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Who makes better use of technology for learning in D&T? Schools or university?

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Abstract

University teacher training departments have many functions in their role as Schools for Initial Teacher Education (ITE), these include accrediting qualified teacher status, teaching subject knowledge and pedagogy, and influencing change in a school subject's content and pedagogy. This paper discusses this latter area.

It can be easy for teacher training in universities to become ivory towers, modelling new ideas for curriculum delivery and content in a 'bubble' away from the real world of the school classroom. A centre of design and technology (D&T) education at an English university has undertaken research-led developments in the use of web 2.0 technologies and technology enhanced learning (TEL), modelling how they can be used in the classroom. The research examined in this paper is the next stage of the centre's curriculum development to ensure the relevance of the university curriculum content and practices.

Anecdotal evidence suggests that the use of TEL in secondary schools is inconsistent and sporadic with D&T teachers using TEL, with minimal awareness of research available, which could inform their practice. This impacts on the centre's trainee teachers as they begin teaching in schools during their final year of the course, with a possible unrealistic expectation of how TEL is used in schools, based on their university experiences.

To discover if their university experience is useful for both undergraduates and graduates of the course when they are teaching in schools, the research questions in this small comparative research project are:

1. How is TEL used by the university within the D&T subject knowledge modules of the course?
2. How is TEL used in D&T lessons in some local secondary schools?

The analysis of this data will be a comparison of the use of TEL across these two fields. The aim of the subsequent discussion and conclusion is to ensure that the subject knowledge taught and modelled in university about TEL in D&T is relevant and forward thinking, preparing trainee teachers for their future employment.

Introduction

A centre of design and technology (D&T) education at an English university has undertaken research-led developments in the use of web 2.0 technologies and technology enhanced learning (TEL), modeling how they can be used in the classroom.

The research examined in this paper is the next stage of the centre's curriculum development to ensure relevance of the university curriculum content and practices. To ensure their university experience is useful for both undergraduates and graduates of the course when they are teaching, the research questions in this small comparative research project are how is TEL:

1. used by the university within the D&T subject knowledge modules of the course?
2. used in D&T lessons in some local secondary schools?

The analysis of data will be a comparison of the use of TEL across university and three Nottinghamshire schools. The aim of the subsequent discussion and conclusion is to ensure that subject knowledge taught and modelled in university about TEL in D&T is relevant and forward thinking, preparing trainee teachers for future employment.

Defining TEL: A D&T Tool Or A D&T Teaching Strategy?

The phrase 'Web 2.0' is regularly used to define web-based technologies, which include blogging, social media platforms, photo and video sharing websites. These examples, amongst others, display content publicly for sharing and collaboration beyond the confines of a single classroom. In education, web 2.0 can 'open channel(s) for exploring the value of social and collaborative production, including peer learning' (Fitzgerald et al., 2009, p.29). Related terms include 'blended learning' and 'TEL', this latter term is appropriate for this paper as it focuses on teaching and learning activity and less on the technology as a D&T tool. This paper compares the use of how technologies (primarily web 2.0) are used to support teaching and learning on a D&T ITE course and D&T lessons in schools.

TEL: The Potential For Learning

The TEL research programme spent over four years developing systems and software for use in schools. An outcome of the project was identification of twelve TEL themes

(Noss, 2012), which have implications for the use of technology in all school lessons. In this paper we focus only on three themes, selected for their relevance to our topic of web-based technology: 'connect', 'share' and 'know'. Selecting these for relevance to our topic. They have been chosen based on our use of TEL and the literature review conducted for this paper in the context of secondary schools and D&T. We will explain these three themes in the context of our research question only and illustrate themes in D&T lessons with examples from literature.

'Connect' is the first theme, and web 2.0 creates opportunity to connect informal and formal learning through the use of social media, blogs and wikis for example. Mobile technologies such as tablets and phones can also be a crucial component of connecting and supporting asynchronous and peer learning (Garrison & Vaughan, 2008; Poore, 2012). According to Poore (2012) social networking tools (e.g. Twitter, Facebook) and the use of video/ instant messaging (e.g. Skype, Facetime) support real-time communication with people outside the classroom, such as between students and teachers.

