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# Classroom-Based Use of Two Educational Technologies: A Sociocultural Perspective

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**Abstract**

This paper describes the fit between educational technologies and teacher views and pedagogies in light of two recently completed research projects. These studies focused on observed pedagogies associated with the classroom-based use of two learning technologies: digital video (student-generated), and interactive whiteboards. The paper considers the use of these two technologies from a sociocultural perspective, recognizing that the nature of tools and the nature of societal use of these tools are mutually dependent. Questions are raised about how the inherent nature of different technologies might shape different learning experiences and outcomes and whether certain technologies fit better with some pedagogical approaches than others.

The potential of e-learning is highly debated. The ways teachers use educational technology and integrate it into their teaching has been the subject of numerous studies over the last decade. Some authors suggest that information and communication technologies (ICT) have been used largely to replicate dominant paradigms of teaching (Hedberg, 2006; Vrasidas & Glass, 2005), albeit with more efficient distribution to learners. Other authors have extolled the virtues of ICT for transforming teaching and learning (Bonk & Graham, 2006; Papert, 1993). This paper discusses whether use of particular technologies is underpinned by particular pedagogies and whether the inherent nature of the technology promotes replication or transformation.

In the two studies discussed in this paper a sociocultural standpoint is adopted, which supports the view that effective use of any technology is not merely about understanding how to use it from a technical standpoint, but more importantly, how it impacts society and understanding of how it can develop higher order thinking (Rychen, 2002). The two-way relationship between tools and their users is recognized, as well. A tool or technology may be modified according to the ways it is used, and in turn, its design will influence how people may use it (Glassman, 2001; Salomon & Perkins, 1998). Sociocultural theories emphasize the historical, cultural, and societal experience, the tools available for use, and the impact of these tools on society.

## Background

Over the past few years, we have investigated the learning and teaching approaches facilitated by the use of two different learning technologies. In 2003-2004 we investigated the pedagogy evident in the use of student-generated digital video (DV) in classrooms (Schuck & Kearney, 2006a). We considered teaching approaches, student learning outcomes, and school contexts. In a subsequent project, 2005-2007, we investigated the pedagogy evident in the use of interactive whiteboards (IWBs) in classrooms (Kearney & Schuck, 2008; Schuck & Kearney, 2007). In a similar way to the earlier project, we explored pedagogical approaches, student and teacher perspectives, and school contexts that promote or inhibit the use of this technology.

This paper considers a conceptual issue that arose as we examined the data from the second project with our analysis of the findings of the first project still fresh in our minds. We noted clear distinctions in teaching methods, underlying philosophies, and student participation in lessons using the different technologies. The following questions are, therefore, explored in this paper:

- What particular pedagogical approaches and philosophies appear currently to dominate the use of each of these learning technologies?
- What is the potential of each of these technologies to disrupt traditional pedagogies?

In the first question, we are exploring whether certain pedagogies and philosophies of teaching underpin the way a particular learning technology is used. Of interest here are teachers' rationales and beliefs about their use of each technology. The second question refers to the ability of the technology to transform the pedagogy and disrupt the dominant didactic modes of teaching that currently exist in schools. In this paper we focus on the pedagogies that were apparent in our two studies: pedagogy using student-generated digital video and pedagogy using interactive whiteboards.

Our study of pedagogy using student-generated digital video (subsequently referred to as "DV project") investigated K-12 student design and production of videos for learning in various curriculum areas. Teachers would provide opportunities for students to script, film, and edit movies dealing with various topics, some of which required development of conceptual understandings while others were mainly for presentation purposes.

Few other studies have investigated student-generated digital video in K-12 Australian classrooms. Reid, Burn, and Parker (2002) reported on their British Educational Communications and Technology Agency (BECTA) project on the use of student-generated digital video in 50 schools throughout the United Kingdom. This extensive

study examined student-generated digital video products for the quality of the film-making, the final product, and what the students had learnt about generating video.

Potter (2005) focused on ways that DV work can be used in an expressive and culturally authentic mode. He found that very young children utilized the video medium to create a range of sophisticated and rich representations and emphasized that children are operating in a medium that is familiar and culturally closer to their experiences of life outside the school than is usual with the school curriculum.

