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UNDERSTANDING HOW INTERACTIVE WHITEBOARD TECHNOLOGY SUPPORTS TEACHING AND LEARNING

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Abstract

School districts around the United States have been purchasing Interactive Whiteboards with the hopes that teachers will create engaging lessons to support student learning. Unfortunately, these boards are being placed in teachers' classrooms without a proper training on how to use the vast array of tools an interactive whiteboard can offer. This study used a design-based research approach to understand the role of instructional videos play in supporting teachers in using the tools offered by the interactive whiteboards. To determine the needs and different comfort level using an interactive whiteboard, the researcher interviewed three female middle school science teachers in a school district located in Southern California. Based on the interviews with teachers, the researcher created a website with six instructional videos that focused on six specific tools. One teacher was selected to watch all six videos and create a lesson to teach her students while the researcher observed and took field notes. After the lesson, the researcher debriefed the teacher about how the videos helped support her learning when implementing engaging tools in a flipchart. This study suggests that the quality of the videos which include HD video, high quality sound, proper pacing, clear spoken audio, and scaffolding the lesson led to higher understanding how to implement tools. Instructional videos were effective in supporting teachers because of the ability to pause, rewind, and re-watch a video based on their convenience. The educational implications and future directions are discussed.

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CHAPTER 1

INTRODUCTION

Over the past two decades educators are integrating technology into their classrooms at a rapid pace. Teachers are now given numerous tools to assist their teaching such as computer labs, projectors, iPads, Chromebooks, interactive whiteboards. They also have the opportunity to leverage students' own personal devices such as cell phones and tablets. Case in point, schools in San Diego Unified School District, the largest school district in San Diego County, have recently received an interactive whiteboard (IWB), an audio-visual cabinet, a teacher's presentation station, a wireless voice amplification system, an advanced-model document camera, a classroom DVD player, a netbook or iPad for each student, and a tablet for each teacher as part of the i21 Interactive Classroom Initiative. This initiative invests over $355 million dollars of San Diegan taxpayers' money (Steussy, 2012) for teachers to integrate technology into their classrooms and create more interactive classrooms. One piece of hardware that is being installed in all of San Diego Unified classrooms is interactive whiteboards.

What are Interactive Whiteboards?

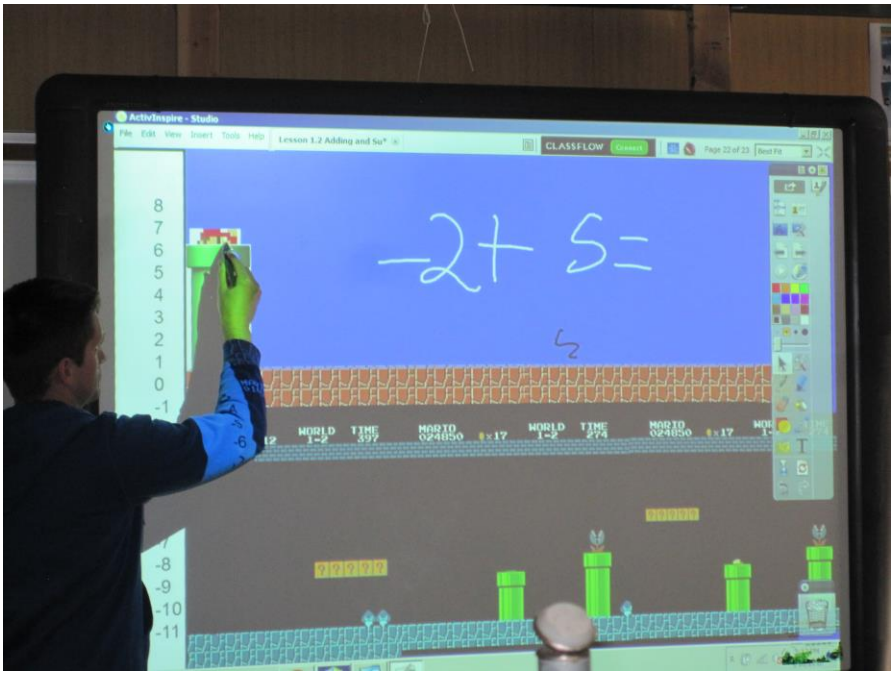
An interactive whiteboard is a revolutionary way to present information to students and colleagues. It combines the tools of a projector, whiteboard, Internet, video, audio, and computer while displaying the computer's desktop on a touch sensitive screen roughly the size of a traditional whiteboard. Using software provided by the hardware company, lesson designers are able to create flipcharts. These flipcharts allow the user to design content specific lesson directly related to the learning objective and their students. They are able to incorporate interactive tools that can make the lesson more interesting and engaging. Some of these tools may be to include

animation, video, voting, matching, audio, and manipulation of the textiles. The limitation of the flipchart is only restricted by the imagination of the creator.

Over the last decade schools sites around the United States have been purchasing IWB in order to enhance teacher's lesson and increase student engagement. In fact according to Türel (2011), 35% of classrooms in the United States use IWBs to deliver instructional lessons to students. Teachers can use IWB to facilitate active student participation in their lesson by allowing students to vote on a question and to interact with a web browser. Teachers can interact with the board using the ActivPen, finger, or mouse and keyboard. Teachers can also call on an individual student to work on the board, or support group interactions by having student brainstorm ideas, save their work, and share it later (BBC Active, 2010).

Currently, there are several IWB systems in the market, however, the San Diego Unified District and many other schools located in Southern California have adopted Promethean, also known as ActivBoard. Promethean combines multi-touch functionality with a dry-erase surface and software to support interactive lessons. Flipcharts are the name of the digital files that teachers create using the software ActivInspire (Figure 1). Flipcharts are digitally saved which allow teachers to access their lessons faster and modify them quickly in order to insure students are gaining most out of their lessons. IWBs have the ability to combine several pieces of technology such as overhead projector, sound system, Internet, and video display, which allow lessons to move faster and more efficiently. They allow users to move from instructional lesson, to video, to images, to manipulating textile objects, reducing the time to transition from one activity to another. Teachers can collaborate around designing flipcharts with ActivInspire by sharing the flipcharts—which are part of digital lessons—using email, shared server, or cloud storage such as Dropbox or Google Drive.

Figure 1. A teacher using an Interactive Whiteboard in the classroom.



There are several benefits of using Promethean Boards in the classrooms for students. First, incorporating videos, pictures, and audio in the lesson can make learning more enjoyable for students (Beeland, 2002; Hall & Higgins, 2005). Second, the designer can make a lesson from scratch. Flipcharts can now be directed towards students learning level and interest to make lessons more enjoyable and easily visible while projected on a large Promethean Board. Finally, students can also benefit from the numerous tools Promethean offers in its software such as voting, precision in tables and shapes, and manipulating textiles as well as the ability to move back and forth from a slide to insure students do not fall behind or miss information. Despite these benefits, Promethean Boards are not being utilized to their fullest potential in the classroom with many teachers using a limited set of tools (Glover, Miller, & Averis, 2003; Hall & Higgins, 2005; Higgins, Beauchamp, & Miller, 2007).

Purpose of the Study

This exploratory study utilizes design-based research to identify the needs of teachers with respect to IWBs, develop a website with instructional videos that starts from the basics of ActivInspire and moves towards more advanced features and tools that can be implemented into flipcharts, and test the usefulness of this website for helping teachers use IWBs. This study aims to address several issues around teacher training with IWB: (1) the inadequacy of teacher training provided by Promethean, (2) the lack of district level teacher training on how to create engaging flipcharts, (3) the different pace through which novice technology adaptors and more experienced technology users learn, either leaving the inexperienced user behind or the advanced user becoming uninterested waiting for others to catch up, during training, (4) the lack of peer support around using IWBs in schools, and (5) the difficulty of finding and navigating numerous websites, instructions, and videos online. School districts have attempted to educate teachers by providing teacher led professional development or onsite trainers but have found this solution to be expensive and inconvenient for teachers (Gislandi & Facci, 2013). To address these issues, as part of this study, the researcher has developed videos that allow teachers to move at their own pace and develop their own flipcharts. Sample flipcharts were also designed for content specific areas to better assist teachers creating their own flipchart for their subject.

Preview of Literature

With technology being mainstreamed into the classroom, teachers now have the ability to present information in a new and exciting way for their students. Interactive whiteboards have the ability to help both the instruction of teachers and the learning of students. Research suggests that IWBs have the ability to help teachers collaborate with each other (Higgins, Beauchamp, & Miller, 2007). Teachers report that investing in lessons saves time in the future

because lessons can be saved digitally, shared, and used over again (Ball, 2003; Smith, Higgins, Wall, & Miller, 2005). Furthermore, teachers are able to create multimedia lesson plans that are more engaging for students (Beeland, 2002; and Bell, 2002; Hall & Higgins, 2005). The higher level of engagement has a key factor in student motivation, which can also improve attention and behavior (Higgins, Beauchamp, & Miller, 2007). The large display that IWBs offer can help students with visual impairments by offer larger text, images, and display while all students can benefit from the precision of shapes, lines, graphs, and diagrams (Bell, 2002; Slay, Sieborger, & Hodgkinson-Williams, 2007; Smith, Higgins, Wall, & Miller 2005). With many school districts purchasing IWBs for K-12 classrooms, providing teachers with the training they need to feel comfortable to use IWBs in their fullest potential in their classrooms is becoming increasingly important (Hall & Higgins, 2005).

