the conversation.

The conceptual model was derived by combining and adapting:

- Kerawalla *et al*.'s (2008) framework of blogging in HE learning and teaching;
- Boyer's (1990) dimensions for defining scholarship.

During the interviews conducted by Kerawalla *et al*. four factors were identified as being important by the students:

- Perceptions of and need for an *audience*
- Perceptions of and need for *community*
- Utility of and need for *comments*
- *Presentational* style of blog content

Our conceptual model has been adapted to include factors which are relevant to researchers, e.g. development of research-related skills. The four factors of Kerawalla *et al*. (2008) together with our three RQs were used to formulate the semi-structured interview questions related to: audience, impact, academic/public engagement, skills development.

Table 2 shows the conceptual model which guided the formulation of the interview questions.

The specific adaptations from the two existing frameworks (Figure 1) are now explained.

In our conceptual model, Kerawalla *et al*.'s "audience" and "comments" dimensions have been grouped together as one component, called *Audience*. We felt that the dimensions of "audience" and "comments" covered similar aspects, the

Table 2. A conceptual model for the semi-structured interview.

| Research questions | Components of blogging in academic/research contexts | Sample interview questions derived |
|---|---|---|
| #1: Why do academics and researchers blog? | This is the first broad research question, which encompasses the issues broken down below, and is tailored according to response from other data sets (blog content, unstructured interview) | What made you start blogging in you current role?<br>Was it your own initiative or was it suggested by someone else? |
| #2: How does blogging contribute to the academics' and researchers' personal and professional development? | Audience | Whom do you aim your blog at? |
| | Impact | Do you use the blog to generate data for your research? |
| | Academic and public engagement | Do you disseminate knowledge and findings through your blog? |
| | Skills development | What are the activities that work successfully through blogging? |
| #3: What challenges do academics and researchers experience with blogging? | Audience | Can you think of an example when your relationship with the audience was problematic?<br>Were any of the comments unhelpful? |
| | Impact | Was it difficult to store data sets on your blog? |
| | Academic and public engagement | Were there any circumstances in which you found difficult to communicate your work? |
| | Skills development | Do you find the blog unsuitable to perform certain tasks? |

former of a broader scope than the latter, because using the comment facility is one example of interaction between blogger and audience. The *Audience* in our model, therefore, incorporates both the perception of readers of the blog (audience) and the communication between blogger and readers through using the comment facility (comments).

The second dimension, *Impact*, includes the first two dimensions of Boyer, i.e. "discovery" and "integration". It implies looking at blog usage in creating new knowledge, e.g. collection and analysis of data in one field of research (discovery), and interpreting the new knowledge across disciplines such as writing a book to illustrate the application of knowledge in different contexts (integration).

We substituted the "community" dimension of Kerawalla *et al*. with *Academic and public engagement*, also to encompass Boyer's "application" dimension. This includes looking at a wider relationship with a specialist and non-specialist community.

*Skills development* encompasses "presentation", the fourth dimension in Kerawalla *et al*.'s framework, and Boyer's "teaching". The dimension of skills development addresses blog usage in relation to the development of research-related and teaching skills, writing and presentation.

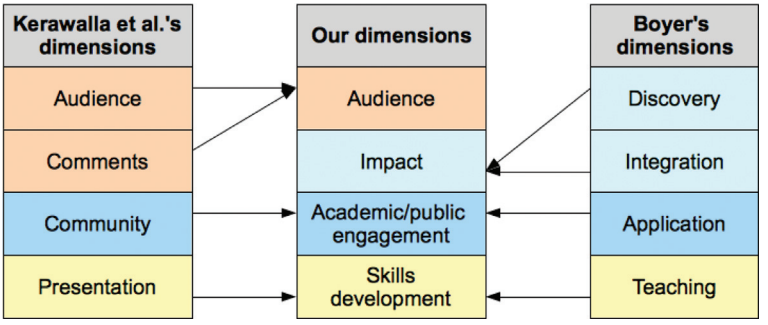



Figure 1. Combining Kerawalla *et al.*'s and Boyer's frameworks.

Table 2 shows a sample of the semi-structured interview questions derived from the conceptual model. The questions were, however, tailored to the individual participant's context and data from other artefacts, e.g. pre-interview questionnaire.

## Results

A summary of the findings that emerged from analysing the data is presented in Table 3.

The themes that emerged in the data are discussed under three headings: motivation for blogging, benefits and associated challenges.

### *Motivations for beginning a blog*

Academic and research bloggers began and maintained blogging for a variety of reasons. Some bloggers mentioned the need to have an archive where thoughts and experiences are recorded and to monitor their individual progress:

> Participant 12 (P12): I've also found [blogging] a useful way to keep track of events I've attended and my reactions to them.

Many also mentioned the need to have a personal online space to reflect upon ideas and to experiment a different writing form:

> P2: The blogging was an opportunity for me to experiment with some ideas, and explore and develop thoughts that I had.

Table 3. Summary of the findings.

| Why do academics and researchers blog (RQ1) | Contribution to personal/ professional development (RQ2) | Challenges (RQ3) |
|---|---|---|
| Repositories of "half-baked" ideas | Alternative/informal way of dissemination | Validity of information |
| To think and reflect | Make an impact | Preserving content |
| Public experimentation | Networking/public engagement | Public vs private |
| Accessibility | Skills development (writing, self-discipline, etc.) | Disappointing social interaction |
| Construct online identity | | Maintaining the activity |

Another reason that prompted some of them to start blogging was a need for an online presence as an academic or researcher, a space to construct and take control of their online public identity or persona. Some participants mentioned that the blog portrays a more informal identity, which can be customised by the user:

> P13: I felt that my blog is a little bit attempting to take control of my web presence.

Therefore, portraying an online identity via blog could be more effective than using personal or institutional websites.

### *The personal, social and professional benefits of blogging*

For some of the bloggers, the boundaries demarcating personal and professional development appeared blurred. The benefits that they perceived applied to both the spheres.

#### *Developing writing, self-discipline, interpersonal skills and networking*

Some participants commented on the usefulness of blogs to improve their skills of presentation and promoting writing and self-discipline, which are important on a personal and professional level. Blogs helped academics and researchers socially in a number of ways:

(1) in interacting with and presenting a piece of writing to an audience,
(2) in thinking about the audience and
(3) how they could write about issues that would be of value to their audience.

#### *Disseminating information*

The data revealed that blogs can be effective to disseminate knowledge and may make an impact on the bloggers' teaching and research. Blogs are perceived as a dissemination mode in a different way as compared to traditional forms of publishing. There was agreement on this aspect amongst bloggers who were at different stages of their careers: from the research student to the established researcher, from the digital scholarship advocate to somebody with not much enthusiasm about using blogs as a form of academic publishing.

#### *Complementarity with traditional publishing*

Blogs were perceived as complementing traditional forms of dissemination. Established forms of academic dissemination and publication are more rigorous, formal and ensure validity of information [although even this domain often presents challenges (e.g. Grant 2009), they do not appear to reach the wide audience the blogs can):

> P7: blogging and other tools shouldn't replace traditional peer-reviewed journals but at the same time maybe the advantage of these new tools is that it disseminates information to beyond the specialist audience.

Several bloggers in the dataset argued in favour of using blogs to report research in progress whilst keeping traditional publications for the research outputs:

> P15: I might put [half-baked ideas or initial thoughts] in my blog and then refine over time and then ultimately aspects of that might find their way into some more formal publication.

