PRELIMINARY REPORT AND PROGRESS UPDATES

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Acknowledgements

We would like to acknowledge the efforts of teachers who are collaborating with us in this research process. We would also like to thank SMART Technologies for enabling us to participate in this important knowledge-building initiative by providing us with their equipment.

Executive Summary

The Technology Integration and Evaluation (TIE) Research Lab will have its launch in 2010 with funding contributed by the Canada Foundation for Innovation, the British Columbia Knowledge Development Fund, TELUS, SMART Technologies, Dell, Epson, and the University of Victoria. The Co-Directors, Dr. Valerie Irvine and Dr. Allyson Hadwin, collected data from four teachers ranging in teaching expertise and technology proficiency. This preliminary report provides initial research findings to SMART Technologies.

Introduction

Phase 1: Project Goals

1. The efficiency and effectiveness of technologies that may enhance student-centred learning in distance learning environments
2. How to support teachers to self-regulate their use of smart technologies for enhancing teaching and learning
3. Issues and best practices when incorporating smart technologies across instructional contexts

Data Collection

General Research Approach: Phase 1

Phase 1 involved following a small number of teachers through the process of adopting and integrating smart board technologies in their classrooms over time. Rather than collecting pre-post survey data exclusively, we systematically collected qualitative and quantitative data on a weekly basis to capture the evolution of teacher experiences with portable Smart boards in their classrooms. Following a self-regulated learning cycle, we asked teachers on a weekly basis to: (a) reflect on usage, successes and challenges over the past week and to (b) set some specific goals for themselves and for learners in their classrooms for the upcoming week.

This preliminary report is based on data gathered (May-June; Sept-Dec, 2009 and Jan 2010). Data collection commenced in May 2009 after the SMART-UVIC contract was finalized, ethics approval was secured from UVic and the participating school district, and an equipment liability agreement was finalized between UVic and the participating school district. It is important to note that clauses in the SMART product placement agreement make it necessary for UVic and participating school districts to agree on a third party liability agreement. Finalizing these details, significantly delayed data collection because UVic could not release the equipment to data collection sites until those agreements were in place.

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Participating Teachers

The preliminary case study included four participating teachers from three elementary schools in SD#61. They included teachers in both the English and French Immersion streams. Teachers ranged in experience from a pre-service teacher on a third practicum placement through to a teacher with more than 30 years experience in regular and special education contexts. Teachers also ranged in their experience with technology. Two teachers were technology leaders in their schools who described themselves as proficient problem solvers when using new technologies. Two teachers had SMART training through their district or the TIE lab prior to data collection. Due to time constraints at the end of the semester, we were not able to coordinate SMART training through the TIE-SMART training until the summer months.

Table 1: Profile of Participating Teachers

Teacher	Age	Sex	# of Yrs Teaching	Grade	Experience with technology	Length of Partic.
T1	50-54	M	30+	Grade 1-2 split FR Immersion 21 students	2 Smart workshops Proficient with computers & solving technical difficulties Computers with special ed students. Prior to project, he incorporated technology (iTunes and video) into his teaching time approximately 4% of the time (a few times a week).	May June
T2	40-44	F	20 yrs	1) Grade 2 English 21 students 2) Kindergarten English	No previous SMART training until she attended the SMART Level 1 workshop in August. Prior to project, she incorporated technology (PowerPoint, Word, Discovery Streaming, Google Earth, Internet Searches) into her teaching time approximately 10% of the time (a couple of times a month).	1) June 2) Sept-Jan
T3	25-29	M	Preservice teacher	Grade 1-2 split English	No previous SMART training, but had approximately 20 hours of hands-on time with a SMART board with self-directed learning prior to this project.	Jan
T4	35-39	M	5 years	1) Grade K, 2-5 Computer lab+ Science +social studies 2) Grade 1-2 English 22 students	No previous SMART training. Proficient with computers and solving technical difficulties. Prior to this project, he incorporated technology (Word, Outlook, Publisher, PowerPoint, Explorer, Photoscape, Paint, Starfall, and Bailey) into 30% of his teaching time (Several times a day).	1) May-June 2) Sept-Jan

