Using SMART Board Technology to Teach Grade 6 Science:
Teachers’ Experiences with and Perceptions of Its Use

Shannon Gadbois

&

Nicole Haverstock

Brandon University

AUTHORS’ NOTES

1. This research was supported by the Natural Sciences and Engineering Research Council as part of the Centre for Research in Youth Science, Teaching and Learning (CRYSTAL) Project.


3. Thank you to the grade 6 teachers and students of the Brandon School Division for their participation in this project. Also, thank you to the principals for their assistance and support.
Abstract

Research has examined students’ and teachers’ perceptions of the benefits and disadvantages of the use of new technologies in the classroom. Interactive white boards, in particular, appear to uniquely interest students and engage them in the learning process (Hall & Higgins, 2005). From the teachers’ perspective, they offer a more versatile and polished presentation format for information sharing in the classroom (Miller & Glover, 2002). Whereas both teachers and students report that the entertainment value of this technology is highly beneficial in the classroom (Reimer & Moyer, 2005; Miller & Glover, 2002). The purpose of this presentation will be to examine the use of SMART Board technology in the teaching of grade 6 science. The focus will be on teachers’ expected uses of the technology, and their strategies for the development of lessons for teaching topics in the grade 6 curriculum. Finally, it will examine their reflections about the continued use of this technology in teaching, with particular emphasis on the benefits and disadvantages of its use.

*Index terms* – interactive white board, science teaching
1. INTRODUCTION

The use of interactive whiteboards (IWB) for teaching has been researched extensively, particularly in England. The evidence shows consistently that both teachers and students see the benefits that they offer in terms of motivating students’ interest and participation in the classroom. There still remains considerable opportunity to examine their use in the context of particular subject areas and with regard to their integration into the classroom. In addition, their role in enhancing the quality of educational experiences is of importance. This study will examine grade 6 science teachers’ experiences as they develop their skills in order to use an interactive whiteboard in their classroom. Their perceptions of the impact of the interactive whiteboard will also be examined.

2. LITERATURE REVIEW

Research on the use of interactive whiteboards (sometimes called SMART Boards, named after the developer SMART Technologies) in education has expanded in the last decade as the emphasis in education spending and curriculum planning has extended to specifically recognize the importance of skills in information and communication technology (ICT) (e.g., Hall & Higgins, 2005; Manitoba Education & Training, 1998). The research has included specific examination of implementation at the broadest level in terms of the type of equipment that may offer the greatest benefit for enhancing education (e.g., Rudd, 2007) to specific examination of the use of IWB technology for the teaching of specific topics (e.g., Shenton & Pagett, 2007). Furthermore, research has included examination of the specific perceptions of students’ and teachers regarding the use of IWBs within the classroom. Research has consistently shown that students and teachers alike perceive that this technology offers considerable benefit to enhance students’ attention to the task at hand (e.g., Hall, Higgins, & Smith, 2005; Miller & Glover, 2002).
and may even improve their ability to learn the material (e.g., Reimer & Moyer, 2005). In contrast, the use of this technology offers benefits for teachers with respect to the professionalism of the presentations they develop, the efficiency with which they can deliver a lesson, and diversity in terms of the manner in which they present curriculum content (e.g., Rudd, 2007).

Broader discussions of the use of IWB in the classroom have examined whether the presence of the technology contributes to a more dynamic classroom environment or whether it creates the conditions that place the teacher (using the board) as the focal point of the learning context rather than promote interaction within the classroom between students and the teacher and students (Rudd, 2007). In fact, Shenton and Pagett (2007) reported that some teachers who used the IWB were most concerned about creating interactivity between the students and the board itself rather than between members of the classroom. The question is whether, as teachers are integrating the technology into the classroom, they are using it in a ways that enhances the dynamic nature of instruction or disrupting it. Is there evidence that teachers use IWBs, as Burden (2002) suggests, in ways that create the conditions for learners to be passive or in a way that adds value to the learning process? In this study, we examined the experiences of nine grade 6 teachers as they developed their skills in the use of an IWB in their classrooms, and particularly for teaching science. We were particularly interested how they conceived of the potential use of the board and how they implemented it in their classroom instruction.

3. METHODOLOGY

Participants:

A total of nine grade 6 teachers participated in this study. All were teaching grade 6 or a grade 5/6 multi-age classroom at the time they were recruited to participate in the study. Five of the teachers had at least 18 years of teaching experience and had taught science for the entire time
they had been teaching. The remaining four teachers had taught between 4 and 10 years, and all had taught science as long as they had been teaching except for the individual who had been teaching for 10 years. This teacher had only taught science for seven of the 10 years.