Other papers in the literature describe learning processes and outcomes using student-authored DV projects. For example, in the United States, Levin (2003) described the value of his high school history students' production of DV products telling the story of holocaust survivors. A major goal of the project was to forge links with the community by meaningful engagement with the world outside the classroom. In all these studies, there is an emphasis on the increasing relevance of digital video production to today's students and discussion of benefits such as media literacy, active learning, experiential learning, play, and motivation. A student-centered constructionist approach (Harel & Papert, 1991) is apparent, in which students take responsibility for designing and making a product with a particular purpose.

The literature on interactive whiteboards comes predominantly from research in the UK. The UK government has invested heavily (£50 million) in the installation of IWBs in schools, with a view to impacting on teaching and learning (Clarke, 2004). In Australia, IWBs are a relatively new phenomenon, and little research has been done on their use. As IWBs have been rolled out in schools, they have become increasingly popular. Most teachers using them are positive about their use, and students seem to find the use motivating. Research evidence suggests that IWBs can have positive effects on teaching and learning (BECTA, 2003).

Kennewell (2006), in a meta-analysis of research on interactive whiteboards, noted that unlike adoption of other ICT, IWBs have met with widespread interest and high rates of adoption in schools. However, he points out that despite the huge uptake of this technology, "to date, the top-down policy driven approach to pedagogical change, represented by the National Strategies in England, seems to have stalled at the stage of surface interactivity which is reflected in replicatory use of IWBs" (p. 7). Kennewell concluded by suggesting that IWBs potentially can be more than a tool to support outmoded pedagogies. This question is taken up in this paper, as we consider the potential for IWBs to disrupt traditional pedagogies.

Our DV project investigated pedagogy in five Australian schools, two of which were primary schools (elementary) and three were high schools (secondary). We selected the schools because a sponsoring body had noted that digital videos were being used in those schools. We visited each school for a minimum of 2 days and a maximum of 4 days to gain a snapshot of what was happening in the school with respect to student-generated digital video. We then wrote up a description of each school case. After writing up each individual case, we then looked for commonalities and differences among the five cases and wrote a report addressing each of our research questions (Schuck & Kearney, 2004).

The second study (subsequently referred to as "IWB project") examined pedagogy in classrooms using interactive whiteboards in six Australian schools: four primary and two high schools. Schools were visited in a similar way as in our first study, and the cases were generated and data analyzed similarly (Schuck & Kearney, 2007).

The methodology for both studies was similar, and we investigated similar aspects of practice. Both studies sought to gain an understanding of the way teachers and students interact and learn in classrooms in which a particular learning technology is used. The focus of both studies is on what happens when teachers in K-12 classrooms use the technology to develop their students' understanding of curriculum content.

## Methodology

A qualitative research paradigm (Erickson, 1986; Lincoln & Guba, 1985) was used in both interpretive studies to develop a deep understanding of the types of practices occurring in the case study classrooms. Further, as we are both proponents of sociocultural theories of learning, the historical-social-cultural contexts of the students and teachers were of interest and were probed in observations, interviews, and document or material study. Data on the practices of the teachers and students were collected and analyzed from a sociocultural perspective, in which the interactions of the group, their past experiences and beliefs, and the impact of being researched, are all seen as part of the research data. Our methodology is supported by Ayersman (1996), who noted in a review of research on teaching with multimedia that "authentic classroom-based research" is of most value to practitioners.

In both studies data were collected as follows:

- Open-ended questionnaires for teachers and administrators to collect demographic information, views about administrative structures, and teachers' beliefs. (The questions from these were included in interviews in the second study, after teachers had indicated that they did not have time to participate in both questionnaires and interviews.)
- Observation of lessons using a semistructured observation schedule. Video-based observation also was used in the first study (Schuck & Kearney, 2006b).
- Interviews with teachers and administrators and selected students in focus groups. Students were selected for these interviews by means of purposeful sampling (as defined by Bogdan & Biklen, 1998).
- Document and resource collection. Artifacts made by students in the first study were collected, as well as school documentation about ICT management, rationale, and use. Photographs of the classrooms were also part of the data in both studies.

