PEDAGOGY IN THE EVOLVING TECH ENVIRONMENT – WHAT HAS CHANGED?

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Abstract

Over a decade ago, educational researchers and authors were saying that technology-rich classrooms would be the catalyst for transforming learning and transforming pedagogy. Since 2000, the evolving tech educational environment has grown considerably, with the use of tablets, cloud computing, podcasts, Web 2.0, e-tivities and online delivery. Has pedagogy changed in education with changes in the technology available to deliver content to students? What does research say about how pedagogy is or isn't changing? This paper looks at a snapshot of current educational literature from around the globe.

Introduction

In 1838, Frenchman Jean Baptiste Alphonse Karr is reported to have said "plus ça change, plus c'est la même chose," which means, "the more things change, the more they stay the same." Is this true for pedagogical practices in today's high tech learning environment? There is no doubt that the stick of chalk has been replaced by the USB stick, manila folders have been replaced by "the cloud," the blackboard has been replaced by the interactive whiteboard, the exercise book has been replaced by the notebook (computer) or tablet, and students don't need to come to class to talk to a real teacher – they can communicate with their teacher through a variety of virtual means. But what of the teachers' fundamental philosophical approach to their teaching? Has this changed at all in the evolving high tech environment? What does the research tell us?

The title of this paper specifically refers to an *evolving tech environment.* My understanding of this term comes in two parts. Firstly, it is an educational environment where the technologies used for delivery of content, student interactions, assessment and learning artefacts utilise the latest developments and innovations in digital technology in relation to hardware, software and Web 2.0 capabilities. The term *evolving* refers to a changing learning environment. In 2002, the latest in technological advancement in the classroom consisted almost entirely of laptop computers with access to the Internet in class, and the beginnings of learner management systems for the storage and delivery of curriculum material. In 2012, the learning environment can be anywhere, as the learner may have any number of portable digital learning devices, such as a laptop, iPad, or smart phone to engage with curriculum materials prepared by a teacher or lecturer.

Secondly, an evolving tech environment also includes, as does much of the current research, reference to the increasing reliance of schools and universities catering for a diverse range of additional students through online and blended learning possibilities.

Ignoring Pedagogy in Current Research

Time and space constraints do not allow for a thorough critique of research into the use of ICT in education focusing on the technology rather than on the impact it has on what humans actually do. There are a plethora of research articles, reports and studies that attempt to justify the use of technology but fail to contribute to knowledge about learning or teaching. McDougall and Jones (2006, p. 357) criticised the state of research into ICT saying: "It is easier to undertake, and to obtain funding for, research that might justify technology's expense than it is to investigate the more fundamental questions about learning and teaching processes." They further claimed:

> Research questions investigating issues of learning and teaching are needed for quality research that will advance knowledge and inform improved practice. Such studies will generally require longer timelines and more complex data collection and analysis methodologies.
> (McDougall & Jones, 2006, p.359)

Another criticism of current studies is that some researchers ignore, or leave out pedagogy as a key component of a teacher or lectures ability in learning how to teach with ICT. Here is a typical research project that fits this criticism. Gronseth et al. (2010, p. 31) addressed two research questions in their study of types and content of technology experiences in US educational institutions that offer teacher preparation courses.   These questions were:

1. What are the perceptions of technology experiences used to prepare teachers to use technology?

2. What are the perceptions of technology topics used to prepare teachers to use technology?

Their results and discussion do not mention anything about why technology could be used and the pedagogical possibilities of educators in using emerging technologies. These were not mentioned because they were not asked of the respondents.   Whereas some research specifically discusses the need to change pedagogy in the 21st century (Sinclair, 2009; Guthrie & McCracken, 2010; Snape & Fox-Turnbull, 2011), Gronseth et al. (2010) are silent on this matter.

The *British Journal of Educational Technology* (Rushby, 2011) invited responses from members of its editorial board and authors of their journal articles and asked them to select from a list supplied what they perceived to be the emerging trends in learning technologies. The top 10 responses were

1. Mobile learning
2. Collaborative learning
3. Social networking

4. Assessment
5. Learning environments
6. Learning design
7. Web 2.0
8. Creative learning
9. Self organising learning
10. Quality.