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Classroom Set-up:

Each teacher was provided with the following:
- Portable SMART board
- Dell XPS or Tablet Laptop computer
- Epson 822 Projector
- Cables

In later months, we also purchased and provided the following additional resources:
- Wireless router
- Bluetooth connectivity to the SMARTboard
- Cart

Sample photos of classroom set-up are provided below:

T4 Grade 1/2	T2 Kindergarten

We have encountered some challenges with being able to expand our sample size and exposure across schools in the district, because there is a lack of operating funds to support the set-up and transportation of equipment (we have paid for and supplied three of each of the following: carts, laptops, webcams, wireless routers, and recurring transport fees). We have been able to acquire four projectors, but we are still short one projector. We have found that many schools are not sufficiently equipped (or resources are shared broadly, which would negatively affect the ability to participate in our project). In order for teachers to participate fully in our research, they require a complete package of equipment. Our research operating funds have specific budget lines, which relate to research assistants, and do not provide us with the flexibility to cover these costs, which is sometimes paid for out of our professional development funds. The ongoing transport fees are continuing to be an obstacle.

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Instrumentation:

The following data was collected with participating teachers:
1. Pre-post interviews
2. Weekly reflections that included two main sections:
    a. Planning for the upcoming week: Instructional goals, Student learning objectives, confidence
    b. Reflections on the previous week detailing: How the SMART board was used, level of goal attainment for teacher goals and student learning objectives, challenges encountered, successes, average use of the smart board per day.
3. Survey (Unified Theory of Acceptance and Use of Technology)
4. Demographic information about teaching context and experience
5. Photos of classroom set up
6. Samples of notebook lessons

Preliminary Findings (Weekly reflections only)

Degree of integration in classroom activities

Three of the four pilot study teachers reported an increases in: (a) their confidence for achieving weekly teaching goals using the Smart board, (b) their confidence that student would achieve weekly learning goals associated with the smart board, (c) increases in the percentage of teaching time in which the smart board was used per week, and (d) increases in the frequency with which the Smart board was used in their weekly classroom teaching activities.

Table 2: Degree of Integration

	T1		T2		T3		T4	
Total # weeks of use	8 weeks		18 weeks		4 weeks		9 weeks	
	1st half	2nd half	1st half	2nd half	1st half	2nd half	1st half	2nd half
Confidence I will achieve Teaching Goal	85%	88%	76%	87%	55%	65%	85%	65%
Confidence students will achieve learning goal	78%	88%	83%	90%	50%	65%	65%	64%
%age of teaching time using SMART	85%	79%[i]	13%	30%	0%	8%	23%	18%
Average use per day	>3hrs	>3hrs	<1hr	1-2 hrs	Never	1-2 hrs	2-3 hrs	2-3hrs
Frequency of use in teaching	Several times per day	Several times per day	Few times per week	3-4 times a day	never	Several times per day	Few times per week	Several times per day

[i] Last week of school year

Teaching Goals using Smart Board

Goals teachers set for themselves and for student learning varied dramatically across teachers (see Table 3 and 4). Teachers capitalized on the presentation capacity of the Smart board as a shared visual display where they could model activities and save copies of lessons. For example, teachers set goals for introducing students to mapping using Google earth and other tools as well as for displaying and sharing videos and digital books. Three of the teachers capitalized on the smart board as an interactive tool to teach math concepts. They encouraged students to play with numbers, learn about and manipulate 2-D and 3D shapes and work with concepts such as word problem translation and money problems. Three teachers also used the smart board to teach mapping units wherein students could manipulate digital maps to find familiar locations in the neighbourhood. Not surprisingly, T4, a computer room teacher, focused on introducing students to the interactive potential of computers. All his learning goals focused on knowledge and attitudes about technology and its potential for learning. T1 was the most experienced classroom teacher, and the only teacher to attend Smart training sessions. His use of the technology was more varied and tapped into a wider array of curriculum areas. He used the technology to experiment with new approaches to teaching and learning, with the goal of preparing himself for the next year when he would have a permanent smart board in his classroom.