Preview of Methodology

In order to address the aforementioned issues around teacher training with IWBs, the researcher conducted a design experiment (Barab & Squire, 2004; Joseph, 2004; Wang & Hannafin, 2005) to find out what teachers wanted to learn. To this end, the researcher interviewed three middle school teachers to find out their background with technology, their comfort level with using Promethean Boards in the classroom and developing flipcharts, as well as how proficient they thought they were with using the wide variety of tools in ActivInspire. Following these interviews, the researcher developed a website with self-paced instructional videos that help beginner, intermediate, and advanced users of ActivInspire. The videos are intended to help users become more proficient and expand their use of tools using a Promethean Board and ActivInspire software. To close the gap between knowing how to use the variety of tools ActivInspire offers and applying them in content specific classroom, the researcher

developed several flipchart slides demonstrating how the tools can be implemented in the classroom. These flipcharts provide an example of how teachers can create engaging lessons for their specific student population and aim to spark their imagination. Finally, the researcher observed a teacher who went through the designed videos and implemented a lesson in her classroom. The researcher took observation notes during the lesson, and debriefed the teacher about how the lesson went and how useful the videos were in supporting her lesson to better understand how to improve the videos in the future.

Significance of the Study

Technology is continually being integrated into the classroom whether in the form of tablets, Chromebooks, laptops, devices students bring from home, or Promethean Boards. In order for teachers to stay up to date on how to implement technology into the classroom, support and continuous training must be made available to educators. Teachers may be given training on Promethean Boards and ActivInspire, but with a wide variety of learners, some teachers may fall behind and not feel comfortable implementing this tools in the classroom and get discourage and not want to learn more about developing lesson plans that include the IWB. School employees may also be given an IWB and be given little to no training which can leave educators frustrated when trying to find out features and may settle for only using the basic tools or worse not use the technology at all.

This study contributes to our understanding of how to support teachers in using IWBs by designing and testing a website that provides instructional videos to meet the needs of beginner to advanced users. The specific design element that is tested in this study is the ability for teachers to move at their own pace with videos that aim to help them become more skilled users of ActivInspire. The goal is to empower teachers to create engaging lessons and present

curriculum in a new way, and feel comfortable using flipcharts. The videos will give teachers the opportunity to create captivating lesson that use video, audio, manipulation of textiles, and many other engaging features. By being able to use flipcharts, teachers can tailor the lessons towards their individual students' learning level and include content specifically focused on their interests.

Summary

As Kellner stated, "we are in the midst of one of the most dramatic technological revolutions in history" (p. 245, 2000) and education is playing catch-up trying to integrate and implement technology into the classroom. One technology that is widely being integrated is IWBs. This piece of technology has the possibility to revolutionize the way educators' present lessons to students. While IWB in the classroom has huge potential, there is a glaring reality that teachers need more support and training to build up their skills to create content specific lessons, become familiar with the layout of the software, and learn how to implement the more advanced tools. This project will focus on closing the divide of teachers who have IWB's but do not utilize them to their full potential, by providing users with instructional videos that guide beginner, novice, and advanced users through the ins and outs of ActivInspire.

Definitions

ActivBoard: An interactive whiteboard that is created and manufactured by Promethean. Allows computer to be projected on it and can be controlled by wireless pen or by touch screen.

ActivInspire: An educational software that allows teachers to create digital lessons that can presented on the ActivBoard. It allows the teacher to create lessons with text, annotation, video, sound, shapes, manipulation of textile objects, and animated graphics.

ActivPen: A wireless, battery-free stylus. It is highly accurate and precise. It is designed to write just like a pen, and act just like a mouse when paired with an ActivBoard.

Flipcharts: The name of the type of file created using ActivInspire.

Promethean: Global education company that develops, integrates, and implements the Activ learning hardware and software products.

CHAPTER 2

LITERATURE REVIEW

Technology is continually being integrated into education and one of the biggest financial commitments in technology are investing in are Interactive whiteboard. IWBs give teachers the ability to present information to students in a new and exciting way, which can lead to higher levels of engagement and increase students' participation (Beeland, 2002; Blue, 2011; Hall & Higgins, 2005; Kent, 2006; Smith, Higgins, Wall & Miller, 2005; Wall, Higgins, & Smith, 2007). Unfortunately, if teachers are not given the proper coaching the IWB may not be used to their full potential (Hall & Higgins, 2005; Kersaint, Ritzhaupt, & Lui, 2013; Shenton & Pagett, 2007; Türel & Johnson, 2012). IWB has the potential of changing the way teachers interact with all types of learners if used effectively. At first glance, IWBs could be perceived as an expensive substitution for a whiteboard where a teacher can write using a digital pen. However, when teachers are provided with opportunities for professional development, the amount of tools that are available to teachers can transform students' learning. As technology continues to be integrated into the classroom, teachers will need to know how to access the tools an IWB offers and be able to implement them in the classroom. Research shows that IWBs supports both teachers and students by creating engaging lessons with the ability to support all types of learners (Smith, Higgin, Wall, & Miller, 2005; Türel, 2011).

Benefits of IWB for Teachers

Convenience of Delivering Lessons

Technology has been changing the way teachers are able to deliver information to students. Teachers have the ability to create lesson plans using IWB. Teachers report that when

they create a lesson using IWB software, they enjoy the benefit of being able to modify a lesson in seconds, save the lesson for another day, and share digital lessons with their colleagues (Glover & Miller, 2003; Higgins, Beauchamp, & Miller, 2007; Lee & Boyle, 2003). Teachers can now create a lesson and save it for next year or modify it for the next class. A 2008 Case study looked at the benefits and drawbacks teachers have when using IWB (Slay, Sieborger, & Hodgkinson-Williams, 2007). In Slay, Sieborger, and Hodgkinson-Williams qualitative study, "teachers report on the efficiency, flexibility, versatility of an IWB and the opportunity to access multimedia content, as well as the ability to manage the class more easily while using IWB" (p. 1322). Research suggests IWB can benefit teachers' classroom management with the ability to move from lesson to activity quickly with little transition time and creates an environment with less distraction (Ball, 2003; Smith, Higgins, Wall, & Miller, 2005). This was also reflective in Glover, Miller, and Averis' (2003) study where their "immediate impression is the IWB based lessons allow little opportunity for students to move off-task. Overall the observed students were 'on task' for 96% of the total lesson time" (p. 182). With the limited amount of time teachers have each day with their students they will want to get the most learning done in the shortest amount of time.

A teacher in Shenton and Pagett's (2007) study echoes this sentiment by saying 'it's enabled me to do more things so, for example, you might be having a lot more handouts and papers that might distract them (without the IWB) – fewer distractions'" (p. 132). Using an IWB teachers are able to integrate activities, videos, textile manipulation, and games in a sequence of slides. This saves instructional time by cutting out the transitioning period from a traditional whiteboard to a computer. Teachers can integrate videos, hyperlinks, and online resources such as Google Earth seamlessly and without the loss of class time (Shenton & Pagett, 2007; Slay,

Sieborger, & Hodgkinson-Williams, 2007). Teachers also reported the benefit to move back and forth between slides, creating a more efficient lesson and allowing fewer opportunities for students to get off task (Glover, Miller, & Averis, 2003; Kent, 2006).

While it may seem there is little difference between a LCD monitor and an IWB, IWB is a "conglomeration of all previous educational technologies, that is, chalkboard, plain whiteboard, television, video, overhead projector, and personal computer but with the added advantage of being able to interact with various elements of these media" (Hall & Higgins, 2005, p. 106). IWBs are not only a conglomerate for previous educational technologies, but it also allows the presenter to import the file types they are comfortable with into a flipchart, such as PowerPoint presentation, mp3, mp4, jpeg, Google Docs, Slides, and Sheets, etc. (Turel, 2011).

Investing in Lessons

As the teaching community moves into the digital age, IWB can be used to effectively save materials that can be used and modified for future lessons. Teachers' rooms have been filled with file cabinets with activities, tests, quizzes, homework sheets and lesson plans. With the implementation of an IWB, teachers can now create digital lesson plans that can be saved from year to year and modified between classes (Ball, 2003; Smith, Higgins, Wall, & Miller, 2005). One teacher in Shenton and Pagett's (2007) study reported: "'I've got a whole bank of resources now that I can use every year but improve every year', one commented. Another described the 'flexibility' that the IWB afforded – 'that's a big thing for me, the ability to store things, work on ideas and come back to it'" (p. 132). With the ability to save and modify lessons in an instant, IWBs have shown to be a vital tool in helping teachers invest in future lessons. According to Higgins, Beauchamp, & Miller (2007) study, creating prepared slides allowed

lessons to be at a faster pace which reduced wasted time erasing and writing down new problems, pictures, and questions.