Procedure:

All teachers were provided with an IWB that was mounted permanently in their classrooms as part of the research project. In addition, during the first year of their involvement in the project the teachers participated in a full-day orientation regarding how the use the board and how to develop lessons. For part of this day teachers were paired with more experienced colleagues who also taught the same grade and who already had an IWB in the classroom. In addition, all teachers were given four half-day professional development days that were devoted specifically to discussion and preparation of the four grade 6 science cluster. For these sessions, all individuals involved in the study worked at the same location where they had access to computers.

Data was obtained from a variety of sources: field notes that were recorded while the teachers worked on the development of their lessons and during visits to the classrooms; semi-structured interviews with the teachers at the beginning of their use of the IWB and in a one year follow-up interview (to date, only six of the participants have completed a one-year follow-up interview); and reflective journals. The teachers were asked to write brief reflective journals on a regular basis after any occasions for which they had used the IWB for science. The data from all these sources were examined to determine key themes that arose regarding teachers’ expected use of the board, their strategies for developing lessons, their experiences in preparing for and using IWB in the classroom and their personal perceptions of the IWB in terms of its impact on their teaching and on their students’ learning.
4. RESULTS

*Teachers’ Perceptions of Science:*

As part of their interviews, teachers were asked to comment on the value of science as part of the curriculum, their approach to teaching science and on the challenges they faced in teaching. Generally, the teachers emphasized the benefits of learning about science for the specific practical knowledge it provides and the general thinking skills it promotes. Below are some examples of specific reflections from teachers:

1) “Everything boils down to science...Knowing what is fact, knowing how to go about finding out if something is fact or fiction.”

2) “Science is everywhere. It explains how our world operates...It’s about asking questions, being curious and seeking answers.”

3) “It’s pretty practical...all of the units that we teach have some kind of world knowledge that you need...they’re all things that you use in your ordinary life.”

4) “I think it rounds them out” in order to make them a “strong contributor in society.”

5) “I want them to do some critical thinking...do the risk-taking, do the thinking.”

6) “...they get to think ahead...with science there is quite a bit of predicting, guessing what will happen...it’s a whole lot of thinking into the future.”

*Approaches to Teaching Science*

When commenting on their approach for teaching science almost all teachers used the term “hands-on” at one point during their interviews. They also referred to terminology specific to the scientific process and establishing hypotheses. For example teachers said:
1) “I use the inquiry approach. We start with a question or questions and then use the question to discover something...go from knowledge...to show that they can apply the knowledge they have learned.”

2) “I use investigation although certain units lend themselves better to that approach...we always work in groups and for some units, like diversity of living things, we use centres.”

Another common theme was that teachers said that as part of the hands-on or activities in teaching science, that students often did some sort of group work for most activities, and that it was a fun subject to teach and for students to learn about.

The challenges that were most commonly reported were: time limitations and the challenges associated with a hands-on approach. For example:

1) “…for me it’s time, it’s time because our slots are really limited, so we have 40-minute periods, it’s really hard to start and finish something in that time slot”

2) “Today we started our unit on Flight...we began by making a craft. The bi-planes took about 3 days to complete...at best I thought the bi-planes would take an hour and a half.”

3) “…we used $65.00 worth of fruit to make solar system models...that cost me money.”

4) “…kids are really poor with their hands...they’ve kind of grown up in the technology type of lifestyle and instead of building something in the garage...I think they play on computer or whatever…”

5) “…with large numbers, getting them all so they’re engaged...I want them safely engaged. So even though I do go to more hands on stuff, if they cannot handle it then we have to go back to square one. I find that really frustrating because that’s not very exciting.”
One teacher commented that there were not really any challenges with teaching science since the curriculum is very good and students find the activities fun.

Preparing to Use the Technology:

During their training session, they covered a range of tools and resources available through the software. In addition, they looked at examples of how to develop a SMART Board lessons and what they look like when complete.

When they did their professional development sessions for particular clusters, the teachers usually worked in pairs at computers and spent time reviewing the SMART Board information and lessons already available for the particular content area in which they were focused. For certain domains, they spent their time trying to put together their SMART Board lessons. Much of their time involved pulling together resources after searching for and reviewing appropriate websites.

Crucial to their lesson development was that the teachers collaborated in terms of the information that they had found and directly forwarded to other teachers, via email, information that they found during the professional development sessions. Furthermore, if they developed a lesson they had flash drives that allowed them to share this information. Typically, an afternoon was sufficient time only to complete one small lesson.