## Technology as Facilitator

Both our studies were designed to be snapshots of what happens in a classroom in which a particular educational technology is used. Consequently, the methodology did not encourage comparison of learning outcomes or approaches with lessons in which the technology was not used. However, the two technologies we examined clearly have facilitated different learning approaches and learning outcomes. This finding is not particularly surprising given that the learning theory underlying our work is a sociocultural theory emphasizing the importance of the tool in learning. It also emphasizes that learning is mediated by the societal tools used (which include digital video or interactive whiteboards), and the tools, in turn, are mediated by the users and are adapted by the users through their learning (Glassman, 2001; Salomon & Perkins, 1998). As well, various assumptions about the nature of learning and of teaching are implicit in the use of the two kinds of tools.

Hedberg (2006) suggested three categories of use of ICT in teaching and learning, based on Jonassen's (1996) emphasis on cognitive tools: presentational, representational, and generative tools. Presentational tools are those that allow users to present content, for example, use of PowerPoint. Representational tools are those that can show relationships, and Hedberg suggested that students' writing and filming a script and then editing it would fall into this category. Finally, generative use would "enable the learner to construct their understanding of phenomena" (p. 175). We would argue, on the basis of our findings in our DV project, that the example given by Hedberg of filming and editing a narrative also could fit into the third category of use: generation. We found that students' conceptual development can be enhanced, especially when they are given an opportunity to discuss pivotal ideas and exchange views during the crucial publishing (or celebration) stage of their projects (Kearney & Schuck, 2006).

Data analysis from our second project suggests that IWB use mainly fits in the first two categories: material placed on the whiteboard is generally collected and displayed by teachers for presentational and representational reasons. Student-generated material on the IWB was not common in our research cases. Where we did see such lessons, the students were also using the boards as presentational devices to a large extent and for representation to a lesser extent.

We emphasize again that we do not intend to compare directly the affordances of digital video and interactive whiteboards per se. Comparing the use of the two technologies would be inappropriate because the two technologies overlap: student-generated digital video can be presented on an IWB and lessons using IWB often make use of digital video. Furthermore, there are numerous examples of *teacher-generated* digital video, usually used for instructional purposes, and these would match many of the examples of pedagogy with interactive whiteboards we noted.

However, our first project did not investigate teacher generation but rather was limited to student generation of video, as it was student learning through their own activity that was of interest. Similarly, we did not explicitly set out to explore *student-centric* use of the IWB, and did not see many examples of such use. This dearth of examples may well be because of the relative newness of this technology in Australian schools; teachers need to become completely fluent (National Research Council, Committee on Information Technology Literacy, 1999) with the new technology and understand what they can and cannot do with this tool before they start investigating its use in new and innovative ways.

However, these two technologies and the ways they were used had certain affordances that suited some contexts of teaching and some approaches to teaching more than they suited others. The differences and similarities in these uses and the attitudes, perceptions, and interest of teachers and students regarding the two technologies provide the focus for this paper. "Technology [can be viewed] as a knowledge system that comes with its own biases and affordances that make some technologies more applicable in some situations than others" (Koehler & Mishra, 2005, p. 132). We draw on our research data to explore the contexts promoting the use of two current and popular educational technologies and discuss the reasons for their applicability of use. Our analysis will cover teacher rationales and beliefs about the value of the technologies, school contexts, student outcomes, and pedagogical approaches used in each study.

## Teacher Rationales and Perspectives

In the DV study, teachers started looking at use of digital video for their own personal use and during this process became aware of the value of the tool for their students' learning. This sequence contrasted with the initial use of the IWBs by teachers. Not surprisingly,

given the nature of the technology, teachers were encouraged within their school setting to start using the whiteboards and became interested in how it would enhance their lessons as they explored its use at work.

In both cases, teachers' rationales for using the technology highlighted a desire to enhance understanding, to motivate students, and interestingly, to increase student ownership (although this increase in ownership was not very apparent to the researchers in the IWB study). As well, in each case the use of the technology appeared to fit well with the teachers' own preferred roles and approaches to teaching: either to their role as facilitator of student learning (in the case of the DV project) or to their role as teacher director (in the case of the IWB project).