'Sharing' is the second theme, it has clear links to connect however 'connect' focuses on the relationship between communication and location of learning, whereas 'sharing' focuses on collaboration. Social media and wikis are web 2.0 technologies that can support collaborative learning (Davies & Hardy, 2011; Hardy and Davies 2013; O'Leary, 2008). Research by the authors (2011) exemplifies how collaborative learning can take place through the use of wikis during design and technology activity. A group design project used a wiki to record decisions made using individual research, which was then posted on the wiki for the whole group see and subsequently use.

'Know' is the final theme, where information available online is made meaningful either by the teacher, the individual or peers and becomes meaningful knowledge through the way it is presented and understood (Noss, 2012). Salmon (2000) describes this process as a development where the knowledge is made personal through the engagement with others through the use of technology. The authors previously reported on the use of eportfolios as a way individuals use images of their own work, to make meaning of their own knowledge development in the use of D&T materials and processes (Hardy, Tinney and Davies, 2012).

Relationship Between ITE, Subject Content And Pedagogy

University teacher training departments have many functions in their role as providers of Initial Teacher Education (ITE), we suggest these include accrediting qualified teacher status, teaching subject knowledge and pedagogy and influencing change in school subject's content and pedagogy.

In England the eight prescribed teaching standards (Department for Education, 2012) are central to ITE course's content in their role as accrediting centres (Ofsted, 2012). Two of these standards require teachers to 'demonstrate good subject and curriculum knowledge' and 'plan and teach well-structured lessons' (p.6-7). This should influence the teaching of subject content and pedagogy during taught components of an ITE course. Consequently, Williams' argument takes on more significance that what trainee teachers learn is as important as how they learn (2009). However, care must be taken not to focus on content over pedagogy. Swennen, Lunenberd and Korthagen propose solving this through congruent teaching; that is (1) modelling, (2) explaining the choices

made while teaching (meta-commentary) and (3) linking those choices to relevant theory (2008, p.531).

D&T teacher training departments, and therefore D&T teacher educators, have a role influencing the modernization of D&T's subject content. Examples include projects led by or involving Dr David Barlex (Nuffield D&T project), Jenny Dein (Technology Enhancement Programme Millennium Projects) and Bill Nicholl (Creative Problem Solving and Inclusive Design). There is a key role to play in modernizing D&T pedagogy by teacher educators, key texts such as Spendlove (2008), Owen-Jackson (2002) and Barlex (2007) evidence this by their inclusion on D&T ITE course reading lists in England.

Modernizing the D&T Curriculum with New Technologies

Ofsted's (2011; 2013) definition of modernising D&T subject content includes employing new technologies, such as new materials and processes. However, we argue for a wider definition of new technology which includes web 2.0. We (Hardy and Davies, 2013) suggest that learning to use web 2.0 technologies develops pupils' creative design skills, and is a component of modernising D&T subject content. Looking at the use of technology from pupils' perspective we know it is a ubiquitous part of their lives; they are digital natives (Prensky, 2001) using technology instinctively and intuitively so why not include it in the D&T curriculum. It is a fine line between technology as a tool for teaching (i.e. pedagogy) and technology as a strategy for designing and making (i.e. subject knowledge).

The ITE functions detailed above should produce effective teachers who will shape future D&T. Consequently, D&T ITE needs to ensure that pedagogy and content enables this.

Method

There were two participating groups who provided data for analysis about TEL in D&T lessons/lectures:

Group 1: university lecturers from the D&T teacher training course.

Group 2: D&T teachers in local schools.

Both groups were involved directly and indirectly in shaping ITE and the school curriculum through school/university partnership meetings. The sampling is purposive as research was conducted to inform curriculum development at this one university. Three of the university participants are also authors of this paper and are mindful this involvement could affect data and interpretation. As a significant percentage of the university's D&T ITE graduates are employed locally (44% of 2013 graduates); university lecturers were mindful to develop the ITE curriculum based on local expectations. Although schools within an 80 mile radius provide teaching placements for the university, for ease of access those within a 10 mile radius were selected for interview.

The investigation used three data collection methods: online surveys, face to face interviews and follow up emails. Two online surveys were set up with similar questions

for each group but contextualised to either a school or university setting. The surveys had two parts. The first part focussed on the 'big four' four (Poore, 2012): (1) social networking, (2) blogs, (3) wikis and (4) podcasting, audio and videos. These were identified from literature and our own practice as being the most commonly used web 2.0 technologies, for engaging and enhancing learning. The second part asked about the use of other technologies which may not have seemed so obvious for enhancing learning in new ways. The headings in the questionnaire's came from current literature and those same headings were used in the structured interviews which took place at both the university and the local secondary schools.

