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Beyond the gadgetry of the gallery:

Using the interactive whiteboard to teach higher order thinking skills in teacher education.

Abstract

Teacher fluency in the use of the interactive whiteboard (IWB) varies significantly. Past research into the utilisation of this technology has readily delineated what constitutes poor teaching (Mercer, Hennessy and Warwick, 2010; Glover, Miller, Averis & Door, 2007; Mishra & Koehler, 2006). It has, however, been less able to define the qualities of those pedagogies which use the IWB in creative and intellectually engaging ways. This project aims to devise methods through which the IWB can be used to promote higher-order thinking (HOT) skills in the classroom to move pre-service teachers beyond the gadgetry of the gallery and student toolkits.

A qualitative case study (Stake, 2007) was undertaken to demonstrate how pre-service teachers could use the tools of the IWB to teach HOT skills in their own classrooms whilst on practicum. A cohort of 224 participants were required to attend one workshop per week at university where they had access to two Smart Board multi-touch IWBs in each room, with Smart Notebook software. They were asked to design and present a Smart Notebook file that would demonstrate tasks that developed primary student's HOT skills. The case study concluded with students writing a reflection on what they had learnt from their IWB training at university, and from their school practicums.

The inquiry found that the IWB provides an effective platform for teaching HOT skills insofar as it offers the user scaffolding tools to plan and design these activities when otherwise the task can appear too difficult to achieve, especially for younger pre-service teachers. The research also found that the structure of the software can easily lead pre-service teachers into presenting simple, formulaic lessons that lack creativity and engagement.

Key words: interactive whiteboard, higher order thinking skills, creativity, scaffolding, teacher education

Introduction

Interactive whiteboards have been a regular feature of many Australian classrooms for some years now, yet it is commonly reported that teachers are not capitalising upon their pedagogical potential (Campbell and Kent, 2010; Sweeney 2008; Zevenbergen and Lerman, 2008). Schuck and Kearney (2007) for example, propose that most pedagogies using interactive whiteboards (IWBs) do not engage the children in higher order activities such as analysis, evaluation and interpretation. Indeed the research is rich in its descriptions of how the IWB is not being used effectively, but poor in its suggestions as to how this problem might be addressed. This project investigates how the IWB can be used effectively to develop the students' higher order thinking (HOT) skills. It combines knowledge of the tools of the IWB with knowledge of how these can be applied in the history classroom to teach these skills.

Glover, Miller, Averis and Door (2007, 2005) demonstrate a need to change teaching practices to make them more innovative and creative. They also reveal the scarcity of research which documents how such pedagogical practices might be developed. In the practical world of the classroom, we often know that our practice needs to change, but the means of achieving this also needs to be explicated and scaffolded. So far, research (presented in this paper) has not been able to demonstrate how these transformations can be achieved so that teachers and pre-service teachers are able to design creative lessons that focus on the development of HOT skills. This paper will propose some possibilities for transformative practice.

Glover et al. (2007) argue that once teachers become competent in using the IWB, they are then receptive to changing teaching methods in order to enhance the value of the technology as a teaching tool. There is a progression from technology to pedagogy when a) teachers are confident operators of the IWB, b) they can reflect on the ways in which the IWB can be used to teach concepts, and c) teachers link content to teaching and learning methods. This progression is encapsulated in the Technological, Pedagogical and Technological (TPACK) model which explicates how competent users of the IWB recognise and negotiate the relationships between these three components of knowledge, technology, content and pedagogy (Mishra & Koehler, 2006).

Meanwhile, Mercer, Hennessey and Warwick (2010) prudently observe that 'research, policy and training initiatives have often tended to ignore the vital need to relate the use of new forms of technology to what is known about effective pedagogy'. They suggest that teacher education and training initiatives have, however, often tended to ignore the need to integrate the use of new forms of technology, such as the IWB with what is already known about quality pedagogies, adding that any training that pre-service teachers receive in the use of the IWB needs to take this into account (Mercer, et al., 2010).

Methodology

The project was developed for primary pre-service teachers who were enrolled in a third year curriculum unit in Australian History. There were 224 students in the cohort, and they were required to attend one workshop per week where they had access to at least two Smart Board multi-touch IWBs in each room, with Smart Notebook software, the preferred software for IWBs in government schools in New South Wales.