Using Technology:

Prior to using the technology or after having just begun to use it, teachers expressed some thoughts regarding implementation of IWB technology in their own classroom. Teachers generally emphasized the potential benefits for the classroom, with some reservations. For example, teachers commented:
1) “Well, technology has really changed the way we teach, period, in that now we have such a large pool of information available to us that it becomes really difficult for an educator to decide what’s important and where to stop…like the SMART Board, using those kinds of programs, maybe it forces us to narrow our focus and decide what’s important.”

2) “For me, personally, I find this professional opportunity a challenge because I like technology…I do do lots of technology and use computers in the classroom for research purposes and presenting, sharing of information but…SMART Board technology just helps you kick it up to the next level.”

3) “Well, science-wise, I think the big thing is to realize: Okay, what’s it good for, and what’s it not good for?…there’s a lot of things that it would be really good for, but I think the big thing is it’s a great visual tool, kids love visual things…”

Teachers were asked to address how the technology might or appeared to change the way they taught. Generally, the common response was to downplay it as a dominant factor in the room. In addition, they often emphasized it as a tool to activate a topic and then follow up with a hands-on task. For example, teachers commented:

1) “The only way it’s going to change it in some ways is that it becomes a permanent record of what you’ve done. So therefore, if you’re making it as like a slide presentation, if I go back to it another year I can change, and adapt, and it’s right there…so it’s more of a tool in some senses to me, it’s almost like a permanent overhead projector in some ways…It’s just more of a permanent thing.”

2) “I suppose so…I use it as a learning tool the same as I do the computer or anything else. It’s just one more, it’s one more weapon I have in my arsenal, and it’s one that I think the
kids will enjoy using, and doing, and manipulating, and I think, again, it will help with enhancing their processes.”

3) “I think I will set up a lot of my lessons using the SMART Board as my sort of beginning part of the lesson and then going on to a lab or whatever…”

What has changed?

Once teachers had been using the board for a year, they were asked to comment on how use of the IWB had changed the way they teach. They reported that they often used it for the start of a lesson as an additional ‘hands-on’ activity to help students to think about or consolidate what they are required to do. For example:

1) “I do a better job of putting things in files in computers than I do in my filing cabinet. So, it’s kept me more organized.”

2) “…in electricity I was trying to make a circuit or something with the whiteboard. But now, it’s kind of more interactive where the students come up first and make the circuit first on the SMART Board, so it’s interactive, and then they…sort of better grasp after the SMART Board of how exactly to make a parallel circuit, or whatever I’m teaching…it’s an extra visual for them before they build the circuit.”

Teachers also commented on the value of the tool for the classroom, specifically indicating that they felt it was a necessary tool or that they used it daily:

1) “I really think that technology is important and I have a lot interest in terms of developing my use of technology in the classroom. I find it as an essential tool.”

2) “It’s essential as a hands-on activity...kids tend to be more visual-auditory. It’s something else I use as a tool...It is just one of those things that solidify the outcomes.”
3) “It’s increased. I’m using it all of the time, virtually for everything. I’m building on resources and websites. All my unit plans are SMART Board pictures, etc. For each of my units in science I’ve added and adjusted. I certainly use it as an overhead kind of idea as well as interactively…”

4) “I use it every day and I use it quite a bit…anything I’m teaching, I scan things and pop them up on the SMART Board…It’s great, I can teach a lesson on electricity or flight and use the SMART Board for that…”

5) “If a question comes up…before I would say ‘you look that up and you can tell us about it tomorrow’ …Usually when a student says ‘I wonder about this’ we just say ‘okay, let’s check’…because the whole class can see it at once it just seems more natural to do it when the question is on their minds…”

In other instances, the board was used as a vehicle for students to demonstrate learning. For example:

1) “I’m definitely trying to incorporate it (the technology)...I’ve always tried to incorporate technology but instead of me directing it, saying to the kids, how can you use this?...We’ve done projects where I’ve said these are the outcomes I’m looking for, how can you show me them? I had kids say “can we use the SMART Board to make a webpage?”...So it’s them, their eagerness.”

Interestingly, several of the teachers made comments that reflected their ideas about some of the essential differences in terms of student interactions with each other in the classroom. In particular, they emphasized that having the IWB in the classroom created the context for additional interactions between students. For example:
1) “When students have questions about the technology, they don’t come to me, they go to the experts in the class – each other.”