Table 3: Teaching Goals Using SMART Board

Domain	T1 (Experienced) 8 weeks	T2 (Experienced) 18 weeks	T3 (Pre-service practicum) 4 weeks	T4 (New teacher – computer class) 9 weeks
Math	• Playing with numbers (how many ways to make the number of the day) • Geometry (2D and 3D shapes) • Geometry (shape and orientation –tangram) • Word problems • money	• introduce adding and power of 10 •	• Access digital manipulatives	•
Mapping and Social Science	• Explore neighbourhood with Google earth • Google maps • CRD map viewer • Coordinate online maps with neighbourhood walks • Document camera for viewing paper maps from home		• Mapping –expand student understanding of map work in school and community (Google earth)	• Use publisher to put together a map of Canada
Writing	• Collecting information about an animal • Organizing report information in a table • Writing report	• Introduce new vocabulary		

Reading	• Keeping track of their own reading partners	• Link to Tumble books and read a few books • Use Smart board as a literacy centre • Introduce letters		
Calendaring		• Introduce calendaring activities		
Technology	• Familiarizing self with Smart tools and resources • Orienting student to the Smart board	• Familiarizing self with Smart tools and resources • Orienting student to the Smart board • Try incorporating internet into a lesson	• Create and share "this is our school video" • Find solution for mobile board – classroom arrangement problem	• Get classes started making pseudo websites (Smart board as presentation tool)
Other				• Have a girl with physical disabilities to use SMART board • Integrate Smart board into a daily routine for low incident student • Skype with a student from their house to talk about their dog

Goals for student learning using SMART board

Table 4: Student Learning Goals Using SMART Board

Domain	T1 (Experienced) 8 weeks	T2 (Experienced) 18 weeks	T3 (Pre-service practicum) 4 weeks	T4 (New teacher – computer class) 9 weeks
Math	• Improve number sense • Improve problem solving skills • Understanding simple 2D shapes • Understanding simple 3D shapes (names, sides, corners) • Understand using simple shapes to create larger designs (sliding, flipping, turning) • Improved visual discrimination	• Patterning • Numeracy • Counting • graphing	• Recognizing 3D solids • Using digital manipulatives to represent mathematical thinking	

Mapping and Social Science	• Demonstrate understanding of map in their neighbourhood • Understand mapping skills as they apply to their neighbourhood		• Practice map work using online map resources • Extend understandings of maps • Identify features on maps • Recognize map of Canada • Identify community places on a map	
Writing	• Improve writing skills (sentences, vocab, paragraphs)	• Develop printing skills, practice printing	• Letter writing	
Reading	• Track reading partners	• Enjoy books through a different medium • Develop pre-reading skills (letter sound relationships, sight words, vocabulary)		
Science	• Better understanding of similarities and differences between animals			
Technology	• Become familiar with the smart board • Learn to use pens and eraser on smart board		• Experiencing technology as a interactive tool that enhances learning • Develop a class video for pen pal class	• See technology as an interactive building tool as well as a presentation tool • Open a file from an interactive map
Other	• Demonstrate attention and improvement in learning • Improve presentation skills		• Share learning about community and friendship	• See that everyone can learn to use technology • Learn about how to use technology for communication • Learn about problem solving or technical trouble shooting • Learn that technology is more than a computer

Challenges:

Challenges reported were consistent across all four teachers. Four prominent themes emerged: (1) Every teacher discussed technical challenges encountered integrating a portable unit and projector into an active elementary classroom where children move around a fair bit. (2) Most teachers discussed challenges with supporting components not being reliable (computer and projector) in a climate where technical support is available once a week at best. (3) Teachers reflected that students in the class had to learn new skills and classroom behaviours to successfully accommodate the technology in the classroom. (4) Teachers discussed challenges encountered as they learned to use additional features and tools. Specific examples of each theme follow. Specific points are not labelled with a participant identifier because they were repeated across most teacher reflections at one time or another:

(1) Tech challenges associated with using a portable unit:
   a. Set up time when moving from one classroom to the next
   b. Re-calibration when screen or projector get bumped
   c. Shadow when children approach the board
   d. Keeping the chords out of the way of children
   e. Finding the right placement for the projector and screen in the room
   f. Teachers commented about having to rearrange classroom seating arrangement in order to accommodate the board and the projector

(2) If one component fails the lesson stops: reliable projector and computer are a MUST
   a. Problems with internet access (wireless) in the school
   b. Repetitive screen crashes when used with a tablet computer (vista)
   c. Projector problems
   d. *Tech support in the school is only once a week so there is a lag and disruption in planned lessons while waiting for a fix*

(3) Children need to develop new skills
   a. How to move around the technology avoiding bumps or pulling cables out
   b. How to cope when something goes wrong....patience with the technology and with the teacher....what to do with time while they are waiting
   c. Using screen and tools without touching tabs at bottom
   d. Using the board without getting in the way of the projector

(4) Learning curve for Smart tools and features
   a. Changing eraser size
   b. Moving the tool bar from the bottom of the screen because it gets touched by mistake when picking up pens or eraser
   c. Saving ink layers, cloning
   d. Takes quite a bit of time to learn and prepare for lessons. After a while one teacher commented that he realized he just shifted his preparation activities to a new medium. Instead of creating paper based activities, he prepared notebook files

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Successes and things learned by teachers

While there were some consistencies across teachers in the kind of successes reported, there was more variability than in the discussion of challenges. We observed that when teachers were using the smart board for multiple hours throughout the day on a regular basis, they had much richer reflections about successes and things learned both in terms of the amount of ideas conveyed and the variety of experiences.

Four themes emerged from teacher weekly reflections about their experiences with the Smart board including: (1) student successes, (2) their own learning curve, (3) changes in classroom practice, and (4) the expanding awareness of Smart technologies in their schools and beyond. Specifically teacher's commented on improvements in student attention and enthusiasm for lessons when the smart board was used. They reflected on new things they learned about the Smart tools and functions. This new learning continued from initial use right through to the end of data collection. The two teachers who were integrating the smart board most consistently throughout the day (including the teacher who had attended at least 2 Smart training courses previously), continued to reveal new functions and tricks they uncovered on a weekly basis. They expressed excitement and satisfaction in that process.

Importantly, learning (for students and teachers) extended beyond tool use and functionality, introducing Smart boards into these classrooms led to changes in classroom practice and created a created a vehicle for introducing Smart boards and their potential to the school community. Other teachers in the school took notice and began to observe they ways Smart boards were being used, parents were introduced to Smart boards as a means for sharing what had been going on in their children's classrooms, and teachers visiting as substitutes were introduced to the smart board by teachers and students.

Table 5: Successes and Things Learned

Theme	Topic	Example
Student Successes	Increased student attention and enthusiasm	*There were magic moments with the children were really on task (T1).* *Kids were very excited to use it and quickly learned to change pages (T2)* *Students are very keen when I use the Smart board to illustrate a problems (e.g., dragging and grouping money) (T1)* *No way I could have achieved that level of attention without the smart board (T1)* *It is much easier to actually circle something with a pen to bring someone's attention to it than to circle it with your finger and hope everyone is watching(T4)*
	Increased learner skills for using the Smart board: Learning together	*Children are quickly learning how to move from one page to the next (T2)* *Children were able to move their own name for reading partners (T1)* *Some children picked up the technology quickly so they can be helpers (T2)* *I learned a neat little trick from a student in grade four [who had past experience with a smart board]. She taught me how to erase writing a bunch of writing on the board - draw a big circle, with the eraser, around the part you want erased, then tap the middle of the circle with the eraser! (T2)*
Teacher Successes	Teachers learning more about the technology and	*I learned that even if the projector screen is off, you can still write on smartboard. I had turned the projector off and one of the children picked up one of the pens and was writing their name on the smartboard. He, nor*