Other rationales for using student-generated DV were to promote active learning in the classroom, provide opportunities for group learning and language development, and develop technological and digital literacies. Indeed, teachers recognized that many students used digital cameras at home. Teachers using IWBs commented on the value of the visual presentation, as well as organizational benefits, such as the ability to prepare lessons thoroughly beforehand and to store them in advance of their lessons.

There was significantly more mainstream acceptance of the value of the interactive whiteboard as a useful technology, from the system administration level through to individual school departments. School system leaders, school principals, executives, and senior staff talked about ways of encouraging teaching staff to become involved and use the whiteboards. In contrast, in the DV study enthusiastic key pioneers were left to adopt and use the technology in their teaching. Teachers in the IWB study were consistently positive about their use of the IWBs, and many older teachers claimed they had found renewed enthusiasm for their teaching.

## School Context

One of the strongest themes emerging from both studies concerned the supportive role of the school. The following aspects of the context were observed across both studies: the presence of a principal with drive and enthusiasm, the availability of school resources in the form of both human and technical resources, a strongly supportive school culture in which the expectation that staff would come on board was strong, and collegial support to help this happen. However, in the IWB study, the top-down support of the principal and systemic support was more noticeable. In the DV project, key people tended to be individual teachers with an enthusiasm for video production.

Professional development was offered in all case schools and found to be an essential part of the teachers' learning to integrate the tools in their lessons. The principals encouraged staff to participate in professional development, both through attendance at external courses and through support at the school. Commercial producers of the equipment or software also offered support in the form of professional development, more so for use of the IWB.

Finally, time was, not surprisingly, an important factor. In both studies, teachers needed time to develop skills using the technology and then to integrate it effectively in the classroom. Longer lessons were a facilitating factor for the use of DV, and time to prepare lessons with the IWB was important in the second study.

## Perceived Outcomes for Students

In both cases, teachers and students talked about having increased engagement and motivation. One distinction was noted regarding the students who were most receptive to each technology. Students who were not engaged by other school activities were often motivated to participate in activities involving student-generated DV. In contrast, students with learning difficulties were supported by use of the IWB, in particular, enjoying the clarity provided by its visual presentation.

With both technologies, subject content was clarified through use of the technology. However, in both cases, the research team observed limited evidence of higher order thinking. Neither tool appeared to be used to its full potential to encourage a powerful learning experience. As well, evidence of development of curriculum-specific conceptual understanding was not strong, although the potential for use of both technologies for this purpose exists, and further research is needed to explore these possibilities.

## Pedagogical Approaches

Teacher roles varied considerably in the two projects, and their pedagogical approaches appeared to be heavily influenced by the characteristics of the technology being used. In the DV project, teachers limited their instruction to teaching students how to use the cameras and editing tool and then played a facilitatory role in supporting their students' development of their DVs. Indeed, enough data was collected to formulate a model of good practice (appendix) for these projects (Schuck & Kearney, 2004, p. 84). In contrast, teachers using IWBs were in full control of the lesson at all times. They presented the material to be discussed and involved students in traditional initiate-respond-evaluate type interactions (Mehan, 1982), where the teacher would initiate questions, students would respond, and the teacher would evaluate the response. Lessons were teacher-directed in all but one case, which was the lesson in which students presented their work.

As a result, student roles also differed. Students had more independent roles in the DV study, deciding in some cases on whether to use digital video, then scripting and directing as well as acting in their videos. They also seemed to take responsibility for dissemination of the videos in presentations. Most of the work was done in groups, while the whole class learning was promoted by the IWBs. In both cases, the technology would have encouraged the way students worked. It was necessary to work in groups to make a movie, due to the different roles needed (filmer, actors, script writers, directors, etc.); whereas, having one IWB in a classroom encouraged whole class discussion of material presented on the board.

Figure 1. Student working with DV.