Collaboration

Using software on the IWB, teachers can now consolidate all their lessons and organize them digitally on a computer or in the cloud. Teachers have the ability to share their lessons with others through email, Google Docs, or other cloud platforms. Teachers can work on a lesson using software on one computer and have the ability to share it with each other in an instant (Ball, 2003). Teachers can modify lessons by adding text, pictures, links, videos or additional slides. If teachers encourage each other to share IWB lessons and resources amongst staff members, the teachers' workload may be reduced (Higgins, Beauchamp, & Miller, 2007). Not only teachers can store and modify their own creations, but they also have the ability to join a learning community where they can share their digital lesson plans on numerous websites such as prometheanplanet.com, exchange.com, smarttech.com, and hundreds of teacher's blog where teachers can select lessons a la carte.

The Benefits of IWB for Students

Student Learning

Interactive whiteboards have been slowly implemented into the classroom for almost two decades and research suggest that it improves students' motivation and engagement (BECTA, 2003; Beeland, 2002; Blue, 2011; Hall & Higgins, 2005; Kent, 2006; Smith, Hardman & Higgins, 2005; Wall, Higgins, & Smith, 2005). IWBs are not a novelty but continue to increase how students interact with information. With the tools available with interactive whiteboards students are now able to see content come to life. Numerous researchers have stated that students feel more engaged in multimedia lessons (Beeland, 2002; and Bell, 2002; Hall &

Higgins, 2005). Teachers have the tools to create engaging lessons with the use of IWB software. They can now present information with interactive videos and animations such as watching a video on cell division while taking snapshots of each phase, and interactive textiles that can support student learning. Students have also reported that they enjoy when an IWB can create accurate representations of shapes and graphs, which help with their understanding of the content (Hall & Higgins, 2007).

Students have reported better understanding of the material when they are able to come up to the board and interact with the content as well as touching the board (Hall & Higgins, 2005; Smith, Higgins, Wall, & Miller, 2005). Examples of this could be videos of primary sources in history, investigating weather patterns in science, analyzing a basketball shot and finding the relationship in algebra class. Also students appreciate the range of resources such as "the Internet, educational software, video clips, games, students' assessment tasks, and examples of student work" (Hall & Higgins, 2005, p. 106) and believe there is no comparison with a plain whiteboard. One student in Hall and Higgins study reported: "It's Better than the normal whiteboard because on that whiteboard all you can do is write and draw boring pictures but on that one (IWB) you can do loads of different kinds of stuff and you can play games on it" (p. 106).

The IWB also has the ability to support all types of learners by implementing images for visual learners, sounds for auditory learners and kinesthetic learners enjoy the tactile movement and the ability to manipulate content. IWB can enhance student learning because "students learn best through their dominant senses, seeing, hearing, and touch. The IWB can appeal to all three of these senses at the same time" (Hall & Higgins, 2005, p.106). Researchers have reported that the ability to color code, hide images/content, annotate text, and manipulate the lessons can

enhance the learning (Bell, 2002; Blue, 2011; Smith, Higgins, Wall, & Miller, 2005; Wall, Higgins, & Smith; 2005) and students reported they enjoyed the multimedia features best such as being able to manipulate objects, the visual aspect of the variety of colors, and the audio tools such as music, voice recording and sound effects (Hall & Higgins, 2005). Students have also reported in several studies that the enlarged content (images and text), has been beneficial for their learning (Bell, 2002; Slay, Sieborger, & Hodgkinson-Williams, 2007; Smith, Higgins, Wall, & Miller 2005).

IWB is not just for secondary school but for all grades. Teachers are now asked to educate the 21st century learner and teachers can support their learning by getting students to use and understand technology at a young age. IWB have been shown to be simpler to use for younger students than a traditional computer. Kindergarten students have found that interacting with a mouse and a traditional computer can be difficult, however IWBs offer an early entry point for young children. Students have found it more user friendly using and IWB pen who have developing motor skills (Goodison, 2002).

Student Attitudes

Many school districts are purchasing IWB to enhance student learning and students themselves perceive IWBs as a beneficial tool for learning. In one research study, 90% of students believed they learn better from the use of IWB (Lan & Hsiao, 2011). Not only do students believe they learn better but "teachers overwhelmingly agreed (77%) that they believed that using IWBs helps their students' learning" (Turel & Johnson, 2012, p. 390). Teaching with an IWB seems more fun for students and they report that learning is more of a game with the use of an IWB and wish teachers taught with them in every subject (Lan & Hsiao, 2011). One reason why student enjoy the lesson is because every student can answer the teacher's

question. Tablets, cellphones, and clickers have been integrated into IWB where teachers can post a question for students and they can answer the question from their desk (Glover & Miller, 2003). IWB gives students instant feedback and holds students' attention much more strongly than other classroom resources (Higgins, Beauchamp, & Miller, 2007). While students enjoy the interaction from their desk, students enjoy the interactive participation by coming up to the IWB (Bell, 2001; Kennewell, 2001 & Olsen; Lamire & Baker, 2011; Lan & Hsiao, 2011; Shenton, 2007).

Students are now coming to class and believing IWB help them learn better (Beeland, 2002), and IWB are helping students be more motivated (BECTA, 2003; Beeland, 2002; Blue, 2011; Smith, Hardman & Higgins, 2005; Wall, Higgins, & Smith, 2005). When students are coming to class more motivated students' attention and behavior improve (Higgins, Beauchamp, & Miller, 2007). According to Turel (2011) the students' perception of an IWB is not a novelty but a lasting effect. He conducted a quantitative study on students' perception on IWBs who have been taught with an IWB for over three months to account for the novelty effect. In his research he found students had highest agreement with the following questionnaire items: (1) IWB use increase my interest in class, (2) IWB makes the class more entertaining, (3) I believe IWB is useful technology for us to learn, and (4) I think that the course are more efficient with IWB (Turel, 2011, p. 2447). Students are coming to class and with the support of an IWB, teachers are able to use these tools to increase student engagement and increase student motivation. Beeland (2002) argues that using IWB in the classroom makes the lessons more engaging and enjoyable resulting in an increase in student participation. Students' attitudes tend to be more positive when lessons are presented on an IWB instead of a traditional whiteboard. In Hall and Higgins study (2005), a student reported: "On that (PW) it's really boring, you feel like

you’re going to go to sleep. But on that one (IWB) you’re like still awake and I’m interested” (p. 106).

Negative Impacts of Untrained Teachers

School districts purchase IWBs with the expectation that teachers will use them in their instruction and will develop more interactive lessons (Higgins, Beauchamp, & Miller, 2007). However, too often they fail to realize teachers may be unable to adapt this new technology into the classroom. As technology continues to be infused into the classroom, teachers are facing challenges of learning how to integrate their lessons with the use of an IWB. Unfortunately, this lack of training can have devastating effects on the growth of a teachers’ information and communication technology (ICT) skills (Kersaint, Titzhaupt, & Liu, 2013). Kellner explains “implementation of technology in the schools reveal that without adequate teaching training and technology policy, the results of introducing…new technologies into education are highly ambiguous,” and “without proper resources…and educational practices, technology might be an obstacle or burden to genuine learning” (p. 247). The lack of knowledge and self-confidence often results in teachers feeling timid and choosing not to seek help. Kersaint, Titzhaupt, and Liu (2013) discussed how “teachers often do not feel comfortable engaging students in open-ended uses of technology tools until they are comfortable exploring the subject matter with technology themselves” (p.75). Teachers will not feel comfortable exploring with new tools because they do not have the proper training. According to Turel (2012), only half of the teachers using an IWB felt their competencies were above average. A teacher in Shenton and Pagett (2007) study, reported: “If they don’t know how to produce a PowerPoint, or they don’t know how to use a program they’re not going to use them” (p. 132). Teachers with moderate skills with an IWB are still not meeting its full potential by using the IWB to structure their lessons in

a teacher focus, rather than create interactive lessons (Glover, Miller, & Averis, 2003; Higgins, Beauchamp, & Miller, 2007).

When teachers are coming to class unprepared using the technology, it can have a negative impact on teaching and students' learning (Hall & Higgins, 2005). Hall and Higgins (2005) conducted a qualitative study on students' perception on IWB and found that students believe teachers' lack of skills using the IWB was problematic to their learning. Students were quoted saying "Everyone's really quite used to the whiteboard but we've got this teacher and well she's kind of new to the whiteboards because she's a new teacher and I think she's still catching on to using the whiteboards and so are two other teachers," as well as "It can get a bit annoying when she can't remember how to work it" and "It wastes lessons" (Hall & Higgins, 2005, p. 109). Students are aware of teachers' shortcomings in relation to the technical pedagogical use of IWB (Hall & Higgins, 2005) and schools districts should be concerned because the effectiveness of an IWB lesson depends on the teachers' ability to manage and use technology (Glover, Miller, & Averis, 2003). IWBs have been shown to engage students, but there is a concern of losing this engagement if teachers are not adequately trained to use them (Hall & Higgins, 2005).

Supports For Teachers Around IWBs

School districts are purchasing IWB with the expectation teachers create interactive lessons but teachers need help implementing the tools an IWB can offer. "Technology might enhance the pedagogy only if the teachers and pupils engage with it and understood its potential in such a way that the technology is not seen as an end in itself but as another pedagogical means to achieve teaching and learning goals" (Higgins, Beauchamp, & Miller, 2007, p. 217). Unfortunately, teachers are not given or do not take advantage of training to reach their full

potential. Research suggests that in order for a teacher to be effective at using an IWB they need training, professional development, and ongoing coaching for them to implement an IWB in the classroom (Blue, 2011; Hall & Higgins, 2005; Kersaint, Ritzhaupt, & Liu, 2013; Smith, Higgins, Wall, & Miller, 2005; Turel & Johnson, 2012). The training needs to be created for teachers so they feel comfortable creating their own lessons. As Turel and Johnson (2012) pointed out "unfortunately training sessions provided by their representative of IWB supplier are superficial" (p. 391).