There are a few possible explanations for this preference. Traditional publications employ terminology, which may be difficult to understand for a non-specialist audience. Publications often require readers to be affiliated to an HE or research institution, or to purchase the articles to access them. Whilst rigour and validity may be ensured in traditional publications, the dissemination or possible impact outside academia, where findings may be relevant, might be minimal. Indeed, publications in open access journals receive more citations than those with restricted access (MacCallum and Parthasarathy 2006). The accessibility and informality of blogs may further help to fill the gap in public engagement and knowledge sharing.

*Complementarity with other social software*

What also emerged in our research is the complementarity of blogs with other social software tools such as micro-blogging (e.g. Twitter) and academic-oriented social networks which include an element of blogging, such as Cloudworks (http://cloudworks.ac.uk). For some academics and researchers, the benefits of blogging are enhanced when complemented with other social software tools. For example, blogs can be used for longer and deeply thought reflections, and Twitter for disseminating brief salient pieces of information, such as URLs.

***The challenges of the new, the unfamiliar and the public***

Our findings confirmed that blogs, whilst effective for dissemination, present challenges regarding validity and ownership. The lack of recognition of the blog as a parallel form of dissemination by professional bodies poses a barrier to new forms of scholarship:

> P24: I am afraid that [academic blogging] will remain something of an oddity (. . .) as long as there is little academic credit to be gained from it.

Another concern for many bloggers is the threat of revealing confidential information, blogs being in the public domain. There could be risks to the reputation of the individuals or to other people and institutions connected to the individual; hence, some bloggers kept a private or semi-private blog:

> P4: . . . I was involved in a project which was quite commercially sensitive (. . .) so I came up with a blog who was only accessed by me and another researcher.

Other challenges are associated with personal management such as time-management and self-discipline:

> P3: sometimes I don't have the time to write on it and I would like to write on it more often but I can't.

Fear of an audience and instances when bloggers felt reluctant about going public was also noted among the challenges:

> P9: you really have no idea [of who reads the blog] and I think at that point I started feeling a bit vulnerable.

This was due to concerns over sharing sensitive information. Some beginner-bloggers also faced difficulties in finding their own style, and in being spontaneous when pressured by readers to write.

Finally, concerns over preserving digital content were noted. Some bloggers were worried about vulnerability of the data, others about its permanence on the Web and an inability to remove content at a later stage.

## Discussion

We have found that blogs seem to occupy an intermediate space among established writing forms such as peer-reviewed academic papers, newspaper articles, diaries, blurring the private–public and formal–informal divide (Heap and Minocha 2011).

There is a growing awareness of blogging as a writing or communicative genre in academia and research and as a new form of scholarship (e.g. Halavais 2007). Whilst it is important to ensure validity of work through established forms of publishing, integrating blogs may help research findings to be known to more readers, specialist and non-specialist, for whom the findings may be relevant to their practice. Blogs also enable sharing information without time lags involved in formal publications.

The writing genre of academic blogging has these characteristics:

- Open: blogs enable a wider participation. However, openness has its challenges as blogs can be spaces for unsubstantiated opinions. This raises the challenge concerning validity of information, as noted in our findings.
- Collaborative: it enables collaboration and knowledge sharing, mediating relationships between bloggers and audience.
- User-generated: content is created and shared by blog users, which in turn makes them producers (Bruns 2007).

Boyer's framework of scholarship, therefore, needs to be reinterpreted in the current context. It does not consider the dynamic/cyclical knowledge collaboratively generated and shared using social software such as blogs. Garnett and Ecclesfield (2011) recognised that Boyer's model should be updated to define this form of open scholarship in the digital age. They theorised a co-creational model for scholarship, taking into account the emerging technology-driven practices. Pearce *et al*. (2010) proposed an updated framework to account for the trend towards openness in digital scholarship. However, they did not consider its collaborative, participative and dynamic nature (Veletsianos and Kimmons 2012).

With our empirical research, we have achieved what Garnett and Ecclesfield (2011) were recognising and we have overcome the shortcomings of Pearce *et al*. (2010).

### *An empirically based framework for blogging in academia and research*

We have found that bloggers in our dataset cared about making an impact through blogging and by engaging with a wider community. Knowledge is disseminated more widely and quickly through blogging compared to traditional means of publishing. Blogs are often combined with other social software tools. Academics and researchers also note the possibilities offered by blogging in developing digital literacy skills such as writing online and in the public domain, and fostering

creativity. Challenges were also evident, in relation to producing knowledge in an open context (e.g. validity of unsubstantiated opinions), making an impact, in public engagement (e.g. managing reputation of self and institution) and developing skills (e.g. time-management).

The bloggers' experiences in our dataset, therefore, suggest that blogging as a scholarly practice is open, dynamic and social. By combining Boyer's scholarship model with Kerawalla *et al*.'s framework for blogging in education and our empirical findings, we have derived a framework for digital scholarship pursued through blogging (see Table 4).

We have extended the conceptual model employed in our empirical research (Table 2) to develop Heap's framework in Table 4. Audience has been incorporated into Academic and Public Engagement. This dimension focuses on the collaborative and social aspect of pursuing digital scholarship through blogging. Another dimension has been added to emphasise the openness of academic/research blogging. This new dimension incorporates our findings related to generating and disseminating knowledge not just collaboratively, but also openly: Open Knowledge Production. Each purpose of blogging is broken down into four dimensions. Each dimension is illustrated with an example of how this form of open and participative scholarship is manifested through blogging.

Academics and researchers wishing to take up blogging or other social software to support their practice can apply Heap's framework of scholarship. The framework guides how blogs can help in engaging with an audience and the associated

Table 4. Heap's framework of blog use in digital scholarship.

| Purpose | Type of scholarship | Description of scholarship through blogs |
|---|---|---|
| Motivation for beginning and maintaining a blog | Open knowledge production | Posting and archiving ideas in progress, "half-baked" |
| | Impact | Need to construct and control an online academic persona |
| | Audience and public engagement | Being accessible to other people |
| | Skills development | Experimenting writing online |
| Benefits of blogging | Open knowledge production | Informal and faster dissemination of information |
| | Impact | Invitation by a blog reader to give keynote presentation |
| | | Promoting a book |
| | Audience and public engagement | Mediating relationships between academics and non-academics |
| | | Complementing blogs with other social software |
| | Skills development | Developing self-discipline; clarity in writing |
| Challenges to address | Open knowledge production | Information and opinions presented in blogs may be unsustained |
| | Impact | Content on blog is vulnerable, may disappear for server problems |
| | Audience and public engagement | Care is needed when writing about third parties (people, institutions) in public |
| | Skills development | Difficulties in maintaining the activity and managing time |

challenges. For example, academics/researchers may construct an online academic persona, combine blogging with other social software tools for networking, for promoting their book to an audience or for considering back-up measures for saving content. The framework can be used by educators and learning technologists to support students: to experiment writing in public and to develop presentation skills; to store notes, references and other resources relevant to the study materials or to encourage writing reflective responses to learning activities; and for conducting conversations outside a formal learning environment. Carrying out learning activities in an informal learning space may also make students less anxious about assessment.

The next steps in our research are to validate the effectiveness of the framework as a thinking tool about digital scholarship, and for guiding the practice of blogging in academia and research. This involves evaluating the framework with colleagues who already blog as a part of their practice, or who are considering adopting blogging for digital scholarship. The feedback will help us improve the framework. We have also developed empirically grounded guidelines on blogging, which we will share with colleagues in other publications in the near future.

**Acknowledgements**

The authors are grateful to Dr Rhona Sharpe (Oxford Brookes University), Dr Chris Jones and Dr Denise Whitelock (The Open University, UK) and the reviewers of this paper for their valuable insights and feedback.