	how to best integrate the technology in their classrooms	*I, didn't realize he was writing all over the calendar page until I noticed it on the computer screen.(T2)* *I successfully used the technology this week and I was pleased with the outcomes. I rearranged the classroom over the weekend and as a result, it has been much easier to incorporate the technology (T3)*
Changes in classroom practice	Shift in preparation activities for teachers	*I have a routine for keeping track of daily lessons and templates. I use my prep time differently - instead of gathering papers and making copies, I set up files that will be required for my lessons (T1)* *noticed that it's not more time consuming to prepare lessons with notebook than it would be to create or hunt for worksheets (T4)*
	Capitalizing on the value of saving work from past lessons	*[saving work on the smart board each day] has helped me understand and record mental processes followed by children (T1)* *I appreciate how we can save the work that we generate. It is powerful to come back to our ideas and make changes as we learn more (T3)* *Highlight of week was a presentation to parents. They wanted to know how the children were able to write such good reports. I was able to show the work we had done on the smart board and how it led to the report. Also showed math work recorded in notebook files. Having the actual record of work available for parents was invaluable*
Expanding awareness of Smart Technologies within and beyond the school		*I learned that more teachers are interested in coming in to watch me teach their student with the SMART board. They are interested but not willing to touch just yet. (T4)* *There was a TOC in my room for the first half hour one day. She had never used a SMART board but I told her not to worry, the students would show her what to do. She was very impressed (T4)* *2 staff members who happened to be in class one day were really impressed... demonstrated SMART board to whole staff (T1)*

Distance Education

Although some preliminary pilot work has been done for distance learning, this is one of the targets for phase two of the research. Preliminary work involving SMART technologies were also used to expose learners to the potential of SMART technologies for changing the way we think about and conduct distributed and even global education.

- At the K-12 level, teachers have combined the use of Skype with the SMART board to bring in guest speakers, such as a child and her pet to supplement a unit on dogs.

- At the preservice teacher education level, Bridgit has been used to connect students with school district personnel from Alberta, who used Bridgit, Video Conference, and SMART boards in their K-12 settings, and showcased their implementation.

- At the post-secondary level (cross-discipline), Dr. Irvine has combined the use of SMART Interactive Whiteboards and Bridgit with high-definition video conferencing and used a recording/streaming server to capture and share both video and SMART board content with distance learners. The work on this is preliminary, but the impact on students seems to be positive and faculty colleagues seemed intrigued by the ability to teach online in the way that

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they have always done and make these rich video lectures very easily. It would seem the start-up work to develop an online course from scratch or to convert a face-to-face class to online may be significantly reduced, but further research will be needed to confirm this. Dr. Irvine developed a new model of learning delivery, which she has referred to as "multi-access learning environments" (Irvine, 2009). The interest in this new model has been high. The Chair of the Premier's Technology Council contacted Dr. Irvine for a meeting and tour of the TIE Lab. The head of Internet2 (CANARIE equivalent in the USA) invited her to present her concept to their advisory board in Washington, DC. Polycom Canada has flown out to visit Dr. Irvine with offers of support and a request for needs.

- In terms of e-health, Dr. Irvine is a member a team of researchers lead by Dr. Francis Lau (e-health research chair in Health Information Science at UVic), who are now an approved "vendor" for applied research projects with Canada Infoway (e-health records). Her role is to provide direction and research related to e-learning. She teaches a number of students online from the Health Information Science program at UVic. One of whom is a certified level 3 Video Conferencing technician for a health unit and who supports the UBC-UVic Island Medical Program. She wrote, "The use of a smart board is really interesting and is a technology I wasn't aware of. Even being able to do simple things like advancing the slides or scrolling down a webpage, such as what Valerie was doing in the lectures, is a bonus. In most classes I take, the professor has a 'clicker' to advance the slides but if they want to show a webpage or document, they end up being restricted by the computer."