Interactivity can help students learn and sustain their interests. It requires structured lesson planning, conceptual learning, paced activities and cognitive review, all which can be implemented with the use of an IWB (Higgins, Beauchamp, & Miller, 2007). According to Higgins, Beauchamp, and Miller (2007) students found interactive tools such as drag and drop, hide and reveal, shading and highlighting, matching, movement or animation, and immediate feedback the most engaging, but these tools can be difficult to learn without the proper training. Therefore, it is paramount that teachers are provided with resources and necessary supports on implementing lessons with the use of an IWB. According to a survey teachers found they were able to get the most out of their training when it was led by a teacher coach, not by a representative of the IWB supplier (Kersaint, Ritzhaupt, & Liu, 2013). Research also has shown when teachers who are not confident in technology are given collaboration time with teachers who are confident with technology, they feel more prepared integrating technology (Smith, Higgins, Wall, & Miller, 2005). The goal of this study is to understand what online supports can be offered to teachers to enable them to create content specific multimodal lessons that promote active student participation.

Summary

Education is potentially experiencing one of the biggest transitions with respect to how information is presented to students as technology is being rapidly implemented in classrooms and used by students in their everyday lives. School districts are adapting to the new wave of technology by purchasing immersive technology such as IWB. Research has shown that these devices have the ability to increase teacher collaboration, create more concise lessons by limiting the transition time between activities, and improve student performance by increasing student motivation and engagement. Given that, it is essential to provide teachers with training around IWBs that allows them to learn and integrate features at their own pace. Instructional videos designed as part of this study provide opportunities for just in time learning for teachers to become content creators by providing the opportunity to pause and review instructions at their convenience. In the next chapter, I review the details of the design of the instructional videos, and the methods used to collect and analyze data.

CHAPTER 3

METHODOLOGY

This study utilizes design-based research to gain a greater understanding of teacher needs to create instructional videos to help teachers develop flipcharts, and how the design of instructional videos are useful for teachers. Design-based research is a research methodology that is being conducted in real-world context where the researcher collaborates with educators around a design innovation (Wang & Hannafin, 2005). In this study, the design innovation is the instructional videos that aim to support teachers in developing their own content specific lessons and discovering what features ActivInspire offers as well as determining what they would like to implement in their lessons. To ensure that the design innovation yields changes in the real world, the researcher interviewed three middle school teachers before designing the instructional videos. In this study, the participating teachers are not considered subjects but are collaborators in that the instructional videos are designed with their input for improving their use of IWBs in their classrooms (Barab & Squire, 2004; The Design-Based Research Collective, 2003; Wang and Hannifin, 2005). The purpose of the interviews is to gain an understanding of teachers' comfort level using an IWB and what content needs to be included in the videos. Based on these interviews, the researcher created six videos that focus on how teachers can implement a wide range of instructional tools. After the website with the videos created, one of the teachers reviewed the videos and created a lesson that features these tools into their lesson. The researcher observed the teacher while teaching the lesson, and debriefed her afterwards to understand her perceptions of how the lesson went, what aspect of the lesson she liked or disliked and how the instructional videos were helpful. According to Barab and Squire (2004), it is important to look

at design-based research not so much as one approach in finding a solution but ongoing collaboration, discussions, and modification of the project with designer and user. As such the information gathered in this study will inform future revisions of the instructional videos.

Participants and Settings

A total of three teachers participated in this study. Convenient sampling was used to identify the teachers. Two teachers were full time science teachers in a school district in Southern California and one teacher was completing her teaching credential at a local university. All teachers were currently teaching at the same middle school. Teachers were identified for their use of technology in the classroom and comfort. The researcher wanted a wide range of teaching experience when using IWBs in the classroom and developing curriculum with technology. Teachers represented a beginner, intermediate, and advanced user. The researcher selected a beginner, moderate, and advanced users to interview to create a user profile for instructional videos. The middle school had 1,381 students and the demographics were 48% White, 30% Asian, 7% Hispanic, 5% two or more races, and 2% Black. It had an API of 921. At the time of the study, there were 45 teachers at this site. Only about 10% of the teachers had a Promethean Board at this site and had not received formal training but were encouraged to collaborate with each other in order to learn more about integrating technology into the classroom.

Emilia, the first teacher who was interviewed in the study, had been a teacher for fourteen years in the district; she spent eleven years at her previous site and three years at her current site. She taught seventh grade life science and eighth grade physical science at two school sites. At the time of the study, she had been teaching with IWBs for the last five years and felt comfortable developing lessons. She also reported using other technologies in the classroom

such as iPads, Chromebook, and, cellphones. She was the most experienced user with technology out of the three teachers interviewed for this study.

Olivia, the second teacher who was interviewed in the study had been teaching for one year in the district and was teaching eighth grade physical science at the time of the study. She learned about the integration of IWBs in the classroom through her experience substituting in another district. While she had no formal training, she knew how to draw and integrate basic tools but had no knowledge of how to use any of the tools in the more advanced features. She seemed to be open to the idea of integrating technology into the classroom and an eager learner. She was selected as a collaborator because she represents moderate user of technology.

Caroline, the third teacher that was interviewed for the study is a student teacher in the district. At the time of the study, she was working towards getting her Preliminary Credential in Science through a local university. For the past year her two Master Teachers both had IWBs and she has been able to observe other teachers using the technology and has been able to use it herself. At the time of the study, she had no experience creating lessons using the software ActivInspire. She used previous lessons her guide teacher created and modified them to her teaching style and comfort level. She enjoyed using technology in the classroom where she encouraged students to bring their own device to support learning, and also offered school technology such as Chromebooks and iPads for students who cannot bring their own device. In this study, she represents the novice user of white boards.

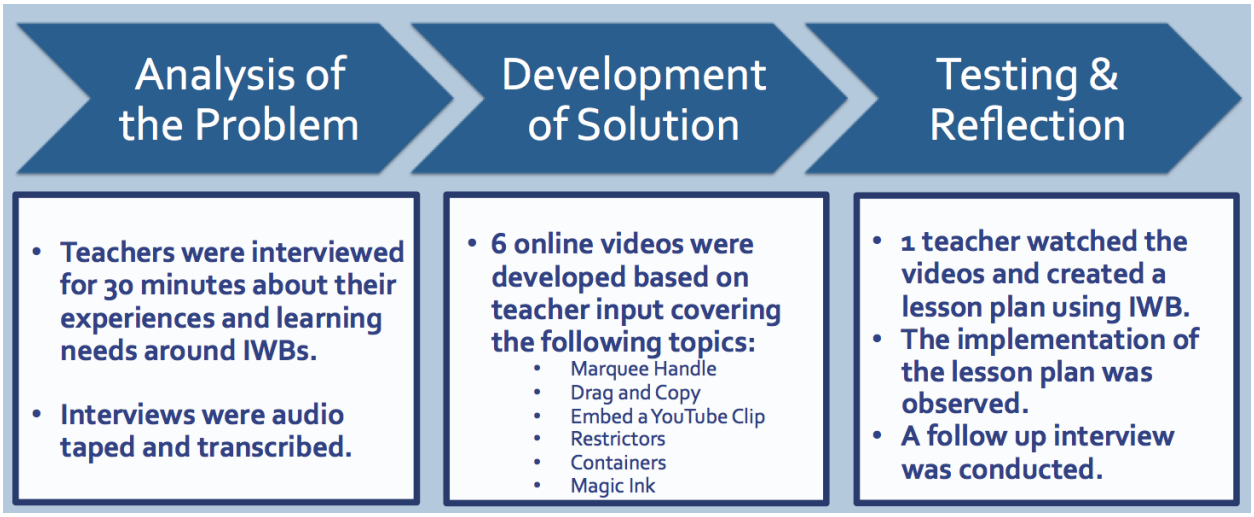
Data Collection

For this study, the researcher interviewed three teachers with different teaching backgrounds as well as different knowledge of the use of technology in the classroom to learn about the needs of a beginner, an intermediate, and an advanced user of an IWB. The interviews

were scheduled at a time that was convenient for the teachers, and took place in a private room. Teachers were asked questions about their experiences with technology more broadly, and with IWBs specifically. They were audio recorded using Smart Voice Recorder, an App available on Android and IOS devices. Teachers' input informed the design of the instructional videos.

The researcher also observed the teacher who was classified as a "beginner", teach a lesson she created after watching the instructional videos. This was because the researcher expected that the beginner teacher would benefit the most from the instructional videos. During classroom observation, the researcher took field notes to capture the teacher's comfort level with the tools and students' understanding of the lesson. A follow-up interview was conducted to understand the teacher's perception of the lesson, the tool used to create the flipchart, and how helpful the videos were. This debriefing was also audio recorded with Smart Voice Recorder.