**References**

Armstrong, J. & Franklin, T. (2008) 'A review of current and developing international practice on the use of social networking (Web 2.0) in higher education', *Report Commissioned by the Committee of Inquiry into the Changing Learner Experience*, Franklin Consulting.

Boyer, E. L. (1990) *Scholarship Reconsidered: Priorities of the Professoriate*, Carnegie Foundation for the Advancement of Teaching, Princeton, NJ.

Braun, V. & Clarke, V. (2006) 'Using thematic analysis in psychology', *Qualitative Research in Psychology*, vol. 3, no. 2, pp. 77–101.

Bruns, A. (2007) 'The practices of news blogging', in *Uses of Blogs*, eds A. Bruns & J. Jacobs, 2nd edn, Peter Lang, New York.

Buetow, S. (2010) 'Thematic analysis and its reconceptualization as saliency analysis', *Journal of Health Services Research and Policy*, vol. 15, no. 2, pp. 123–125.

Cheverie, J. F., Boettcher, J. & Buschman, J. (2009) 'Digital scholarship in the university tenure and promotion process: A report on the sixth scholarly communication symposium at Georgetown University Library', *Journal of Scholarly Publishing*, vol. 40, no. 3, pp. 219–230.

Ellison, N. B. & Wu, Y. (2008) 'Blogging in the classroom: a preliminary exploration of student attitudes and impact on comprehension', *Journal of Educational Multimedia and Hypermedia*, vol. 17, no. 1, pp. 99–122.

Ferguson, R., Clough, G. & Hosein, A. (2010) 'Shifting themes, shifting roles: the development of research blogs', in *'Into Something Rich and Strange' – Making Sense of the Sea-Change, The 17th Association for Learning Technology Conference (ALT-C 2010)*, 7–9 September, Nottingham, UK.

Garnett, F. & Ecclesfield, N. (2011) 'Towards a framework for co-creating open scholarship', *The 18th Association for Learning Technology Conference (ALT-C 2011)*, 6–8 September, Leeds University, Leeds, UK.

Grant, B. (2009) 'Elsevier published 6 fake journals', *The Scientist*, [online] Available at: http://bit.ly/q7bXz3

Halavais, A. (2007) 'scholarly blogging: moving toward the visible college', in *Uses of Blogs*, eds A. Bruns & J. Jacobs, Peter Lang, New York.

Heap, T. & Minocha, S. (2011) 'The experiences of academic and research bloggers: a phenomenological enquiry', *30th International Human Science Research Conference: Intertwining body-self-world (IHSRC 2011)*, 27–30 July, St. Catherine's College, Oxford, UK.

Kerawalla, L. *et al*. (2008) 'Characterising the different blogging behaviours of students on an online distance learning course', *Learning, Media and Technology*, vol. 33, no. 1, pp. 21–33.

Kirkup, G. (2010) 'Academic blogging: academic practice and academic identity', *London Review of Education*, vol. 18, no. 1, pp. 75–84.

Langdridge, D. (2007) *Phenomenological Psychology: Theory, Research and Method*, Pearson/ Prentice Hall, Harlow.

MacCallum, C. J. & Parthasarathy, H. (2006) 'Open access increases citation rate', *PLoS Biology*, vol. 4, no. 5, [online] Available at: http://bit.ly/qltKGc

McLoughlin, C. & Lee, M. W. (2008) 'Future learning landscapes: transforming pedagogy through social software', *Innovate: The Journal of Online Education*, vol. 4, no. 5.

Minocha, S. (2009a) 'Effective use of social software in UK further and higher education: case studies', *JISC Final Report (SOCIAL-SW)*, [online] Available at: http://tinyurl.com/ 5a8zu3

Minocha, S. (2009b) 'A case study-based investigation of students' experiences with social software tools', *New Review of Hypermedia and Multimedia*, vol. 15, no. 3, pp. 245–265.

Minocha, S. & Kerawalla, L. (2010) ''University Students' self-motivated blogging and development of study skills and research skills', in *Web 2.0-Based E- Learning: Applying Social Informatics for Tertiary Teaching*, eds M. J. W. Lee & C. McLoughlin, IGI Global. pp. 149–179.

Mortensen, T. & Walker, J. (2002) 'Blogging thoughts: Personal publication as an online research tool', in *Researching ICTs in Context*, ed. A. Morrison, InterMedia Report 3, University of Oslo, Norway.

Pearce, N., *et al*. (2010) 'Digital scholarship considered: how new technologies could transform academic work', In *Education*, vol. 16, no. 1, [online] Available at: http://bit.ly/wyDNky

Priem, J. & Hemminger, B. M. (2010) 'Scientometrics 2.0: toward new metrics of scholarly impact in the social web', *First Monday*, vol. 15, no. 7, [online] Available at: http://bit.ly/ mC5AK9

Saville-Troike, M. (2003) *The Ethnography of Communication: An Introduction*, Blackwell, Oxford.

Sim, J. W. S. & Hew, K. F. (2010) 'The use of weblogs in higher education settings: a review of empirical research', *Educational Research Review*, vol. 5, no. 2, pp. 151–163.

Veletsianos, G. & Kimmons, R. (2012) 'Networked participatory scholarship: emergent techno-cultural pressures toward open and digital scholarship in online networks', *Computers & Education*, vol. 58, pp. 766–774.

Ward, M. H. & West, S. (2008) 'Blogging PhD candidature: revealing the pedagogy', *International Journal of Emerging Technologies and Society*, vol. 6, no. 1, pp. 60–71.

Warschauer, M. (2010) 'Invited commentary: new tools for teaching writing', *Language Learning and Technology*, vol. 14, no. 1, pp. 3–8, [online] Available at: http://bit.ly/gfBjbU

Weller, M. (2011) *The Digital Scholar: How Technology Is Transforming Scholarly Practice*, Bloomsbury Academic, London.

Xie, Y., Fengfeng, K. & Sharma, P. (2008) 'The effect of peer feedback for blogging on college students' reflective learning processes', *The Internet and Higher Education*, vol. 11, pp. 18–25.

*Research in Learning Technology*
Supplement: ALT-C 2012 Conference Proceedings


# Mass-customisation and self-reflective frameworks: early developments in New Zealand

John Clayton*

*Emerging Technologies Centre, Waikato Institute of Technology, Hamilton, NZ*

*(Received 5 March 2012; final version received 1 June 2012)*

Education has long been regarded as the foundation stone of national growth and international competitiveness. In the last three decades national educational reforms to improve access to higher education qualifications, individual higher education institutions' aggressive national and international marketing initiatives and improved information and communication technology (ICT) systems and infrastructure have resulted in greatly increased participation in tertiary education. As a consequence of this wider participation, tertiary educators are now engaging with increased numbers of culturally and economically diverse learners in distributed ICT environments that they, the educators and learners, are often unfamiliar with. There is an expectation that these educators will be able to design learning modules to meet students' multi-cultural needs, in a range of contexts, with no additional resources. In essence, it is expected that learners will participate in individually customised learning events at a cost similar to traditional delivery. This requires a fundamental shift in educators and learners conceptions on the provision of education. The purpose of this paper is to explore how the development and deployment of reflective frameworks, based on recognised international standards, can fully engage learners in mass-customised environments. First this article outlines the key building blocks required for reflective mass-customisation to occur. Second, it illustrates how this concept is being tentatively explored at a New Zealand institution. Finally, it recommends the areas of action for further research on the impact and effect of mass-customisation on learners, educators and institutions to be undertaken.