2) “We, one time, were having problems having some of the tools working on the screen so I had a student who was quite adept sitting at my computer so that if something wasn’t working with the student who was working on the screen she would do it with the mouse at the computer. That was really nice because it made her feel special and important and we certainly acknowledged her skills. And kids are showing each other things like editing or copying and pasting or finding images on the net. They’re showing each other short cuts and how to do things a little more with the SMART Board…and I’m not sure why that is because they could easily sit at a computer together and show those things. But I guess it’s because more people can see it. So, if somebody is sitting at the computer and demonstrating how you do it, a large group of kids can see that. I’m seeing that sharing of skills and building of skills more because the SMART Board is in the room.”

Issues in the use of IWBs in the Classroom:

Despite the fact that all the teachers were excited and optimistic about the presence of the IWB in their classrooms, key concerns were expressed. First, all the teachers talked about the time demands in preparing lessons for use with the IWB. Specifically, one teacher stated that her thoughts on the development of a lesson:

“There were no pre-made activities on flight for the SMART Board. These would have to be created on our own. The activities need to give information and have an interactive component. They also need to follow what is happening in the classroom and be tied to an outcome. Very time consuming.”
Furthermore, an additional comment was made specifically with reference to concerns around importing information from a variety of sources and the challenges associated with appropriately documenting those sources.

Finally, one teacher made an interesting comment regarding her ideas about how the IWB would be used and how it can be used, particularly for science, where hands-on activities are emphasized:

“I'm not sure I had a really clear idea of what was going to happen. I think I thought we would use it more interactively than I do now just because I have 28 students. So I had this vision of every kid having a chance to interact with it. It doesn’t work with 28 kids. My grade 5’s use it more because there’s only 19 of them and every kid will get up there and do something when we’re doing something interactively…My grade 6 class right now…it’s science and a lot of it’s hands on and hands-on is still better than an interactive SMART Board.”

5. DISCUSSION & CONCLUSIONS

This research was carried out to examine teachers’ experiences as they integrated IWB technology into their grade 6 classrooms, and particularly for the teaching of grade 6 science. Generally, all the teachers demonstrated development of independent skills in the implementation of the technology within their teaching. Their comments reflected the fact that they used a particular approach to teaching science prior to use of the IWB and, based on their comments, it appears that their approaches to teaching did not change dramatically as a result of integration of the technology in the room. Instead, as they indicated, they found ways to integrate the use of the board to enhance their teaching approach. In many instances they employed use of the board that might be considered to initiate a shallow approach to learning (Burden, 2002) in that they used it to present notes or ideas that they would previously have presented on a whiteboard or overhead.
However, all the teachers also emphasized that they made a point of creating lessons that used the interactive nature of the IWB as they were planning. Most importantly, particular comments expressed by the teachers indicated that they indirectly used the SMART Board, for what has been defined as a “profound” level of engagement (Burden, 2002). That is, the teachers’ demonstrated a willingness to allow students to determine how they might use the board, or in allowing students to take control of the technology as they are learning.

Though it has been argued that some teachers, when integrating IWB use in their classrooms, might never achieve a more integrated and interactive use of the IWB (e.g., Rudd, 2007), the teachers that participated in this study may be unique in terms of their level of experience in the classroom and in teaching science particularly, and/or in their willingness to integrate technology into the classroom. All of them expressed willingness in attempting to develop skills and to embrace use of the technology in the classroom.

Other factors that benefited them, and that others have emphasized are important for successful implementation of IWBs in the classroom included:

- Principals who supported and accommodated their needs for SMART Board professional development
- That they had the SMART Boards mounted directly in their classrooms rather than having to share them with other members of the staff
- That they had training in the use of the IWB from an individual who also taught at their grade level and who had developed lessons for the IWB
- That they had an opportunity to work as a group and plan together to develop lessons for particular science clusters and share these lessons through the use of other electronic means (via email and flash drives)
• That they had someone within their school that they could go to in the event of some concerns with technical problems (two sets of teachers both taught grade 6 and shared information and ideas)

Despite the positive outcomes for these teachers, there still remains the key constraint of finding time to continue to develop their skills in use the IWB for particular subject areas. In the case of these teachers, because they were given the specific opportunity to train and use the IWB for teaching science, all of them used it for science on a regular basis. However, in order to continue to develop their skills to enhance the learning experiences in their classrooms, these teachers, along with others who acquire their own IWB, will require ongoing support and professional development. These teachers expressed a range of needs in terms of professional development (i.e., time to work alone, time to work with other teachers, time to specifically develop lessons based on those demonstrated by other teachers), and this variable approach to professional development may be necessary to continue to develop their skills. Fortunately, two of the teachers from this group have indicated an ongoing interest in sharing their experiences and skills in helping other teachers as they develop their skills with this unique technology.
6. REFERENCES