Figure 2. Overview of data collection



Data Analysis

To analyze the data, the researcher reviewed the audio recordings of the interviews multiple times and identified themes that emerged from the data. The initial coding resulted in

the following four categories: (1) challenges of using technology, (2) benefits of technology, (3) perceptions of Promethean Boards, and (4) supports needed to more effectively use Promethean Boards. The researcher identified quotes from the interviews with each teacher using these four categories. To understand the meaning of quotes, the researcher examined what came before and after the quote. The analysis of the interviews informed the design of the instructional videos. A similar approach was taken to analyze the field notes and post interview with the teacher who created and implemented a lesson after watching the videos. The researcher reviewed the notes and the audio recording of the interview multiple times to look for emerging patterns.

Design of Instructional Videos

This study utilizes a design-based research approach, which Wang and Hannafin (2006) define as:

> "a systematic but flexible methodology aimed to improve educational practices through iterative analysis, design, development, and implementation, based on collaboration among researchers and practitioner in real-world settings, and leading to contextually-sensitive design principles (p.6)."

This study aims to use design method research to offer teachers, students, trainers, and administration a way to develop their skills using an IWB. To accomplish this goal, a website was created to offer six instructional videos that were developed with the input of teachers who participated in this study. The researcher used the Promethean instructional manual as a reference to identify tools for beginner, intermediate, and advanced users. This combined with the interviewed with three teachers determined the topics to be covered by the videos. A total of six instructional videos were created to help teachers learn how to create lessons using

ActivInspire. The instructional videos covered a range of beginner to advanced levels with respect to IWB tools. Below is the preview of the content of each video:

Video 1. Marquee Handle (Beginner Level): This video focuses on what marquee handles is and how to use the numerous tools. The video covers how it is a set of tools the user encounters when an object is highlighted with the arrow. In this video, the researcher first introduces the tool by showing how to locate the tool by highlighting an object. The video also shows how to move objects, rotate objects, move object forward or backward, enlarge, shrink, and change objects transparency.

Video 2. Drag and Copy (Beginner Level): This video covers how to implement the tool drag and copy into the lesson. It gives the user the ability to select an object, image, or text and the ability to place the arrow key onto that object and drag a copy of the object, image, or text. The user can continue this process to create as many clones as needed for the lesson.

Video 3. Embed a YouTube Clip (Intermediate Level): This video shows the user how to take a YouTube video and embed it into a flipchart. This video discusses how to take the embedded link, modify the URL and insert into ActivInspire. It also shows the user how to change the size of the video display and take still images of the video.

Video 4. Restrictors (Intermediate Level): This video covers how to take an image, shape, or text and restrict the movement. The video discusses how to go into the browser menu and find the options of each shape and restrict the ability to move horizontally, vertically, or along a path.

Video 5. Containers (Advanced Level): This video covers how to take a shape, object, or text and make it have the property of being placed in certain shapes or rejected and placed back in its

previous location. The video discusses how to select a shape and shows the user how to go into its properties and change what it can contain.

Video 6. Magic Link (Advanced Level): This video covers how to implement the tool Magic Ink. The video discusses how Magic Ink allows the creator see through the top layer and into the middle layer of your flipchart.

The instructional videos were recorded on the researcher's computer using Screen-O-Matic. Screen-O-Matic is software that allows the user to take a screen cast of their computer screen for up to 15 minutes in high definition video with clear audio. The videos can be saved to the computer or it can be uploaded directly to the web. The instructional videos and the sample flipcharts created as part of this study can be found at Promethean Builder website.

Summary

The purpose of this study is to support teachers in developing their skills in creating content specific flipcharts that utilizes engaging tools ActivInspire offers. To ensure educators have continuous support, the researcher has created a website that allows teachers and administrators to learn about the basics and more advanced tools of ActivInspire through instructional videos. The videos were created using the ActivInspire software, and Screen-O-Matic was used to screencast the instructional videos. All videos and links were made available through a Google Site. Sample templates of flipcharts and example lessons were made available for all users as well as forums and links to Promethean Planet support. To ensure that the researcher was creating instructional videos that teachers wanted to learn about, interviews were conducted to capture the teachers' knowledge and use of technology in the classroom and creating flipcharts, as well as what they look for in the instructional videos. Furthermore, to understand how the instructional videos were useful, the researcher observed one of the teachers

implementing a lesson she created based on the instructional videos, and debriefed her about her perceptions of the lesson and the utility of instructional videos in helping her use the tools in ActivInspire.

CHAPTER 4

RESULTS

The goal of this study was to gain a better insight about ways to support teachers in developing comfort and confidence in designing lessons with IWBs. In what follows, I first share the findings from interviews with three teachers who represent different levels of expertise with IWBs. I, then, share the researcher's observation of one of the teachers implementing a lesson that she created based on the instructional videos designed as part of this study. The observation is shared in a narrative form to provide a holistic description of what happened during the lesson. I conclude this section with a post interview with the teacher who implemented the lesson to gather information about her perceptions of the lesson and the utility of instructional videos in helping her teach the lesson.

Reports of the Initial Interviews with Teachers

Interviews were conducted with a beginner, intermediate, and advanced user of technology to inform the design of the instructional videos. Three teachers were interviewed to gain better understanding of their experiences with technology and more specifically IWBs in the classroom. The information gathered from the interviews with teachers was utilized in creating the instructional videos. Overall, teachers provided information about the length of the instructional videos, how they wanted the information to be presented, and the content to be covered in the instructional videos.

Caroline: A Beginner User of Technology

At the time of the interview, Caroline was finishing her last month in the teaching credential through a local university. She had been working as a student teacher for the last two

semesters. Her first class she taught was for an Audio Visual teacher who had a Promethean Board who she referred to as "tech savvy". At the time of the interview, Caroline was an 8th grade Physical Science teacher, and an enthusiastic about using technology in her classroom. She enjoyed "using doc cam, Chromebooks, flipcharts, and iPads in the classroom." It has been important for her to integrate technology in the classroom to keep herself and her students organized by displaying daily schedules.

While she reported enjoying integrating technology in the classroom, Caroline ran into problems using technology in the classroom due to hardware failures with slow laptop computers, and bandwidth issues that interfered with buffering videos. She was disappointed to run into these issues because she enjoyed showing students videos during class and taught that "It's a great way for them [students] to understand why they are learning what they are learning and how science applies to them." She also enjoyed modeling using technology and believed it is a key element for student engagement. One of the tools she reported using for modeling was an Interactive Whiteboard.

When asked about her thoughts about using an IWB, Caroline reported that she believed she did not use it to its fullest potential. She used them more like a PowerPoint presentation. She enjoyed being able to annotate her notes and presentations with the ActivPen, and learn new tools through her guide teacher. According to Caroline, the manipulation of images, text and annotation increased student engagement. This movement "engages the students and catches their eye." Although she was unsure if the IWBs increased student participation in the lesson more than an ordinary PowerPoint, she described her students enjoying seeing the teacher move objects and coming up to the board. Caroline described these two activities as being "inspirational" for students. While she reported being comfortable with the basics such as

annotating, typing, adding and manipulating images, Caroline recognized that she did not give herself enough time to experiment or learn new features.

When asked about what is challenging about using an IWB, Caroline explained how using prepared slides from her master teacher was not challenging, but she had a hard time creating her own lessons. She believed importing images or videos into a flipchart were not user friendly and began to show the researcher how she completed this action. The way she imported images and videos was a bit more complicated than it needed due to her lack of formal training using an IWB. This lack of training can make it difficult for teachers to develop lessons but can also make a lesson lose momentum. For instance, Caroline stated lessons slowed down when students use the IWB because they may have pushed the wrong button, lost the pen, or had difficulty organizing student data on a flipchart.

When asked what specific tools IWB offered that she enjoyed using in the classroom she listed graphing, revealer, adding worksheets, and highlighter tool. She also used shapes to demonstrate the density of molecules in each phase of matter. She tried to create certain slides by herself, but felt more confident taking flipcharts her guide teachers created and modifying parts of their content. She expressed an interest in enhancing her flipcharts by embedding videos, images, and links to allow a more natural flow in her lesson. She also wanted to learn how to implement tools such as Magic Ink, layer pictures, and formatting using an IWB.

Caroline thought that instructional videos would be very helpful. Specifically, she said it would be helpful for her to have a short description of each video next to the link so that she would know what the learning goal is and allow her to choose what she wanted to learn. This would allow her to refine certain skills or discover a new tool that the user may not have known about. When asked about her preferences over the layout of the website that would host the

instructional videos, she stated that she would prefer instructional videos (divided into beginner, intermediate, and advance levels) to be on the same page. She wanted to explore the videos without having to go through different pages. When asked about the length of the instructional videos, she reported that the length of the video would depend on the content. When watching an introduction video on creating a lesson she would watch for about twelve minutes, but when learning about a specific tool she would only want to watch a video for about four to five minutes. Each video covered about one to two topics unless the tools were related then she wanted to see them all in one video.

Olivia: Intermediate User of Technology

Olivia was in her first year as a full time teacher at the time of the interview. She has spent the past three years substituting in the district where she used IWBs in the classroom. At the time of the study, she taught 8th grade Physical Science in a district located in Southern California. She has been using technology for the past four years in the classroom and at the time of the study had access to a computer lab, Chromebook cart, a document camera, projector, and a DVD/VCR combo. She also encouraged students to bring their own device for instance tablets or smart phones. Olivia enjoyed using technology such as the Chromebooks where students learn independently either through Google slides or videos. She also used the document camera and projector daily.