**Keywords:** customisation; frameworks; self-reflection; New Zealand; assessment

## 1. Context

Driven by fiscal restraints and the need to remain globally competitive and internationally relevant in an increasingly networked world, national governments and individual institutions have introduced a number of educational reforms (New Zealand Ministry of Education 2010). In general these initiatives have focused on, firstly, improving performance and efficiency ensuring more learners, national and international, from a broader ethnic, cultural, economic and educational background can complete higher qualifications at an affordable or competitive cost (Clayton 2011). Secondly, they have focused on increasing the organisational integration of e-learning systems and information and communication technology (ICT) applications for administrative purposes and teaching and learning, enabling institutions to deliver educational activities to distributed sites nationally and internationally

*Corresponding author. Email: john.clayton@wintec.ac.nz

ISBN 978-91-977071-4-5 (print), 978-91-977071-5-2 (online)


http://dx.doi.org/10.3402/rlt.v20i0.19187

(Martinez 2011). As a consequence of these changes educational institutions have broadened entry criteria and aggressively marketed course offerings both within their own countries and externally (Barboza 2011). These actions have resulted in greatly increased enrolments from both domestic and international markets. Educators are now engaged with increased numbers of culturally diverse learners in environments that often discourage group and/or individual personal tuition. Learners and educators also need to acquire ICT skills and master software applications they were previously unfamiliar with (OECD 2005). If not well designed these reform-driven environments may encourage an approach where the impact of learning events is limited to the reproduction of knowledge rather than promotion of understanding (Mimirinis and Bhattacharya 2007).

These initiatives and reforms have seen a fundamental shift in the role of educators and learners and their conceptions of the provision of educational courses. Educators are required to balance the competing notions of individualised learning and mass-delivery to increasingly large, distributed, groups. In essence educators are challenged to deliver learning events to meet ever increasing numbers (mass-delivery) yet design these events to meet individualised learning preferences (customisation). For the purpose of this paper the design and delivery of personalised learning events for unlimited numbers is mass-customisation.

## 2. Mass-customisation overview

For the last two decades the limitations of traditional high-volume manufacturing practices have been exposed. The two bedrocks of this process-led mass production model, efficient pricing and product quality, providing firms with a competitive advantage, are being eroded. Rapid development of product, expanded product choice, limited shelf-life and increasing consumer demand for individualised goods and services and responsive delivery systems have seen a fundamental shift in organisational behaviour. Firms are increasingly adopting customer-centric operational practices such as mass-customisation (Cohen and Pine 2007). Whilst it has been argued that it is difficult to provide and all-encompassing definition of mass-customisation, there is common agreement that it is a customer-initiated process to which providers respond (Turner 2009). Under the production philosophy of mass-customisation, goods and services are produced to meet an individual customer's requirements with mass production efficiency. In essence consumers consume a service or product customised to their own specifications at a cost similar to pre-made, ''off-the-shelf'', generic products or services (Xia and Wang 2010). The challenge for producers is to acquire the agility and flexibility to customise products and/or services of excellent quality, in high volumes at a reasonable cost. Firms are meeting this challenge by pre-fabricating standardised components in high-volume while achieving customisation through customer-specific assembly and/or arrangement of these components (Verdouw *et al.* 2010). In this approach, where the final product and/or service is assembled from an existing inventory of standardised components, there is an assumption that sufficient components with the right functionality are readily available to be rapidly configured to meet consumer demand (Verdouw *et al.* 2010). This particular mass-customisation approach requires a robust and reliable, yet constrained, communication and design platform on which the customer can configure, and reconfigure, the product or service required until they are satisfied with the final outcome. This is normally accomplished by using

information technology-facilitated interactive forms, labelled configurators, that are personal and user friendly (Cross *et al.* 2009). In mass-customisation the service to the client, not the creation of the product, becomes the focus of the production process.

### *2.1. Mass-customisation in education*

In a traditional classroom environment learners are bound by time, place and pace. Learning activities are scheduled to occur in a specified room and an educator systematically guides learners to achieve stated objectives through a variety of teaching methods and learning events (Syed-Khuzzan and Goulding 2009). E-Learning environments are not as constrained as these traditional environments. Learners have more choice in the time they learn and the place the learning will occur. While instructors have carefully structured digital content and designed e-learning events to achieve identified objectives, the ultimate responsibility of achieving those outcomes is transferred from the instructor to the learner. In these more personalised environments, learners need to be more self-motivated and self-directed (Clayton 2009). Advances in information and communication technologies and digital databases have encouraged educators to further personalise these learning environments and apply increasingly sophisticated communication technologies and databases in the design of intelligent tutoring and testing systems. In these systems learner progression can be controlled and, if required, review and remediation interventions can be organised. The data collected during these training sessions can be used to identify future training requirements (Hwang, Tseng, and Hwang 2008). A technical example of this automation of learning is the European learning grid infrastructure (ELeGI) approach to formal learning. The ELeGI approach is based upon personalised knowledge construction using experiential-based and collaborative learning approaches situated in a personalised networked environment. Formal learning experiences are based on the automatic generation, a unit of learning (UoL) that dynamically adapts the learning process based upon the participants' behaviour within the environment (Gaeta, Gaeta, and Ritrovato 2009). An educationally focused example is the construction of a personalised learning environment prototype for the construction industry in the UK. The prototype is based on the assumptions that learners have different levels of motivation, different attitudes about teaching, different approaches to learning, and will react differently to specific learning environments or instructional practices. By using a diagnostic questionnaire, and an in-depth understanding of instructional design theories and pedagogical approaches, a learning environment meeting the learning styles of individual participants is created (Syed-Khuzzan, Goulding, and Underwood 2008). In essence it is argued that e-learning can provide the platform to customise learning for the individual.

### *2.2. A model for mass-customised e-learning environments*

The design of personalised e-learning environments, involving multiple stake holders with multiple points of view of learning, is a complex task. These environments need to be built upon three divergent schools of thought: behaviourist, cognitive and constructivist (Peter, Bacon, and Dastbaz 2010). Behaviourists argue that learning occurs as a response to stimuli. Positive stimuli will result in learners repeating behaviour; negative stimuli will discourage a repeat of the behaviour. Cognitivists

argue that learning is a process. To fully engage learners we need to understand an individual's learning style and match teaching methods and content to this style. Constructivists argue that learning is constructed through reflection and interaction. To constructivists, learning occurs as individuals reflect on their current knowledge and interact with the physical and social environment created for learning (Clayton 2009). Therefore, any e-environment platform implemented needs to be agile. Agility means that the infrastructure created is sufficiently flexible to be quickly adapted to meet the technical requirements and teaching and learning approaches of all schools of thought (Syed-Khuzzan and Goulding 2009). In the literature there appears to be general agreement that the development of these agile platforms is based on three fundamental building blocks (Gaeta *et al.* 2009; Hwang *et al.* 2008; Syed-Khuzzan *et al.* 2008).

(1) Firstly, the learner interacts with the environment through an intuitive user interface. The interface is interactive and obtains from the learner background information on current capabilities, learning style preferences and identifies user requirements.
(2) Secondly, the structured data gathered in step one interact with distinct databases, such as learner profile, teaching approach, knowledge repository and assessment rubrics) to create personalised learning plans (PLP) designed to meet the students' learning style preference and identified requirements.
(3) The PLP is delivered, at the appropriate level; to the learner in an environment they are comfortable and competent in.

A schematic diagram of this process is illustrated in Figure 1.