A marked difference observed in lessons was the degree of autonomy experienced by students in learning with the technology. In the DV project, this autonomy was extremely high, with students directing their own learning experiences; whereas, in the whiteboard project, student autonomy, although mentioned by the teachers as one of their goals, was not observed to any noteworthy degree (see Figure 1). For example, 6-year-old students from one of

the case schools in the DV study were given considerable autonomy in their daily filming of the class news (see Video 1). After brief initial instruction, the teacher allowed students to explore ways of using the camera and to ask questions if they needed help. She said she thought of her students as "directors" and, in this way, she let students "realize themselves that smoother filming is better." They also made claymations (see Video 2) and participated in a sequencing activity using iMovie (see Video 3).

Authentic learning opportunities were strongly evident in the first project (Kearney & Schuck, 2006), and this was a major finding of the DV study. The authenticity was apparent through the ability of DV tasks to be set in real-world contexts, to develop life skills, and to culminate in a collaboratively owned product for a real audience. A popular experience was the use of DV to create news and current affairs programs, as evidenced in three of the case schools (for examples, see Kearney & Schuck, 2006). Teachers mentioned authenticity as an important factor in the IWB study, as well, often emphasizing the ability to connect to the outside world through the board. However, we saw little in the way of classrooms forging links with the outside community, and tasks generally contained few, if any, characteristics of authentic activities discussed in the literature (e.g., Cognition and Technology Group at Vanderbilt, 1990; Reeves, Herrington, & Oliver, 2002).

## Discussion and Conclusions

The two studies highlighted two very different pedagogies. The DV study supported the work of Shewbridge and Berge (2004) in indicating new directions in pedagogy associated with student-generated DV tasks. In our study, pedagogy was student-centered and often encouraged students to engage with ill-defined and authentic tasks (Koehler & Mishra, 2005), a valuable experience matching the complexity of the real world. Students worked in teams and had a large degree of autonomy in what they were doing, controlling the nature of the activity or learning experience.

The teachers were central in the IWB study. The pedagogy focused on the teacher's ability to present relevant and current issues to students through carefully prepared lessons, which took advantage of the IWBs to offer a large variety of resources, attractively presented and dynamically arranged.

Figure 2. Student using interactive whiteboard.

Nevertheless, the IWB was heralded by almost all teachers as providing interactivity for students. The only form of interactivity we saw was the tactile benefit for young learners who were able to have input to the material by using their fingers to circle items, rearrange them, write notes on the board and scroll through to find other resources that had been placed on the screens by the teacher before the lessons (see Figure 2). Higgins, Beauchamp, and Miller (2007) noted in their review of the literature on IWBs that few researchers are specific about how interactivity actually occurred, despite strong claims for the presence of such interactivity in their studies. Although teachers talked about student ownership of the lessons, ownership seemed restricted to the sort of input discussed here. However, the ability to

prepare, organize, and store lessons led to highly structured, well-sequenced lessons with access to useful resources. Similar to Kennewell (2006), our study found that IWBs at present are mainly used for replication of traditional pedagogies.

As in other recent studies (e.g., Kent, 2004), the use of interactive whiteboards for teaching and learning in our study also led to the initiation of more teachers into the world of ICT. By agreeing to use a technology that, at first glance, does not appear very different from a blackboard (a technology with which most teachers are extremely familiar), teachers embarked on a journey that led them to Internet communications, resources on the Web such as learning objects, and use of electronic tools such as PowerPoint and presentation software that comes with the IWB. Therefore, the IWB acts as a valuable conduit for teachers of varying levels of ICT proficiency to ICT resources that have the potential to enhance teaching.

The question arising from our studies is whether the different pedagogies arose as a result of the technologies being used or whether the pedagogies dictated the choice of technology. Certainly, attitudes toward use of IWBs seemed positive and, despite the greater expense of the IWB technology, usage seemed far more widespread than usage of student-generated DV for lesson development. Possibly, this enthusiasm is because initial use of IWBs can replicate traditional teaching methods and enable teachers to maintain control of the learning. If this is the case, IWB technology may not be disruptive (as defined by Hedberg, 2006); that is a technology that supports pedagogies replacing dominant and traditional pedagogies. It may become one in time, however.

The methodologies in both our studies were underpinned by sociocultural theories that acknowledge the importance of the context in which the learning takes place and the social embeddedness of the tools. Recent researchers, such as Schmid (2006), have used similar methodologies to illuminate the issues discussed in this paper. We recommend such methodologies for future research investigating pedagogy and technology.