During the initial interview, Olivia informed the researcher that she ran into a few challenges while using technology. For instance whoever mounted her projector in the classroom placed it too close to the screen. This was a problem because she could only display small images, which can be difficult for students to see the image being projected. Olivia revealed that she enjoyed using technology in the classroom because students can relate to their

daily lives. She thought that when students used their own personal devices in the classroom, they enjoyed the connection of education and the use of their own technology. She also believed technology helped with students' learning because it offered visuals with the implementation of video and images on personal devices. Students enjoyed using their personal devices but they also liked using the Chromebooks best because "they feel like they can do whatever they want," and this sense of freedom helps student with their learning.

When asked about her general thoughts on IWBs, Olivia responded by saying: "I like them, I think they are good, they are helpful, and I feel like they are almost like updated chalkboards. You can be demonstrating something and switch back and forth between things pretty well". Olivia seemed to be aware of the benefits of using IWB and felt comfortable with some of the tools it had to offer. For instance, she stated that she was comfortable using videos, presentations, and going between slides on a flipchart. She gained knowledge over the past two years while using an IWB and enjoyed using it because of the affordance of the IWB to project what she wanted. This included visuals to help support student learning and she thought it gave students "something cool to see". Students were able to interact with the board and contribute to the lesson. The lessons were not just used to utilize projecting still images but were used as a platform to allow student engagement in her classrooms. She also believed that IWB helped facilitate the discussion of a lesson. Like Caroline, Olivia also thought that having students come up to the board increased student engagement with the lessons.

Olivia had most of her experience with an IWB while she was substituting. This involved lessons that other teachers made and she had to teach them to the students. She also had seen them used by other teachers as well. While she was experienced in teaching lessons with IWB, Caroline only had limited opportunities to create her own lesson plans. She created a

few lesson plans without a formal training. She was able to create them based on her observations of seeing other teachers use an IWB. When asked what challenges she had about using an IWB, she described ActivInspire as “tricky”. It seemed the problems stemmed from her lack of knowledge with fixing hardware. For instance, she mentioned the ActivPen not matching up with the Promethean Board, the calibration menu not popping up, and even after the ActivPen was calibrated the pen still not being in sync with the board. She also mentioned having hard time organizing the lessons she designed. She was worried that her lessons could get “too cluttered” meaning having too much text or images on a given page.

When asked about specific tools she enjoyed using in the classroom, Olivia responded by saying: “It’s been presenting, annotating, adding notes, fill in the blank, and some drawing.” Most of her slides were created with the basic tools such as images and text but did not go beyond this elementary level of design. Olivia had not been able to implement more advanced features because all of her learning came from observation of other teachers and she did not have the opportunity to develop lessons on her own. She was aware that there were more IWB features that she could use, and wanted to implement something that is “more interactive than just writing”, including moving textile objects, or treating the IWB like a touch screen device.

Olivia was enthused by the idea of a teacher website with beginner, intermediate, and advance level instructional videos on more engaging IWB tools. Olivia believed she would immensely benefit from instructional videos because she could learn new features that would be engaging for her students and it would save her time looking through the Internet just to implement one tool. She stated if she wanted to learn how to implement five engaging tools, she did not want to spend an hour on each video. She also thought that instructional videos were

more helpful than an instructional manual because she could see the tools being implemented rather than having to read about them. When asked about her preference over the length of instructional videos, Olivia stated that she preferred watching ten to fifteen minutes. She thought shorter videos would be more beneficial because they would provide the user to create a flipchart and implement that specific tool right away instead of watching several steps. She also believed that instructional videos should engage teachers in a step-by-step process of using certain tools, e.g. grouping pictures. She also suggested that the instructional videos should be more generic rather than content specific. Like Caroline, Olivia also preferred instructional videos to be on the same page. Unlike Olivia, she did not want them to be separated as beginner, intermediate, and advance but wanted to see a short description of the learning objective for each instructional video.

Emilia: Advance User of Technology

Emilia is a veteran teacher who had been teaching for fifteen years. She spent the 12 years teaching 7th grade Life Science and at the time of the study she was teaching 8th grade Physical Science. Emilia has been using technology in the classroom for the last twelve years. The type of technology she had been using in her teaching career was an LCD projector, document camera, Promethean White Board, Microphone System, iPad, and Apple TV. At the time of the study, Emilia used Promethean Board, document camera, Chromebooks, and a laptop in her classrooms. She also encouraged her students to bring their own devices. She used most of the technology devices in her classroom used daily.

For Emilia, the most challenging part of using technology in the classroom was lack of infrastructure. For instance she had difficulty getting her audio to work because when the cables were hooked up correctly the audio signal made a hum sound which distracted students from

learning. Also she experienced network issues because the district blocked access for teachers. This included websites that a teacher may want to use but do not have access because the district blocked it. Also, teachers were not allowed to download updates and programs; they had to contact the district office and had to have someone come to the classroom and download the program for them.

When asked what she enjoyed most about technology Emilia explained that technology made your life easier. This included having the ability for her students to make up any missing work when they were absent. She accomplished this by taking a snapshot of the notes and posting it on her personal website. This also allowed parents to stay up to date on what their child was learning in school. Technology also helped students during class by making it easier for them to read the content. For instance, on the document camera or IWB Emilia could zoom in on what she was writing to help all students see more clearly than a traditional whiteboard.

When asked about her thoughts and comfort level on using an IWB in the classroom she explained that she was very confident and had been using the technology since 2010. She enjoyed learning new things and felt there was room for her to grow but she could design her own lessons. She started using an IWB in 2010 when her district purchased and installed in her classroom with no formal training. She "literally walked in the classroom and had ten minutes to figure it out." She described her first year of using it as just a glorified white board. She began to feel more comfortable when her district sent her to a few training sessions but realized there was so much information for her to learn that "in an eight hour training you could easily only learn two things." She began to feel more comfortable when she allowed herself to experiment with the software and added new tools to her toolbox.

Emilia enjoyed being able to create her lesson and saved them for the next year. She thought it was beneficial to her students that she was able to modify her lessons between classes or on the spot. She liked that she could annotate a lesson and then reset the presentations to its original format for the next class. Her students liked the IWB better than a traditional whiteboard and responded better to the interactive tools it offered. She said: "It is a one stop shop for launching all things that are student beneficial". She pointed out that student engagement is much higher, in fact she explained that "kids are fighting to see who gets to use the stylus pen" and write on the board. Emilia believed that her students were digital natives and could not be educated the way students were taught in the 1950's and 60's with just a chalkboard or traditional whiteboard. According to Emilia, teaching with an IWB is more effective than using a document camera, PowerPoint, or Apple TV and iPad combination. She also stated, the IWB helped students with learning because the display was clearer, brighter, and easier to see for all students.

Emilia thought that ActivInspire had a steep learning curve, and that teachers needed to have the tenacity to want to learn how to use it. If teachers lacked tenacity, the IWB would not be used effectively and even worse, not be used at all. She personally experienced challenges because of not having complete control over the software. Because ActivInspire was installed on a district computer, she did not have the ability to update the plug-ins for the software.

When asked about what specific tools she enjoyed using with an IWB, she mentioned liking launching the Internet through the IWB as well as using the revealer to pace her lessons. She also liked using more advanced features such as spotlight, which blocks out all of the presentation except a certain area so the students are focused on what the teacher wants to show. Also she used a tool called Magic Ink, which allows the user to overlay two images and

see through the top one. She also enjoyed moving textile objects so that students can sort different parts of a cell or demonstrate formulas of chemical reactions. Emilia would enjoy if students could have ActivInspire software at home so students could access the notes at home and had a flipped classroom model. Also she was aware that she did not know all the tools and wanted more time to explore the software in more detail or collaborate with other users.

Like the other two teachers, Emilia was enthusiastic about instructional videos. She also thought that it would be nice if the district offered teachers an opportunity to meet for a face-to-face training as well. For Emilia, instructional videos should provide an opportunity for teachers to build their own lessons. She suggested that there should be specific spots in the video to pause so that teachers could try to implement the tool on their own lesson. Emilia believed an instructional video should be no longer than twenty minutes for one tool. These videos should cover one specific tool but also showcase how they can be used in different content areas to show all teachers the benefits it can have in the classroom.

The Design of Instructional Videos for Teachers

After the initial interviews with the three teachers with different technology background, the researcher created instructional videos based on their recommendations and needs as the targeted learner-user. The researcher created six videos to accommodate the skill level of each collaborator. Caroline, the novice IWB user, stated she wanted "the ability to watch several videos of different difficulty," in order to enhance her skill level with an IWB. The videos were categorized based on difficulty as defined by ActivInspire's instructional manual in either beginner, intermediate, or advanced. The following instructional tools were selected which included: Marquee Handles, Drag and Copy, Embedding Youtube Clips, Restrictors, Containers, and Magic Ink.

To accommodate the collaborators request, the researcher specifically chose to make two videos per category to allow novice users of IWBs to progress through the material as well as advance users select a specific tool of interest. The teachers reported they would watch an instructional video from five to twenty minutes long. In order to be respectful to all teachers time, the instructional videos had a maximum time length of twelve minutes. Olivia, the intermediate user of technology, stated she wanted to have the choice of what video to watch. She stated each video needed to stand on its own and did not want to watch the previous videos in order to understand the next one. To meet this request, the researcher scaffolded each instructional tool and presented the information as if they have not watched the previous instructional video. Caroline, who was the least skilled in using an IWB was selected to watch the videos and create a lesson plan for her students.