What is interesting to note in the above results, is that pedagogy was not rated. In fact, it was not on the list at all for the respondents to choose from. It could be construed that *BJET* does not think pedagogy is an issue when it comes to trends in learning technology, or that they simply wanted to ask specifically about technologies and not the beliefs of the teachers and trainers responsible for designing the learning experiences.

Pedagogy in Practice

In an evaluation of a program designed to "complement, rather than replace traditional teaching and learning approaches within schools," Condie and Livingston (2007, p. 346) found that:

> While some teachers continue to display a reluctance to engage with new technology, others remain fearful of trying new approaches which they perceive might have a negative impact on exam results. It may be that external drivers such as high risk national examinations inhibit innovation. Making use of technology to support learning and teaching and using more constructivist approaches appear to be perceived as risky strategies for some teachers and they prefer to stick with tried and tested methods which they believe enable them to predict and control outcomes more easily.

Condie and Livingston (2007) further stated that while teachers did not seem to engage with the technology, there was evidence of a positive impact on not only student learning, but more importantly, on their exam results. The authors said that by the provision of additional online and blended learning opportunities, students were able to make more decisions about their own learning. They concluded: "Teachers will be required to move out of their comfort zones and will need to be convinced that an upheaval and discomfort that this brings will be worth it, in educational terms" (p.346).

Green et al. (2010) reconceptualised their online pedagogy for all students enrolled in two graduate courses for distance learners. Their research focused on the pedagogical and conceptual underpinnings used in the context of their teaching and learning of an online course. Previously, the pedagogy adopted by instructors was one of depositing enough information within students so that they could regurgitate it at assessment time. This regurgitation provided the instructors with no contextual basis for the community of students, no critical engagement, nor ownership of the curricula by students and no innovation in learning or teaching.

Through the process of teaching through assessment, which was designed in a manner that supported learning through knowledge creation, Green et al. (2010) claimed that by teaching through assessment, it challenged them to put pedagogy ahead of technology, and therefore, learning how better to use the learner management systems to not only teach, but to learn with students.

> Assessments required students to work together (in groups) to agree on what common artefacts of their learning they would produce…The assessment tasks set the parameters, but ultimately responsibility rested with the students to take an active, responsible role in their own personal and professional development. Their responses to the assessment tasks demonstrate their learning to be of a higher quality and more in depth than the assignments received from students in previous years. (Green et al., 2010, p. 263)

Fittingly, Green et al. (2010, p.271) claimed that as a result of this research project, they (the researchers) had "regained control of our professional identities and reframed our online pedagogies to reflect our philosophies of teaching and learning."

Two questions remained unaddressed by these findings, which more than likely, were not or could not be addressed. Firstly, did the researchers start with these constructivist learning pedagogical principles, and secondly, did the students who learned in this way, go on to use these principles when they commenced their professional lives as teachers?   Research suggests that it is very difficult for first year out teachers to retain constructivist pedagogical beliefs when confronted with the realities of teaching in schools for the first time (Whitefield, 2004).

Comas-Quinn (2011) says that is isn't merely enough to learn how to teach with online tools, but more emphasis should be placed on the professional development required to shift the values, attitudes and beliefs of teachers into becoming online teachers. She says that there needs to be "a reconceptualising of the roles of both teacher and learner, and of how they co-construct understanding through synchronous and asynchronous online interaction" (p. 230). If teachers already have constructivist beliefs and attitudes to learning, then they are more likely to adapt their teaching practices to using new technologies and work in a blended learning community environment.