Ong (2005) used an analogy of the printing press, which enabled what was known by a privileged few to be read by a large number of people across widespread locations. This event transformed education over time. Hedberg (2006) suggested that, to support more disruptive pedagogies, ICT usually used only for presenting and representing ideas need to be associated with “a range of interactive activities that employ digital resources provided by the teacher or generated by the learner” (p. 177). Furthermore, Papert (2004) asserted that real reform will not occur until children become the driving force of change instead of its passive recipient and the focus shifts from teachers’ technologies to learners’ technologies. These circumstances may be happening at the moment with student-generated DV, but familiarity with the capacity of IWBs to be used this way could provide a technology with the ability to disrupt existing traditional pedagogies.

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## Model of Good Practice for DV Projects *from Schuck and Kearney, 2004, p.84*

| Stage | Teacher Strategies | Peer Learning Structures |
|---|---|---|
| **1. Developing Ideas.**<br>**Define film purpose and target audience, film genre, content and context**<br>**Students research content** | Scaffolding e.g. suggestions for purpose, ideas for genre, content, audience, roles etc.<br>If possible, support student choice of genre, film content and context.<br>Modelling of films from teacher, other experts and previous students.<br>Modelling of relevant language. | Groups negotiate own roles based on own expertise / interest<br>Formulate plan to swap and rotate roles through project<br>Discussion of necessary teamwork skills |
| **2. Storyboard / Scripting**<br>**Re-storyboarding** | Encourage use of mind maps to inform storyboard.<br>Modelling of storyboards from teacher, other experts and previous students.<br>Students have to 'sell' storyboard to teacher (formative assessment of storyboard) or peers before filming and if necessary, edit it. | Collaborative mind maps<br>Group meetings to assess progress and share perspectives. |
| **4. Preparation for filming** | Facilitate student preparation of scripts, props, costumes, lighting etc.<br>Modelling of relevant language.<br>Modelling of filming techniques. | Allocation and rotation of roles<br>Group meetings to assess progress and share perspectives. |
| **5. Filming** | Give formative teacher assessment (including informal observations) of film quality | Use of peer tutoring / 'expert' system for skills support<br>Possible collaboration in roles (e.g. 2 people share a role.) and possible rotation of roles<br>Peer assessment of film quality. |
| **6. Editing** | Scaffolding from teacher (e.g. some media elements – clips, photos, sounds etc. - could be supplied by teacher or from external sources – especially for younger learners.<br>Give formative teacher assessment (including informal observations) and advise on re-filming and re-editing of scenes. | Possible collaboration with OR feedback from online filming communities |
| **7. Small group viewing**<br>**Reflect and discuss**<br>**Students' own group as main audience.** | Give formative teacher assessment (including informal observations) and possibly encourage re-filming of scenes<br>Mediate small group discussions of film content or film-making process. | Peer assessment<br>Discuss and share perspectives<br>Possible collaboration with OR feedback from online filming communities. |
| **8. General class / school presentation**<br>**Celebration of Product!**<br><br>**Reflect and discuss**<br>**Class / school peers and teacher as main audience.** | Mediate small group discussions of film content or film-making process to extend / review / probe concept and skill development<br>Use feedback from audience to inform teacher assessment Summative teacher assessment of task<br>Encourage student reflection (e.g. use of journal, e-portfolio). | Roles allocated to group for presentation<br>Peer assessment and feedback<br>Roles allocated to audience to encourage audience participation.<br>Discuss and share perspectives. |
| **9. Dissemination and publication.**<br>**(CD / Web / email / TV)**<br>**Audience now becomes peers external to class (include international), other teachers, parents, wider school, local or international community.** | Use product for reporting to parents (incl. student-lead parent-teacher conferences). Use product to promote subject / class / school. Use product for intra or inter school film festival, competition, or TV show.<br>Share with an online community; Possible feedback from outside experts. | Possible use of film as vehicle for communication / cultural exchange / sharing of perspectives with peers outside class.<br>Possible use of videos as peer conversational artifacts in online communities. |