## 3. Building blocks of mass-customisation

The concept of self-reflection (the conscious act of purposefully thinking about activities undertaken) has been widely debated in educational circles for a number of decades (Korthagen and Vasalos 2005). To advocates of reflective practice, deep learning is dependent on individuals making meaning from their experiences through the process of reflection. The outcomes of the reflective process help individuals, firstly, to highlight the strengths of their current skill and knowledge and, secondly,

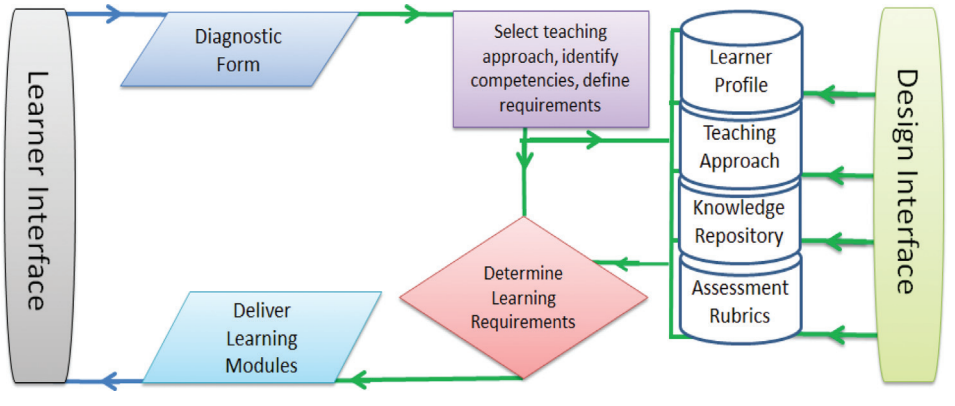



Figure 1. Conceptual overview of constructing personalised e-learning environments.

identify areas where undertaking educational activities or training would facilitate increased capability. It is argued that this on-going reflection helps individuals iteratively build their capability and capacity (Carlson and Parry 2003; Clayton, Elliott, and Saravani 2009). In essence, reflection creates individualised learning environments that are on-going (sustained), connected to their needs (situated) and focused on individually generated tasks (authentic).

### *3.1. Self-reflective frameworks*

A fundamental criterion for the success of reflection is the ability of the individual to make the appropriate connections between their existing skills, knowledge and experience and industry expected skill, knowledge and behaviours. If the learner has limited workplace experience, or limited exposure to other colleagues, their capacity to make informed judgements on their current competencies will be limited (Clayton 2011). To address this barrier, to engage participants in the self-reflective process and to aid them in making connections between their previous experiences and professional practices, self-reflective frameworks, based on acceptable standards and detailed in assessment rubrics, have been developed (Clayton 2011).

Fundamentally, these assessment rubric based self-reflective frameworks are designed to help individuals, with limited experience, or limited exposure to, or engagement with, other workers or colleagues, to make connections and comparisons between their existing skills and knowledge and industry-accepted best practice. This comparative process, using industry accepted standards, enables the individual, no matter their location, culture or language, to identify which competencies they are considered to be proficient in and those competencies they need to develop. The result of this reflective process is the generation of industry-grounded PLPs enabling them to become self-regulated learners (Zimmerman 1990).

### *3.2. Assessment rubrics*

In educational settings it is generally agreed that assessments should be reliable (measurements of the same skills or knowledge produce the same results), consistent (all skills and knowledge are evaluated by identical procedures) and transparent (assessors and learners all share the same levels of expectation) (Latimer, Bergee, and Cohen 2010). Increasingly carefully designed assessment rubrics are being used to ensure reliability, consistency and transparency. At a fundamental level a rubric is an instrument that defines the requirements for a specified standard by dividing that standard into performance criteria and providing a description of what constitutes the level of performance for each of those individual criteria (Ciorba and Smith 2009). At this level the rubric serves to clarify expectations about individual student's level of performance. The agreed criteria and associated descriptions provided learners and educators with consistent standards to achieve within the course (Kerby and Romine 2010). At a more sophisticated level rubrics can radically alter institutions as the very act of developing and implementing rubrics forever alters perceptions of educators and administrators of student learning and assessment. These altered perceptions can create an educational culture that is transformed from one that is teaching-focused to one that is more learner-centred (Kieke, Moroz, and Gort 2007). In the creation of rubrics a number of developers use statements to define the standard and Likert scales to solicit responses. In the development cycle

of these rubrics an inclusive set of items describing identified aspects of a specific skill, competence or level of knowledge in a given discipline are created. These items then are paired with Likert-type, categorical response scales and assessors use these scales to record student achievement against the specified description (Ciorba and Smith 2009). Critically, the feedback provided by these rubrics empowers students to reflect on their current performance and identify weaknesses and strengths. This means that they can direct future efforts to identified areas of improvement. The feedback also allows educators to revise information provided, assignments set and instructional approaches used (Kerby and Romine 2010). In essence well-designed and implemented assessment rubrics could enable the personalisation of learning.

### *3.3. Mentors*

It could be argued that the focus on standards-based, rubric driven criteria as the foundation of reflective frameworks acts as a constraint in the reflective process; it could restrict the acquisition of additional skills and knowledge and rigidly prescribe limited learning events (Strudler 2011). These valid concerns can be addressed by the appointment of an experienced mentor. The term mentor originates from Greek mythology when the well-travelled, and absent parent, Odysseus entrusted the care and education of his child to his friend called Mentor (Penner 2001). Traditionally, in business and industry, mentoring strategies are used to attract, retain and promote employees, ultimately improving individual and corporate performance and effectiveness. In the compulsory education and health sectors mentoring has long been acknowledged an integral part of professional learning and development. For example, in teacher education and nursing practicums, student teachers and nurses learn skills and techniques from either experienced classroom teachers or registered nurses. In the first years of their profession newly qualified teachers learn professional skills and strategies from experienced colleagues (Ghaye 2011). In higher education, while it has not always been easy for staff themselves to access it, mentoring has long been regarded as an important adjunct to teaching and learning (Strudler 2011). Through sustained feedback and follow-up, mentors create environments that encourage greater autonomy, personal transformation and deeper self-reflection. As such mentors should be regarded as a critical aspect of the self-reflective process.

### *3.4. Portfolios*

Historically speaking, in artistic circles, portfolios not only summarised an artist's creative achievements, but they also illustrated those achievements in a physical form. As portfolios encourage the accumulation of physical evidence to illustrate achievement, they are seen to be a valuable tool for the formal assessment of competencies and are used in many professions such as nursing, medicine and teaching (McColgan and Blackwood 2009). Similarly, in formal accreditation environments, systematically compiled digital portfolios provide a protected shared space where learner evidence of competencies can be rigorously controlled and systematically evaluated (Fiedler, Mullen, and Finnegan 2009). Portfolios can be regarded as the purposeful collection of a learner's work structured to exhibit and illustrate the learners' efforts and achievements over time (Kim, Ng, and Lim 2010). Portfolios should be viewed as a personal learning management tool encouraging individual improvement, personal

growth and development, and a commitment to life-long learning by encouraging on-going reflection.

### *3.5. Mass-customisation and reflective frameworks*

Using the four building blocks outlined above (reflective frameworks, assessment rubrics, mentors and portfolios), a model for the customisation of learning, part human and part automated, can be produced. This process model involves four identified "actors", learners, mentors, designers and assessors, who engage with each other in a common virtual space. How these four actors interact with each other is described below.