Technology, Content and Pedagogy Models
Some researchers believe that if you carefully construct a teachers' professional development learning experience to include such things as technological, pedagogical and content knowledge (TPACK) grounded in a constructivist paradigm, this will lead to the teacher's growth in those areas. Polly (2011, p. 960) says that teachers will gain in various components of TPACK by learning through the construction of technology-rich instructional resources, noting, "By focusing on improving teacher learning through creating and compiling resources that align with academic standards and

promote higher order thinking skills, the use of these resources increases the likelihood that student learning outcomes will also improve."

However, Polly (2011, p. 59) also suggests that

> Research needs to be conducted using TPACK …to examine how opportunities for teacher learning influence participants' beliefs, knowledge and skills, instructional practice and their students' achievement… what evidence of teachers' TPACK carries over from interviews into their lesson planning and classroom practices.

In a similar research project whereby professional development at a Teachers College in the United States was designed using the TPACK construct, Archambault et al. (2010, p.11) said that these types of learning experiences do have "a positive impact on the beliefs and teaching practices of faculty." But the authors also said that this particular study was limited because it relied on faculty perceptions on what they believed to be the likely impact on student achievement, without actually collecting any data to support this.

In a Taiwanese study, Lin et al. (2012) propose a two-dimensional model for teachers ICT integration, where technical competency is mapped next to pedagogical competency. According to this model, a teacher at any level of technical competency can reach the top of pedagogical competency. This is an interesting theoretical model as it says a teacher at Level 1 of technical competency (mundane use) can operate at Level D in pedagogical competency (social learning), and conversely, a teacher may be at Level 7 of technical competency (implementing sophisticated instructional systems) and be only at Level A of pedagogical competency (direct learning). This latter example of their model could be considered a "mere exhibition of teachers' ICT skills" without the pedagogical rigour and impact on students learning to make the use of technology worthwhile (Lin et al., 2012,107).

Lin et al. (2012) rightly suggest that the model needs more empirical studies conducted longitudinally. I would suggest that the model has potential and the studies mentioned above could also be conducted globally to see if there are any similarities or differences between cultures and countries. The authors suggest that a "third dimension may also be needed to explore how different combinations or alignments of the current two dimensions impact student learning" (Lin et al., 2012, p. 107).

The two dimensional model (Lin et al., 2012) is similar to TPACK (Koehler et al., 2007), but without the content knowledge dimension. Both models offer some guide to instructors in the design potential of developing learning experiences for students. What is missing in educational research is the impact on student learning outcomes over a longer period of time.

Net Gen Students
There is a tendency to assume that all students today belong to or show the widely believed characteristics of the 'net generation', or the generic 'Gen Y.' Technological competency is central to the success of students in primary,

secondary and tertiary education, but can we assume that all students today are totally net savvy? In a study of over 2000 students in a first year university course, Kennedy et al. (2008) found that not all these students embraced the technologies and tools of the net generation, and more importantly, "that core technology based skills do not necessarily translate into sophisticated skills with other technologies or general information literacy"(p.117). There are those students who may be skilled in the use of everyday technologies in their daily lives but are reluctant to use them in their studies. Lorenzo et al. (2007) also contend that students in higher education represent a broad and highly diverse growing body of students with wide varieties of information literacy capabilities.

Valtonen et al. (2011) were concerned with the 'net generation' assumptions concerning 74 first year student teachers at a Finnish university. These students designed various learning modules in an obligatory course on ICT in education conducted in their first semester when their pedagogical studies were just beginning. The researchers were interested in how they used their technical, pedagogical and content knowledge (TPCK) to design a learning module for use in a classroom by students. What they found was that even though these students used many kinds of technologies themselves, "They do not necessarily see them as tools for learning" (Valtonen et al., 2011, p.15). They noted, "It seems that instead of finding innovative ways of applying ICT in education…the student teachers kept to traditional teaching and learning methods and simply added a technological dimension" (p.15).

Perhaps the most important recommendation made by the study was this: "It would also be interesting to see whether the elements of the student teachers' TPCK change during their studies and how these elements materialise when the students start working as elementary school teachers "(Valtonen et al., 2011, p.16).