This project aimed to prepare primary pre-service teachers to teach Australian History. The first step was to demonstrate the tools and Gallery of the IWB to the pre-service teachers, some of whom had had experience with an IWB on their school practicum. The next step was to demonstrate how the IWB could be used to design and deliver activities that would develop the higher-order thinking skills of students. They were shown six pages from the file, provided with a rubric, and asked to assess each page to determine what skill (for example, describe, compare, analyse) was being developed through the activity presented on that page. Definitions of HOT skills were drawn from the New South Wales *Quality Teaching* model (NSW Department of Education and Training, 2003). Higher order thinking is defined in the quality teaching model (NSW Department of Education and Training, 2003, p. 11) as tasks that 'require students to organise, reorganise, apply, analyse, synthesise and evaluate knowledge and information'.

Participants were expected to design a file that was student-centred and interactive, and promoted intellectual engagement. As a second step, the pre-service teachers in this study were given an activity on the Stolen Generations (Aboriginal children who were taken from their parents) to help them define and delineate the meaning of HOT skills. A video on the Stolen Generations from the program *Behind the News* (Australian Broadcasting Commission, 2008) was then shown to participants. The video explains why Aboriginal children were taken from their parents. Participants were then asked to formulate higher order questions that they might use with their children around the issue of the so-called Protection era.

The third step was to ask pre-service teachers to design and present a Notebook file consisting of 10-15 pages that would demonstrate tasks that developed the student's HOT skills. These files were presented to the class in an eight-minute presentation. There were 76 presentations.

The final step required pre-service teachers to reflect on what they had learnt from their training at university and whilst on the school practicums. Students were encouraged to teach Australian history in intellectually engaging ways through the use of the IWB.

Discussion

Approaches to design

Some participants did their homework before they began their design. They consulted the literature to find out how higher order thinking skills are defined. For example, they used Bloom's taxonomy (Killen, 2005) to scaffold a series of pages (activities) based around 'analyse, compare, contrast, evaluate'.

Most participants were less accepting of the potential of the software and hardware to assist them in designing HOT activities. They felt that these skills still needed to be developed by the teacher. Another participant added: 'Don't be swayed by all the flashy tools and pre-made quizzes and games'. Indeed many participants reflected that there was little in the software to help them teach HOT skills, with the teacher still having to do the analysis: 'to design HOT activities, I found it required a lot of thought'. Many participants found it difficult to design HOT activities, with one adding: 'knowing yourself what higher order thinking skills are, is a great starting point for creating lessons'.

As with all teaching, the need to establish a clear aim for the lesson on the IWB was seen as crucial to designing HOT activities. Designing a lesson with higher order

thinking activities required several participants to begin with the end in mind, an approach to design that Wiggins and McTighe (2005) term *backward design*. Outcomes-based education in Australia governs backward design insofar as teachers need to begin with what the student must know at the end of the lesson or unit of work. Another participant emphasised the need to ‘always remember what your aim is’. The study supports the proposition from Wiggins and McTighe (2005, p. 255) that designing a presentation as a set of pages ‘to be filled in one at a time is likely to result in a poor design, because such an approach won’t involve the kind of revising and aligning needed to produce a coherent plan’.

What did they learn about designing HOT skills?

The key point that we all learned from this study was that creativity and intellectual engagement do not derive from the IWB or its software, but through the relationship between students, teacher and others: ‘I feel that it is not so much the IWB that inspired my creativity but the people around it. It is the teacher and your peers that inspired my creativity and the IWB was only the tool’. Another participant remarked: ‘I love the aesthetic possibilities of the IWB but the initial spark of creativity and knowledge still had to come from the teacher’. Other participants noted how the structure of the software can easily lead teachers into presenting simple, formulaic lessons that lack creativity and engagement: ‘I love the IWB so long as you don’t get stuck inside Notebook and use it instead as a gateway to the fabulous resources available on the web’. Another added: ‘The sparkle and pop’ of IWB activities is great, and does get children’s attention. However, caution must be paid when designing these activities. Children can be engaged with the sparkle, and disengaged with the material’. Research in the past has often referred to this relationship as interactivity, for example Glover, et al. (2007). Creativity does not come from the teacher or the student, but through the interaction between them as they work on the lesson.