(1) Firstly, the learner engages with the environment through an intuitive user interface. The interface uses an interactive self-reflective questionnaire, based on a discipline-specific assessment rubric, to gather data on the learners' current capabilities and existing knowledge.
(2) Secondly, the data gathered from the self-reflective questionnaire is firstly sent to a mentor appointed to facilitate learner progression to identified goals and secondly aligned with industry-accepted standards and gaps in learners' current competencies – and industry-accepted standards are automatically identified.
(3) Thirdly, the gaps identified between the learners' current knowledge and industry requirements are used as filters to interact with a complex learning object database (containing all learning activities to meet standards identified), to automatically generate a customised learning module. This learning module is delivered to the learner for action and to the mentor for information.
(4) Fourthly, the learner (in their own time, at their own pace and in a place of their own choice) works through the individualised learning module and simultaneously creates evidence to demonstrate their newly acquired competencies. During this stage of the process the learners, guided by their mentor, provide evidence of their previously stated capabilities and knowledge. All the evidence generated is systematically stored in a structured digital portfolio with categories aligned to an identified assessment rubric.
(5) Finally, when the learner and mentor agree that the evidence gathered meets all requirements of the assessment rubric, the portfolio is sent to an independent assessor. The independent assessor reviews the evidence presented and once more aligns this evidence with the assessment rubric. The assessor's judgement is then passed onto the learner.

A schematic diagram of this engagement and interaction is illustrated in Figure 2.

## 4. Mass-customised courses: a New Zealand example

In 2010 the Waikato Institute of Technology recognised the need to provide professional development (PD) in ICT for staff to meet the needs of its increasingly culturally diverse and technologically experienced student population. *The certificate in open, flexible and networked learning* (COFNL) consists of 5 modules based on identifiable Unit Standards registered with the New Zealand Qualification Authority

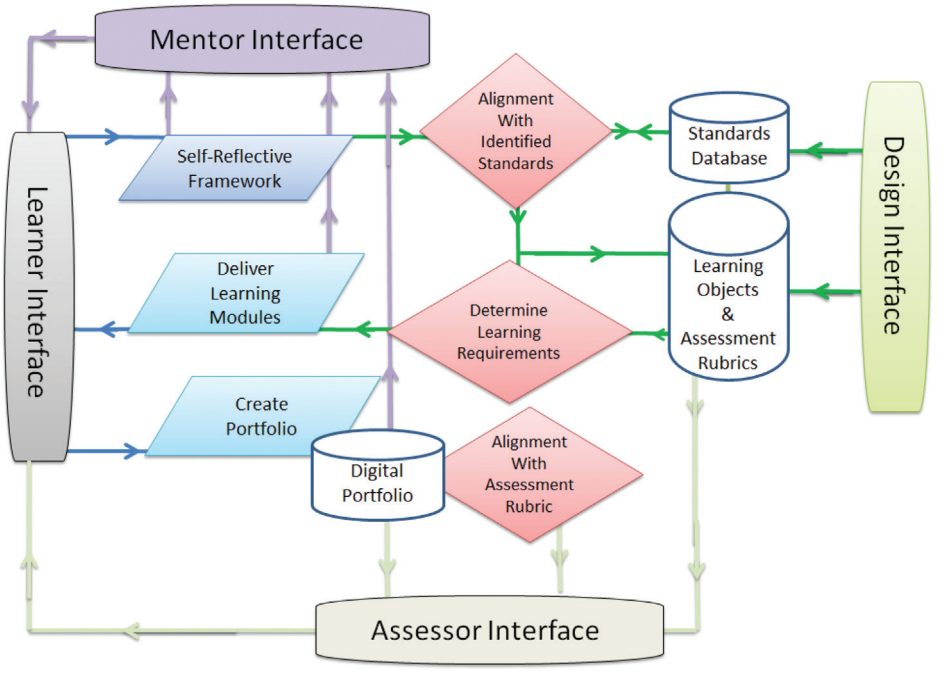



Figure 2. Conceptual model of mass customised learning module delivery.

(NZQA). Basing the modules on these registered standards ensured that the institute was following best national practice, and it aligned institutional PD delivery with national goals.

### *4.1. The CAT: a reflective practice framework*

As noted previously the concept of reflection and that deep learning occurs as individuals make meaning from their experiences through reflection have been widely debated in educational circles for a number of decades (Ghaye 2011). To engage participants in reflective practice and to aid them in making connections between identified pedagogical standards in ICT and their previous experiences, a self-reflective competency assessment tool (The CAT) was created for COFNL learners. The CAT was designed to enable learners to assess their current competencies against nationally defined standards.The CAT interface provides the learner with a series of statements relating to each of the five modules within the COFNL. The statements within each module are classified within three categories, understanding, evidence and moderation.

- Understanding: This category prompts the learner to reflect on their personal knowledge of the aspect being investigated.
- Evidence: This category asks the learner if they can provide evidence of their understanding.
- Moderation: This category asks the learner how the evidence provided has been evaluated.

| Examine the relationships between participants in OFNL. | |
|---|---|
| **Understanding** | |
| I have a good understanding of the relationships (such as direct, indirect, active, passive, interactive, independent, and interdependent) that exist in open, flexible and networked learning environments. | Partially agree |
| I have evaluated the impact different relationships between participants in OFNL (such as direct, indirect, active, passive, interactive, independent, and interdependent) have on student learning in different contexts. | Strongly agree |
| **Evidence** | |
| I can provide digital evidence of my understanding of the relationships (such as direct, indirect, active, passive, interactive, independent, and interdependent) in open, flexible and networked learning environments. | Partially agree |
| I can provide digital evidence of how my understanding of the relationships between participants in OFNL (such as direct, indirect, active, passive, interactive, independent, and interdependent) has been used in my practice in different contexts. | Agree |
| **Moderation** | |
| My understanding of the relationships (such as direct, indirect, active, passive, interactive, independent, and interdependent) in open, flexible and networked learning environments has been peer reviewed. | Select |
| Practical application of my understanding of the relationships between participants in OFNL (such as direct, indirect, active, passive, interactive, independent, and interdependent) has been peer reviewed and assessed. | Select |

Figure 3. Categories, statements and responses.

Learners are asked to reflect upon and then respond to individual statements using a "drop-down" menu. Categories, statements and example responses are illustrated in Figure 3.

As learners progress through the CAT, their answers affect the indicator colour on the index page. The indicator colours are based on the familiar "traffic light" theme:

- Red: This indicates to the learner that they have limited knowledge and/or experience of the identified standards. It also indicates how these limitations can be addressed.
- Yellow: This indicates that the learner has some knowledge and/or experience of the identified standard. It also indicates how this existing knowledge/ experience can be built upon.
- Green: This indicates to the learner that they meet the requirements of the identified standard. It also indicates to the learner that they can now build knowledge and experience in other areas.

As the learners progress through the modules, categories and statements, their responses provide a pictorial reflective framework carpet. This reflective process and visual carpet enable individuals to select which module(s) they need to review, which competencies they need to develop, what evidence they need to provide and how they should evaluate their practice.

The visual carpet produced from learner engagement provides the learner with:

- An initial assessment of their current knowledge, experience and understanding of individual aspects of this domain.
- An indication of potential starting points to begin a learning journey and
- Navigational tips to map a learning route from starting points to intended achievements.

In essence engaging with The CAT assists the learner in the creation of a PLP empowering them to become self-regulated learners.

This reflective visual carpet is illustrated in Figure 4.