Implications for pedagogy are clear and obvious. We as educators should not assume that all students are the same, use technologies the same way, or that they learn in the same way. Offering an alternative view, Watulak (2012) warns us that there are some students who feel disconnected between their participation in a pro-technology discourse of the educational and their own personal technological practices. We need to be mindful of these types of students and offer a range of learning opportunities for all kinds of students that will allow them to succeed.

Why Should Pedagogy Be Changing?

Snape and Fox-Turnbull (2011) argue that education in the 21st century requires a new way of teaching and learning with technology. The last century required schools to discipline students for work and life in a society that was the result of an industrial age, but the new century requires schools to prepare students for a society that needs different skills.

> The skills, attitudes, values and competencies that will be needed have not always been addressed in traditional educational programmes. Student's resilience and ability to accept and adapt to change will

determine success. Different approaches and methods of teaching are what many educationalists are calling for. (Snape & Fox-Turnbull 2011,p.149)

Although specifically referring to technology education in New Zealand, Snape and Fox-Turnbull (2011) are clear in the assumption that the pedagogy required by teachers for students to achieve the skills necessary to live and work in the 21st century is constructivist pedagogy. Students need to be engaged in authentic, real world activities, must socially construct outcomes, make connections with others, and collaborate with a range of partners. These students will need to be prepared, willing and be determined to engage with topics that add meaning to their lives. In an unusually grandiose statement, Snape and Fox-Turnbull said: Technology teachers can become the leaders of change that will revitalise education systems and end the traditional content-driven, low level learning and assessment-based regime that still frequently predominate in our schools" (Snape & Fox-Turnbull, 2011, p.159).

In another study from New Zealand, Sinclair (2009) argues that teachers need to adopt a provocative pedagogy due to a cultural transformation as a result of online learning. This transformation has come about as a result of the questioning of traditional forms of teaching in lectures, tutorials and laboratories in universities. Sinclair (2009, p. 206) says: "Beliefs about pedagogy will be constantly confronted and challenged by the growth of new technologies and thus requires an appraisal of and reflection on existing practices."

Teachers and lecturers who themselves were not students in a technologically rich learning environment, or who did not learn online, will continue to struggle in the 21st century where mobile learning, blended learning and online learning will become more prevalent.   The provocative pedagogy mentioned by Sinclair (2009) is one where these teachers must learn to examine the effect on children's learning by reflecting on their teaching beliefs and strategies. They must examine their underlying assumptions about their pedagogical beliefs and explore "the multiple perspectives of the views of others" (Sinclair, 2009, p.205).

Finally

What does all this mean? In my own doctoral research nearly a decade ago (Whitefield, 2004), I found that while teachers of years 7 – 10 classes were quite prepared to use technology and try innovative learning activities with their students, it was very difficult for secondary school teachers (of Years 11 and 12 classes) in a technologically rich learning environment to change pedagogical beliefs and practices due to a range of external factors. While the educational research of the late 1990s and early 2000s quite overwhelmingly said that the introduction of new technologies would revolutionise pedagogy and we would see a shift from instruction (teacher centred) to construction (student centred), I found this not to be the case for teachers of senior classes. The factors that inhibited this 'revolution' were the assessment requirements of a State-wide educational curriculum (pen and paper examinations), school culture where there the pedagogy was one of survival (sit down, shut up and

listen to what I say), and external influences such as parents expectations (if the exams don't allow my child to use a computer, why are you teaching with one in years 11 and 12). What I did find in these schools was that students still learned, they still succeeded in university after they left school, and have probably done OK since leaving university to enter the world of work. Of course, this is purely speculatory, as I have not conducted any longitudinal analysis of those students in this decade.

Has anything changed between 2002 and 2012? There are some strikingly similar themes. There seems to be a collective agreement that learning in this century now is different to that of 10, 20 and 30 years ago. The digital age is here and the children we teach now in schools and universities have grown up digitally. Research is still saying that pedagogy must keep up! The pedagogy of instruction must make way for the pedagogy of construction. But then again, those who believe in a Socratic, teacher centred approach do not seem to be getting published!

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