To minimize the barriers for navigation on the website for teachers, the website included only three main tabs: (1) a welcome page that introduced everyone to the website and explained the purpose of it (see Figure 3), (2) a videos page where all the instructional videos were listed with titles and short descriptions for each video (see Figure 4), and (3) about the creator page that gave a short description and background of the researcher-designer (see Figure 5). Caroline, the least experienced user with technology, was provided with the link to the website and took about ten days to watch all six videos and create a lesson on Mitosis. This lesson was presented to a 7th grade life science class. She was chosen to test the effectiveness of the design of the website and the instructional videos because given her lack of experience with IWBs, the intervention should benefit her the most among the three teachers. In the next section, I summarize the findings from classroom observation of Caroline teaching the lesson she designed using the instructional videos.

Figure 3. A screenshot of the welcome page.

Figure 4. A screenshot of the video page.

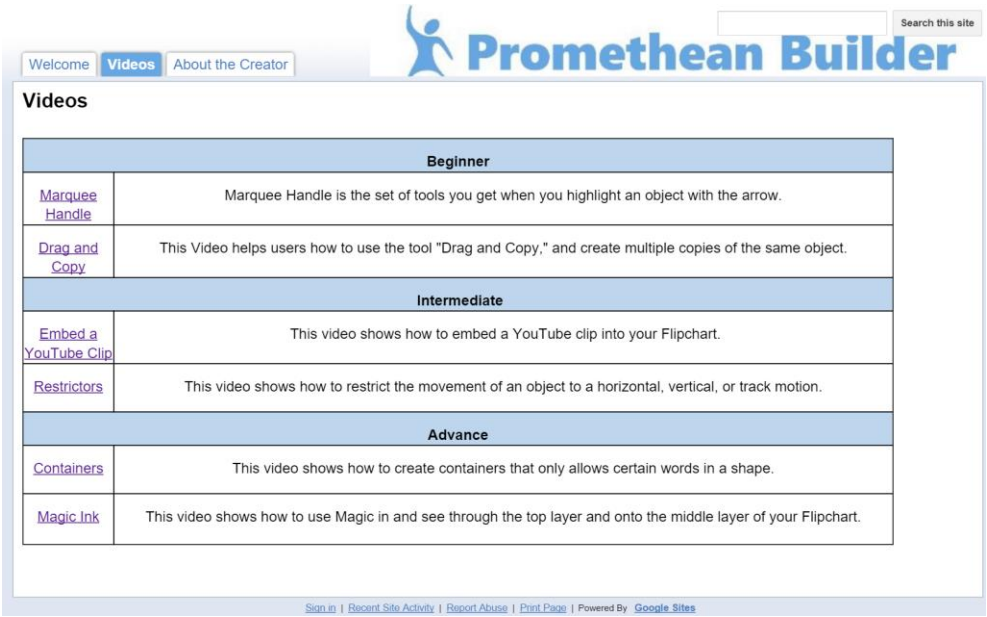
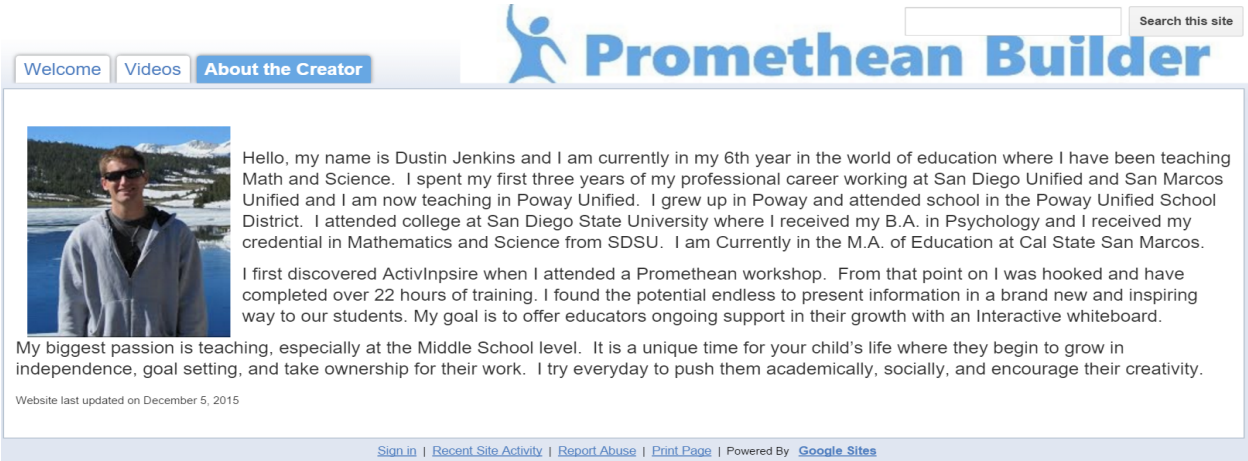


Figure 5. A screenshot of the about the creator page.



Classroom Observation

After the design of the instructional videos was completed, the beginner teacher watched all six instructional videos. The beginner teacher then created a flipchart that incorporated the new tools she learned into her lesson. The researcher observed the lesson to see what tools the teacher implemented and her comfort level using an IWB.

Classroom Layout

The researcher was already sitting in the back of the room when the students came into class. The room consisted of nine tables laid out in a three by three setup with four seats at each table. The class has a Promethean Board at the front of the board that is mounted in front of a whiteboard. The teacher had a desktop computer as well as a laptop that is connected to the IWB. All of the classroom supplies was located in bins on each table consisting of glue, rulers, scissors, and extra pens and pencils. The teacher had a center countertop in front of her Promethean where she puts supplies that she will need for the day. She also had three class pet lizards in the room. Students' classwork was showcased around the room pinned up on the

cabinets and empty wall space. The students file in and were able to sit wherever they would like.

Class Demographics

All students were in the seventh grade Life Science class, which is a yearlong class that stays with the same teacher all year long. They attended a school grade 6th through 8th grade middle school located in Southern California. The class consisted of thirty-five students, sixteen girls and nineteen boys who ranged in age of eleven to thirteen. The special population consisted of ten students, five girls and five boys, who were classified as Gifted and Talented Education (GATE). The class had eight students, two girls and six boys, with an Individual Education Plan (IEP) as well as two students, one girl, one boy, who were classified as English Language Learners (ELL). The class also had two students in the AVID program. According to the schools background information students' ethnicity breaks down to the following: fourteen students identified as White/Caucasian, eleven students identified as Asian, five students identified as Filipino, three students identified as Hispanic, and two students identified as Asian Indian.

Caroline's Lesson

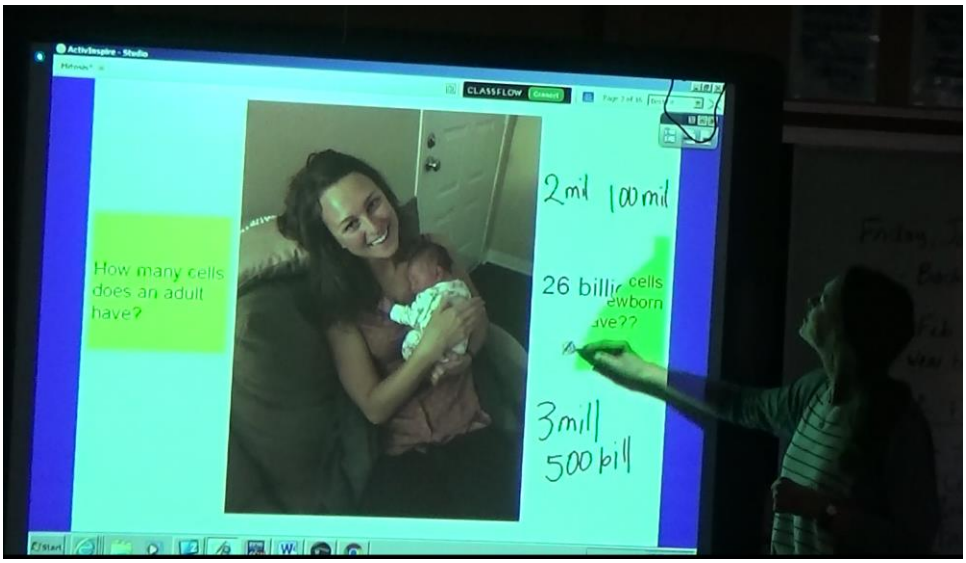
The lesson was an introduction to mitosis and covered the steps and description of each phase. The lesson was taught to 7th grade life science students during 7th period, which is right after lunch. The time ranged from 1:25-3:05. Students walked in after being outside and waiting to be let in the classroom. Students did not have assigned seats but sat down without it being an ordeal. While students were taking their seat the IWB was already on and it had the agenda on the board.