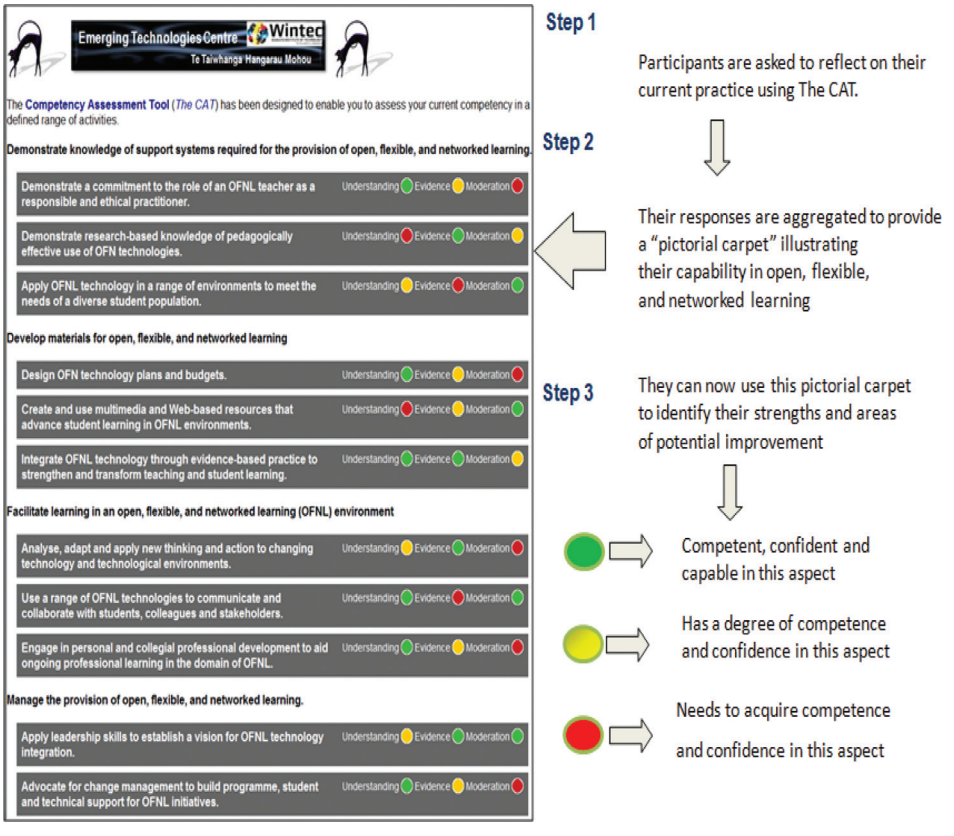



Figure 4. The visual carpet.

### *4.2. The supervised mode*

Whilst designing individualised personal learning plans are focused on enabling the individual to take ownership of the learning process, the regulations of COFNL recognise individuals cannot achieve their intended professional goals in isolation. When the participant enrols in the certificate they are allocated a mentor. The mentor will use the results of the CAT and generated learning plan to guide learners by providing appropriate links to educational theory and practical demonstrations. However, mentorship is not a one-way process. COFNL identifies both the responsibilities of the mentor and learner. The responsibilities of the mentor include:

- Being available at predetermined times throughout the duration of the learners' enrolment in the course.
- Providing ongoing guidance, encouragement and support, and assist students to achieve their identified learning outcomes.
- Ensuring learners' receive timely and appropriate feedback on course progress and on outcomes of specific requests.
- Monitoring the individual learner to ensure completion of a comprehensive record of achievement in a personal online e-portfolio.

The responsibilities of the learner include

- Acting in an ethical and responsible way in all communications associated with the course.
- Submitting evidence of achievement of individual outcomes on a regular basis.
- Submitting evidence of achievement of learning outcomes in the format outlined by their mentor.
- Abiding by any response timeframe set by mentors to ensure appropriate and timely feedback is received.

### *4.3. Digital portfolios*

In accreditation environments like COFNL, digital portfolios can provide a protected space where learner evidence of competencies can be rigorously controlled and systematically evaluated. In COFNL learners are shown how to structure their portfolio around the assessment rubric created for each of the five modules. The assessment rubric provides a measure of quality of performance based on established practice in open, flexible and networked learning environments as identified by the New Zealand Qualifications Authority (NZQA). In essence the rubric is based upon what the participant can demonstrate they have learnt, rather than what has been taught. As such it should be regarded as an authentic CAT. Crucially the evidence provided will be the learners' own creation showing how their experiences have met the identified standard. An example of this structure is illustrated in Table 1.

## 5. Review and discussion

This paper has argued that the growing need for higher education institutions to remain financially viable, globally competitive and internationally relevant has motivated them to aggressively market their educational course offerings (Barboza 2011). As a consequence institutions are becoming increasingly socially diverse and multi-cultural. The need for educators to interact with diverse students and to manage cultural differences effectively becomes significant (Sawir 2011). Simultaneously, the demand for flexibility, the implementation of learning management systems and the increased access to ICT infrastructures mean that educators are now actively encouraged to engage with increased numbers of distributed and diverse learners in often unfamiliar ICT-based learning environments (OECD 2005). There appears to be an unstated expectation educators will be able to design learning modules to meet multi-cultural student needs, in a range of contexts, with the same

Table 1. Portfolio structure.

| Main category | Sub-category |
|---|---|
| Demonstrate knowledge of theoretical models of adult learning | Apply sound knowledge and understanding of adult learning theories and epistemological principles to the effective design of learning objectives, curriculum and application of OFNL technologies in learning and teaching<br>Contribute to the development of the knowledge base of the OFNL community |

resources as before – or less. In essence it is anticipated that diverse learners will participate in flexible learning events, individually customised to meet their specific learning needs, at a cost similar to conventional delivery (New Zealand Treasury 2011). This expectation requires a fundamental shift in educators' and learners' conceptions of the provision of education. The traditional parameters of time, place and pace are challenged as educators begin to mass-customise learning modules.

Mass-customisation fundamentally alters perceptions of educational delivery. The traditional pattern of subject discipline experts creating logically structured and sequenced learning events specifically addressing the knowledge deficiencies of a predetermined number of identified participants is neither flexible enough to meet divergent needs of multiple participants nor economically sustainable (Spanier 2010). To some, mass-customised environments consist of identified modularised learning objects provided efficiently and effectively to limitless numbers of participants' on-demand (Cohen and Pine 2007). However, this rudimentary approach, which fails to acknowledge learners' existing knowledge, their previous learning experiences, their current level of skill, their economic and/or cultural background or learning style, encourages a surface level of processing where the impact of the learning event is often limited to the reproduction of knowledge (Mimirinis and Bhattacharya 2007). For deep learning to occur the design and implementation of mass-customised curricula should ultimately create learning environments that challenge students to meaningfully reflect on their existing knowledge, level of skill and their learning experience (Ghaye 2011). This design process involves the creation of reflective frameworks, based upon an industry-accepted assessment rubrics, which learners use to reflect on their current competencies and identify the critical gaps they need to address.

While a mass-customised approach to educational delivery provides, firstly, institutions with the agility to respond to divergent learner needs and, secondly, empowers individuals to develop personal learning plans ensuring they take ownership of their own learning, institutions should mass-customise their course offerings with care. It appears that the use of learner-centred reflective frameworks would allow the automation of a process determining the construction and delivery of individualised learning modules and the appointment of a mentor. This part-human, part-automated process model, following pre-determined rules, involves four identified actors (learners, mentors, designers and assessors), actively engaging with each other in a common virtual space. This approach enables learners to both make meaning from their learning experiences and provides them with the reflective skills to be lifelong learners. This approach to the mass-customisation allows institutions to extend their reach and educators to broaden their repertoire of teaching skills. This improves not only the quality and relevance of courses offered but also the experiences of learners.