The teacher survey had 20 respondents and the university survey four (a maximum of five was possible). From these surveys, initial data analysis was carried out and participants who had indicated willingness to be interviewed from both surveys were contacted for a follow up interview. Three lecturers and five teachers were interviewed face-to-face. Structured interviews allowed for exploratory questions and discussions about the participants' examples of TEL in teaching and learning (Powney & Watts, 1987). Appropriate questions were developed for the different groups, based on the survey analysis.

After analysing the interviews participants were emailed and asked for further examples of how they used specific web 2.0 tools such as podcasting, Dropbox.com, tablets and mobile phones. This was because the examples given in the interviews did not focus on enhancing learning.

Findings

Part One: The Big Four

Social Networking

Eleven of the surveyed teachers used social networking in their teaching and learning however only one teacher gave a specific example of using this tool when interviewed. All of the interviewed lecturers said they used social networking in their teaching and learning. Both the teacher and one lecturer use Twitter to post web links to information relevant to the students' in class work. The same lecturer also has Twitter conversations with students about taught sessions and gave a specific example of using Twitter during a session when tweets were sent during a student lead seminar to a designer who was being discussed in the seminar.

	Teachers		Lecturers	
	Survey data (n=20)	Interview data (n=5)	Survey data (n=4)	Interview data (n=3)
Social networking	55.5% (11)	20% (1)	100% (4)	100% (3)
Blogs	30% (6)	20% (1)	100% (4)	66.6% (2)
Wiki	30% (6)	0% (0)	100% (4)	100% (3)
Podcasting, audio videos	65% (13)	80% (4)	75% (3)	33.3% (1)

Table 1: Summary of use of 'big four' technologies to enhance learning in D&T lessons/lectures

Blogs

There was no evidence of teachers or lecturers using blogs during lessons/lectures to enhance learning from either the survey or interview. One person from each group gave an example of how blogs were used outside of lessons both formally and informally. The teacher uses a blog to provide an update on topics and give feedback. The lecturers' have a department blog and one lecturer had asked some students to write posts about their learning in session; this recognised as a promotional and awareness raising exercise not for direct enhancement of learning.

Wikis

In the survey 30% (n=6) teachers indicated they used wikis in lessons; we did expect at least one interviewed teacher to give an example but none did even when a follow-up email was sent asking for any further examples. All of the lecturers interviewed and surveyed said they used wikis in lessons to enhance learning and this has been reported at previous conferences.

Podcasting, Audio And Videos

Four teachers interviewed stated they used podcasting, audio and videos in their teaching and learning. One teacher gave an example of where they have created their own videos to be used as food demonstrations to pupils. Whilst three of the four lecturers surveyed said they used podcasts, audio or videos in their teaching and learning, when interviewed only one gave a specific example: 'I made a YouTube video about setting up a machine for the students to refer to'.

Part Two: Other Technologies

Online Video Sharing

This was comparatively high with both teachers and lecturers. Three teachers spoke about using 'YouTube' clips and 'BBC iPlayer' in their teaching as an information source, these resources are not created by the teacher but selected for suitability:

'Philippe Starck had a TV programme called 'Design for Life'. Pupils were given access to this via iPlayer and had to make notes answering specific questions. Philippe Starck was the designer that pupils had to research for their exam so this was an introduction to him. Pupils in groups watched different sections and then shared their information with other groups.'

	Teachers		Lecturers	
	Survey data (n=variable*)	Interview data (n=5)	Survey data (n=4)	Interview data (n=3)
Online video sharing	94% (15/16)	60% (3)	100% (4)	66.6% (2)
Video Messaging	27% (4/15)	0% (0)	75% (3)	33.3% (1)
Cloud storage	94% (15/16)	60% (3)	75% (4)	100% (3)
Image sharing	43% (6/14)	0% (0)	50% (2)	66.6% (2)
ePortfolio tools	86% (12/14)	0% (0)	50% (2)	100% (3)
Note taking	33% (5/15)	0% (0)	100% (4)	100% (3)
Apps on mobile devices	63% (10/16)	20% (1)	50% (2)	66.6% (2)
Mobile devices	60% (9/15)	20% (1)	75% (3)	33.3% (1)
Email	100% (17/17)	100% (5)	100% (4)	66.6% (2)
Interactive voting poll	73% (11/15)	20% (1)	50% (2)	0% (0)