Emerging Issues and Discussion Points

Trends between in the data requiring further exploration

We have observed a trend worthy of further research during phase two. We noticed that the two teachers with more extensive teaching experience tended to exhibit the following:

- (a) Integrated the technology across a broader array of curriculum areas
- (b) Capitalized on the interactive capacity of the smart board for manipulating works, ideas, numbers, shapes, and maps. Less experienced teachers tended to capitalize on the board as a shared display area where multimedia content and resources could be introduced.
- (c) Used the smart board for higher percentages of teaching time than the less experienced teachers
- (d) Demonstrated higher confidence in achieving teaching and learning goals using the Smart board.

This warrants a more systematic follow-up study designed to compare teachers based on their levels of teaching experience.

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Impact on School Technology Adoption

No products by SMART Technologies were present in the schools we partnered with, which was a primary reason why they were selected. It is interesting to note that upon removal of equipment from one school, two immediate SMARTboard purchases were made while a purchasing plan was implemented to gradually install fixed boards into each classroom where there is teacher demand. A second school where boards will be removed at the close of the school year already has plans to purchase at least one board. Some participating teachers have held demonstration sessions in school staff meetings and in the evenings for parents to educate them on what the technology can do. While the benefit of this research partnership is significant for the academic and school community in terms of understanding the impact of this technology on the teacher and classroom, there appears to be a benefit to SMART Technologies in terms of exposure. Where schools have not had access to this technology, it seems important that innovative learning technologies be circulated for demonstrating and hands-on learning experiences. Without this opportunity, educational change in terms of technology adoption would not likely occur.

A common obstacle arose during interviews among participants who felt the impact of SMARTboards in their classroom was positive. How can a school afford to purchase a fixed board per teacher? The issue of equity appears to be an obstacle in technology implementation in such a way that if everyone cannot have it, then maybe no one should have it. In the context of this discussion, teachers are aware of district purchases in other provinces where stories emerge about SMARTboards sitting in closets unused. One solution that was suggested involved the purchase of two SMARTboards. One fixed board would be installed in an identified technology leader – an individual who had participated in this project, who had experience and interest in continuing to use the technology. The second board purchased would be a portable board. Although our findings suggest fixed installations had significant advantages over portable installations, the portable board could be a means to identify teachers who would be next in line for the purchase of fixed boards. This would be based on interest in using/booking the technology and in the pursuit of professional development. The benefit of such an approach for schools and districts would mean less frequency of instances whereby technology was purchased and unused by a teacher who was not at an entry level of technology adoption.

Initially, our participating teachers who shared a mobile board took short turns with the technology before having to release it to their colleague. In different sites, these teachers all moved toward turns lasting at least 2-3 weeks, so they could have enough access to the technology so as to facilitate gains in learning and integrating it.

Networks for Learning

One of the issues that seems to be emerging in our preliminary review of the interview data is the importance of teachers having access to networks of expertise or communities of teachers who are integrating SMART Technologies. Teachers frequently comment that, with the push of everyday work, when you are taking on something new, it helps immensely to have that 1-2 people in your school who you can call on and who can provide guidance on how to integrate these technologies in meaningful ways.

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For the next phase of the research, we want to explore further what that community of learners might look like and what the requirements might be for a successful teacher network. In particular, we are looking for ways online communities can be harnessed to create SMART teaching communities.

The second thing we are interested in exploring here is how technology can be used to create mentoring partnerships where innovative teachers using SMART technologies and creating change in the classroom can be paired with one or two – to create opportunities to create informal ways of sharing knowledge and best practices. We are looking at ways to use existing collaboration spaces for school-university partnerships in this area. We have existing support and access to Sharepoint Services but we require research operating funds to upgrade the license so that non-UVic persons (teachers) can have access to this network. We see this as an important next step and are seeking funds so we can empirically compare the efficacy of different models for implementing distance collaborations between teachers.

Conclusion

The first phase of our project has provided us with a sound foundation of research and has informed us about new directions for phase two. In the coming year, we will be completing the analysis of our ongoing interview and associated data. We will also have received data that supports a deeper exploration of the SMART peripherals, which have been touched on in our preliminary work.

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