## 6. Summary

Mass-customisation shows potential in the creation of cost-effective, learning-centric higher educational environments, and this has become increasingly relevant in times of fiscal restraint. The automated construction of individualised learning plans, the evolution of this automated process and the impact of automation on the learning experiences of individuals needs to be further examined. Research needs to be undertaken to provide evidence regarding the impact and effect of mass-customisation, driven by reflection, on learners, educators and institutions.

## References


Barboza, D. (2011) 'Berkeley has plan to start a program in Shanghai': [Foreign Desk]. *New York Times*, 8 Dec., from Banking Information Source, (Document ID: 2513038291).

Carlson, T. & Parry, S. (2003) 'A reflective framework from a pre-service teacher's perspective', *Physical Educator*, vol. 60, no. 4, pp. 208–221.

Ciorba, C. & Smith, N. (2009) 'Measurement of instrumental and vocal undergraduate performance juries using a multidimensional assessment rubric', *Journal of Research in Music Education*, vol. 57, no. 1, pp. 5–15.

Clayton, J. (2009) *Evaluating online learning environments*, LAP Lambert Academic Publishing, Köln.

Clayton, J. (2011) 'Reflective-frameworks and international education: rethinking, teaching, learning and the curriculum: a case study', *Cambridge International Conference on Open, Distance and e-Learning: Internationalisation and Social Justice: the role of Open, Distance and e-Learning: Collected Conference Papers and Abstracts: September 2011*. The Von Hügel Institute, St Edmund's College, Cambridge, in association with The Open University and The Commonwealth of Learning, Cambridge, pp. 74–85.

Clayton, J., Elliott, R. & Saravani, S.-J. (2009) *ICT PD Cluster Programme Research Review Project: Report on Key Recommendations, Trends, and Lessons from ICT PD Provision*, Project Report, Emerging Technologies Centre, Hamilton.

Cohen, S. L. & Pine, B. J. (2007) 'Mass customizing the training industry', *Training and Development*, vol. 61, no. 6, pp. 50–54.

Cross, R. *et al*. (2009) 'Design communication for mass-customisation', *International Journal of Mass-Customisation*, vol. 3, no. 2, pp. 146–164.

Fiedler, R. L., Mullen, L. & Finnegan, M. (2009) 'Portfolios in context: a comparative Study in two pre-service teacher education programs', *Journal of Research on Technology in Education*, vol. 42, no. 2, pp. 99–122.

Gaeta, A., Gaeta, M. & Ritrovato, P. (2009) 'A grid based software architecture for delivery of adaptive and personalised learning experiences', *Personal and Ubiquitous Computing*, vol. 13, no. 3, pp. 207–217.

Ghaye, T. (2011) *Teaching and Learning through Reflective Practice: A Practical Guide for Positive Action*, Routledge, Abingdon, Oxon.

Hwang, G., Tseng, J. & Hwang, G. (2008) 'Diagnosing student learning problems based on historical assessment records', *Innovations in Education and Teaching International*, vol. 45, no. 1, pp. 77–89.

Kerby, D. & Romine, J. (2010) 'Develop oral presentation skills through accounting curriculum design and course-embedded assessment', *Journal of Education for Business*, vol. 85, no. 3, pp. 172–179.

Kieke, M., Moroz, K. & Gort, A. (2007) 'The transformation to a learner-centered community as a result of university-wide assessment', *On the Horizon*, vol. 15, no. 2, pp. 107–117.

Kim, P., Ng, C. & Lim, G. (2010) 'When cloud computing meets with semantic web: a new design for e-portfolio systems in the social media era', *British Journal of Educational Technology*, vol. 41, no. 6, pp. 1018–1028.

Korthagen, F. & Vasalos, A. (2005) 'Levels in reflection: core reflection as a means to enhance professional growth', *Teachers and Teaching*, vol. 11, no. 1, pp. 47–71.

Latimer, M., Bergee, M. & Cohen, M. (2010) 'Reliability and perceived pedagogical utility of a weighted music performance assessment rubric', *Journal of Research in Music Education*, vol. 58, no. 2, pp. 168–183.

Martinez, L. (2011) 'The study abroad advantage', *Diverse Issues in Higher Education*, vol. 28, no. 19, pp. 25.

McColgan, K. & Blackwood, B. (2009) 'A systematic review protocol on the use of teaching portfolios for educators in further and higher education', *Journal of Advanced Nursing*, vol. 65, no. 12, pp. 2500–2507.

Mimirinis, M. & Bhattacharya, M. (2007) 'Design of virtual learning environments for deep learning', *Journal of Interactive Learning Research*, vol. 18, no. 1, pp. 55–64.

New Zealand Ministry of Education. (2010) *Tertiary Education Strategy 2010–15*, New Zealand Government, Wellington.

New Zealand Treasury. (2011) 'Performance information for appropriations: vote tertiary education', *Education and Science Sector: Information Supporting the Estimates 2011/12*

*B.5A Vol. 2*, Wellington, New Zealand, Available at: http://www.treasury.govt.nz/budget/2011/ise/v2/ise11-v2-pia-tered.pdf

New Zealand National Qualifications Authority: NZQA. (2011) 'Domain - Open, Flexible, and Networked Learning', Retrieved 23 March 2012 from http://www.nzqa.govt.nz/framework/explore/domain.do?frameworkId=1263616601

Organization for Economic Co-Operation and Development (OECD). (2005) 'E-learning in tertiary education', *Policy Briefs*, Available at: http://www.oecd.org/dataoecd/27/35/35991871.pdf

Penner, R. (2001) 'Mentoring in higher education', *Direction*, vol. 30, no. 1, pp. 45–52.

Peter, S., Bacon, E. & Dastbaz, M. (2010) 'Adaptable, personalised e-learning incorporating learning styles', *Campus-Wide Information Systems*, vol. 27, no. 2, pp. 91–100.

Sawir, E. (2011) 'Academic staff response to international students and internationalising the curriculum: the impact of disciplinary differences', *International Journal for Academic Development*, vol. 16, no. 1, pp. 45–57.

Spanier, G. B. (2010) 'Creating adaptable universities', *Innovative Higher Education*, vol. 35, no. 2, pp. 91–99.

Strudler, N. (2011) 'Electronic portfolios in teacher education: forging a middle ground', *Journal of Research on Technology in Education*, vol. 44, no. 2, pp. 161.

Syed-Khuzzan, S. & Goulding, J. (2009) 'Personalised learning environments (part 2): a conceptual model for construction', *Industrial and Commercial Training*, vol. 41, no. 1, pp. 47–56.

Syed-Khuzzan, S., Goulding, J. & Underwood, J. (2008) 'Personalised learning environments – part 1: core development issues for construction', *Industrial and Commercial Training*, vol. 40, no. 6, pp. 310–319.

Turner, F. (2009) 'The Influence of mass-customisation on consumer satisfaction and its implications for the U.S. IPTV television market: an exploratory study', *Business Leadership Review*, vol. 6, no. 4 [Electronic Version], Available at: http://www.mbaworld.com/blr-archive/issues-64/4/index.pdf

Verdouw, C. *et al*. (2010) 'Towards dynamic reference information models: readiness for ICT mass-customisation', *Computers in Industry*, vol. 61, no. 9, pp. 833–844.

Xia, S.-S. & Wang, L.-Y. (2010) 'Customer requirements mapping method based on association rules mining for mass-customisation', *International Journal Computer Applications in Technology*, vol. 37, no. 3/4, pp. 198–203.

Zimmerman, B. (1990) 'Self-regulated learning and academic achievement: an overview', *Educational Psychologist*, vol. 25, no. 1, pp. 3–17.

# Index of Authors