- Not all respondents answered each question

Table 1: Summary of use of other technologies to enhance learning in D&T lessons/lectures

Cloud Storage

Used by both the teachers and the lecturers but with different web tools given as examples. Lecturers referred to Dropbox.com when giving examples whereas teachers talked about the VLE as cloud storage. Two teachers spoke about using Dropbox.com to share resources with colleagues.

Email

Teachers interviewed said they used email in their teaching and learning, but only one gave a specific example related to pupils and this was with older students as a means of communication to discuss coursework. Lecturer results indicated use of email as a part of their teaching and learning to follow up after tutorials and to keep students aware of any changes to sessions.

Eportfolio

There is a large contrast between the use of eportfolio tools used in teaching and learning. It is a part of a university policy that these tools are used in formative and summative assessment. All of the lecturers interviewed stated that they used these tools in their teaching and learning, whereas none of the teachers used this tool. One teacher stated that exam boards do not accept this format for coursework and there is no need to use this tool.

Discussion

From the data collected, the university appears to make more use of web 2.0's capability to support sharing and collaborative learning. The lecturers said TEL supported peer-to-peer learning, sharing knowledge and information, and collaborative work. In the interviews with teachers, it was clear that they enjoyed using technology formally and informally and saw the benefits including:

'Increased pupil engagement and access to materials'

'It's created a situation where pupils can access information outside of the classroom'

'Pupils engage so much more as its real for their lifestyle'

The lecturers used more tools than the teachers, which may be explained by the obstacles teachers mentioned in the interviews: training, set up time, appropriateness of tools for school use, and awareness of the tools available. School policies were also seen as an obstacle, such as restrictions of mobile phone use, discouraging pupils and teachers bringing their own devices into school. Unsurprisingly lack of confidence was another hurdle to using technology. However, one teacher did say that as a result of the interview they would experiment further with technology in their lesson, in particular Twitter.

Both groups did use TEL for asynchronous learning, for example the use of a VLE, blogs and Twitter. Teachers commented that using social networking in school raised fears about internet safety. The university lecturers use these tools more frequently but do not have the same responsibilities with respect to cyber bullying and child protection due to their students' age.

It is interesting to note the discrepancy between the survey and interview data from the school teachers, the survey scores tend to be higher than the interview scores. This may be due to them over-compensating on the survey, completing the survey quickly or time in the interviews to clarify the teacher's understanding of the technical terms. In addition, we wonder if they may have misunderstood the focus on the use of these tools to enhance learning.

Referring back to the three themes of 'share', 'connect' and 'know', both groups used technology for all three. The data does not allow us to make a fair comparison of the effectiveness of the school use in supporting developing pupil knowledge with the university.

As mentioned by Loveland (2012) and Poore (2012) constructivism, specifically social constructivism, is learning through collaborative and interactive process. We believe the technologies discussed in this paper support this due to their ability to facilitate collaborative learning in D&T. Although this research has highlighted some of the differences and obstacles for schools, the arguments for using TEL outweigh these,

which in turn have led us to the following recommendations to influence our own practice as educators:

- Develop the meta-commentary about scaffolding the use of TEL within design practice
- Explain the benefit of using web 2.0 technologies such as wikis to developing pupils' D&T capability
- Be explicit about the use of technology to enhance learning but also as tools for professional development and planning
- Work with our students to be aware of the wider implications of using social media with school aged children.

Conclusion

This is a local research project working with the partnerships between this one university and local schools in the training of D&T teachers, and does not claim that generalisations could be extrapolated from either the data or its analysis. However, we hope by sharing our findings it may support other colleagues in how they engage with developing pedagogical uses of technology in D&T teacher training. It would be interesting to discover if the ways in which this university uses TEL within D&T ITE is unique to them, or if there are similarities with other D&T courses. This would give an opportunity for universities to work collaborative to develop TEL in D&T pedagogy.

Final notes

The research for this paper was led by a student on the ITE course funded through the university's undergraduate research programme. The authors worked collaboratively to plan, analyse and write using a wiki.

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