Findings

There are several findings from this study that support previous research. First, the use of Smart Notebook helped participants to *organise and structure* their lessons. It became a receptacle for their teaching material, where previously the lesson plans and units of work had been placed in a ringed folder or left in the corner of the bedroom at home.

Second, the IWB clearly motivates and engages both students, and their younger teachers. Previous research has demonstrated how the IWB has the potential to motivate and engage children, and this study is no exception. However, the IWB also holds the potential to *motivate teachers*, especially when they have the support of others. One participant remarked at the end of the study: ‘I really want to teach now’.

Third, the study supports the proposition that technology use gives children a place in the classroom, especially when they have technology at home. The participants in this study supported this conclusion on the basis on their professional experience in schools.

Finally, like any good lesson, an activity for the IWB must be designed with a clear and explicit aim or outcomes in mind. Otherwise it can easily deteriorate into a series of simple descriptive activities. But did the study suggest any improvement in the quality of teaching and learning?

Quality pedagogy

In terms of quality practice, participants reported that the use of the IWB helped them to engage the *younger students*. It also assisted some to *differentiate for learning* including catering more effectively for gifted and talented students, early finishers and ESL students through the use of pull-out tabs with special tasks assigned, links, and interactivity. Several participants reported that the IWB helped them to more effectively assess student learning.

Most importantly, the participant's teaching improved when they began to design and teach HOT activities. Pre-service teachers often experience difficulty in designing and creating HOT activities. They are more inclined to teach lower order skills such as description, drag and drop, and match. But they find it difficult to teach analytical skills because they often do not have a conscious understanding of what the skill or act of analysis entails. Moreover, they do not possess the metalanguage for explaining it to children. Consequently, pre-service teachers can readily default to the given activities and pathways of the software, just as they do in a classroom where they come to rely on the worksheet to do the implicit 'teaching'. In order to produce an effective pedagogy, pre-service teachers and teachers need to do far more than to 'prompt, explain, develop and test concepts through the lesson' (Glover et al 2007, p. 12).

This study has demonstrated the need to explicitly teach pre-service teachers how they can include HOT activities in classroom planning and teaching. It has also reinforced the findings of previous research outlined at the beginning of this paper, where teachers must know *how to teach* in order to use the IWB and its software effectively (Glover et al., 2005; Mercer et. al., 2010). The participants in this study who learned the metalanguage around the teaching of higher-order thinking skills, that is, those who not only understood the concepts associated with analysis and interpretation, but could also explain to children what they needed to learn in order to *do analysis*, were then in a better position to draw on the tools of the software in order to incorporate HOT activities in their pedagogies.

Conclusion

The reluctance of the software designers to promote ongoing creative configurations of resources inhibits the user from interfacing with the IWB in creative ways. The software has the potential to lock the user into a predictable pathway and set of patterns for interacting with the IWB. It pre-supposes a theory of knowledge based on a series of pre-stored facts (and activities) on the board or through links to the internet. Some of the participants in the study explicitly highlighted the need for the user to escape the structure that is imposed in order to produce a lesson that is creative and intellectually engaging. Indeed they provided warnings to others (see above) of the need to be careful that they do not get caught up in the structure and pathways that are installed, ones that are seemingly fun and entertaining, but lack substance and HOT skills. Working outside the given fields or templates is one way of beginning to use IWBs creatively. Learning to use the IWB is understanding how to design a lesson within the gaps and lacunas of the software as much as it is knowing how to use its tools.

However, HOT skills are promoted and developed by people, not software. As participants reflected on their work with Notebook file, some proposed that the teaching of HOT skills in the classroom depends on the 'personality' of the teacher. Some teachers are analytical, and they need to think in analytical ways in order to develop HOT activities for the IWB. These teachers are receptive to incorporating

higher-order thinking activities in their lessons. Others are more descriptive, while some are action oriented. These pre-service teachers are often content to work within the given pathways and structures of the software. As with all teaching, it is the teacher's *style* that makes the difference.

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