Caroline created pre-made slides on the lesson introducing mitosis, which consisted of fourteen slides. Students began to take out their spiral notebooks where students took notes and glued in handouts. The lesson began with an agenda for the day and it consisted of typed text and an image that showed the steps of mitosis. Caroline went over the agenda and asked the students how they felt about the test by showing thumbs up, to the side, or down. She explained students would be able to retake the test if they did not perform as well as they wanted to. Before notes began she introduced an online magazine where students, teachers, world travelers, ocean enthusiast, and researchers could publish articles based on life science. The website was created by a teacher and was used to showcase life science. The magazine was called seven seas which is an online magazine that was based on marine conservation. Caroline used the ActivPen to switch from arrow tool to pen tool and crossed off parts of the daily agenda. Students were prompted to get prepared to take notes and to grab a handout in front of the room. One student per table came up to pick it up.

Once all the students had their handouts, Caroline introduced what they were learning with a verbal explanation of describing mitosis. She began the lesson by having a picture of herself and her newborn niece in the center and two different colored boxes of the picture, one on the left and one on the right and each had written text inside the box. One had the question "How many cells does an adult have?" and the second was "How many cells does a newborn baby have?" She then selected the pen tool and asked the students how many cells does a newborn baby have? Students responded with a range of guesses from 2 million to 500 billion. This prediction game got the students engaged and asking questions. To reveal the answer Caroline used the Magic Ink tool that covers up anything on the top layer of the flipchart and reveals anything in the second layer (See figure 5). For the students it looked like she was

erasing the green box and the text to see the answer below which was 26 billion. Students responded with excitement about how close they were. Caroline continued the process with how many cells does an adult has. Over half the class had their hands up wanting to participate. She selected four students whose answers ranged from 3 trillion to 500 trillion cells. Caroline then used the Magic Ink tool to reveal correct answer of 500 trillion. Students were again excited saying how close they were or they were going to guess the correct answer. She asked the students how does a baby go from 26 billion cells to 500 trillion cells and a student responds by saying the cells duplicate. On this slide Caroline used the tools importing pictures, creating shapes, pen annotation, typed text, and Magic Ink.

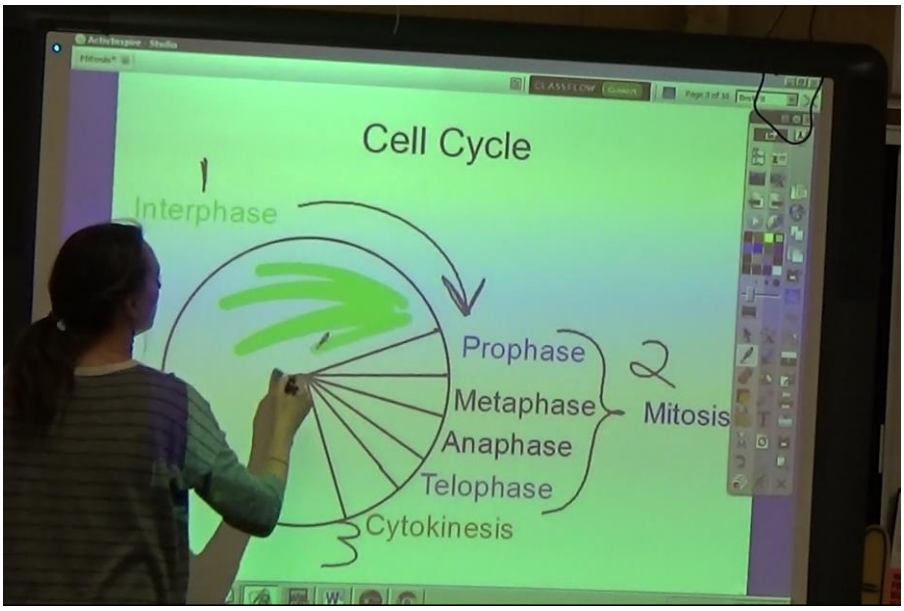
Figure 6. Caroline working on an Interactive Whiteboard using the Magic Ink Tool.



Caroline continued to the next slide, which had a visual of the cell cycle. The slide was designed by using the shapes tool using a pie chart showing the amount of time each phase takes. She also labeled each part of the pie chart with typed text and color-coded each phase. She asked the students to draw the picture of the cell on their spiral notebook. She then used the

annotation pen to write downs the parts of cell cycle. She wrote a one for interphase, two for mitosis, and three for cytokinesis. She then color-coded the pie chart with the pen. She made the width of the pen bigger in order to spend less time shading in the shapes (see Figure 7). Caroline created an easy to read, color coded diagram of what the cell cycle is. The researcher was in the back of the room and could see the different colors and text easily. Students were copying the diagram and it seemed easy for them to read. No one asked for a larger image or for the text to be bigger. The researcher moved around and did not see any students asking their neighbor for clarification or ask to be moved closer so they could see.

Figure 7. Caroline using Highlighter, and Annotation Tools.



While students were copying down the diagram, Caroline explained with real world examples what was going on during each phase. While the explanations were well explained, students seemed more interested in what was on the board and copying it down for their notes. Caroline would ask general questions to the class and the same student continued to answer the question. Caroline would pause when needed to answer students' questions and clarify any

misconceptions. To help reinforce the idea of cells replicating, she gave more example such as when a person gets cut and the skin heals itself. For kinesthetic learners, Caroline created a visual performance of cell cycle using her hands and had the students perform with her. When she was done with the visual representation she misplaced her pen and took some time to find it. The Promethean Board is not a touch screen and needs the ActivePen in order to use it.

The next slide was created using only text and asked students to create a mnemonic by using the first letter of interphase, prophase, metaphase, anaphase, telophase, and cytokinesis. It also required students to create a saying that would help each student remember the order of the steps in mitosis. The letters I, P, M, A, T, and C where already written on the board and typed in different colors. For students who did not know what a mnemonic was, Caroline gave two examples: "King Henry Died by Drinking Chocolate Milk," which she explained is used when learning the metric system and also gave an example for remembering the order of the planets in the solar system: "My Very Excellent Mother Just Sent Us Nine Pizzas." Students were then prompted to work at their tables and come up with their own mnemonic to remember the phases of the cell cycle.

After about seven minutes of allowing students to work in their groups, she called on a few students to come up and write their answers on the board. This was the first time students were able to come up and use the pen and write on the board in the lesson. Students seemed eager at the chance and several raised their hands to be called on. When students came up they intuitively knew how to use the ActivPen and were able to write on the board with no problems. When students were done writing she would make positive comments about their response and would erase their writing as she called on a new student to come up. Some of the examples students came up with were "Ignorant People's Mothers Act Terribly Careful", "Iguanas Pack

Many Ants to China," and "Peruvian Moms Ate Toxic Cake." Students really enjoyed the opportunity to come up to the board and use the ActivPen.

The next part of the lesson was a detailed description of each phase of the cell cycle. Caroline started off by having a slide that just said interphase. She typed in the definition as students wrote the same definition in their notebooks. The next slide Caroline created was a cell using the shapes tool, which included the cell membrane and the nucleus. The slide also included typed text of several parts of the cell that were not drawn on the cell. She asked students what type of cell was drawn on the board and a few students raised their hand and one responded animal cell. She switched between the arrow tool to move the text to the correct location and the pen to draw a line from the text to the correct location. She also added parts of the cell with the pen tool that were not originally created, such as the chromatin and centrioles. As students were copying the drawing down the cell, Caroline explained what each part of the cell does during mitosis and gave verbal analogies of what each organelles function is.

The next slide consisted of a text title that said Early Prophase. The rest of the slide was blank. She typed in a definition onto the flipchart as students wrote down what was on the board into their notebooks. The notes were being typed in bullet points and then she used the highlighting tool to highlight each of the key words. To help students understand the definition, Caroline went to the next slide that was blank and selected the pen tool and drew a chromosome. This slide was not planed but she was able to insert a new blank slide in between two pre-made slides. She stated: "I am just adding this because you (the student) had a question about chromosomes." After drawing the chromosome she labeled the parts and made an analogy with her hands. She continued to explain the parts and function of a chromosome and color-coded the parts.

On the next slide it had a title of Early Prophase and had key words as well a pre-made cell created with shapes. She used her pen tool to add necessary parts of the cell such as centromeres and chromatid. She was able to add the spindle fibers on parts on the centromeres and move the text in the correct location. She showed the difference in the nucleus by drawing how the chromosomes look in this phase. Students have been writing a lot and it was getting towards the end of the day. Students were talking a bit more than in the beginning of the period and are starting to get a little restless. Caroline paused for a little bit to allow students to finish drawing and labeling the picture.

Caroline changed to a new slide with the title Middle Prophase. The slide was blank and she added the definition by typing the information down on the paper and students copied it. The researcher just realized everything was color-coded. Titles were always in black and descriptions were always in blue. Class was ending in less than ten minutes and it seemed Caroline was going faster than the previous slides leaving less time for students to copy down the notes. She put up a new slide with the custom-made cell and had the parts of the cell typed out. She used the pen to add additions to the cell such as showing the nuclear membrane dissolving and drew the chromosomes denser. She changed the thickness of the pen to illustrate this. She then moved the text next to the part of the cell using the arrow key and switched back to the pen tool to draw the centrioles and spindle fibers in different locations.

She let the class know they had time for one more slide and opened up a new one. She typed in the title of “Late Prophase” and began to type down the definition in bullet point format. Students were writing notes as Caroline was typing them on the board. When students were finished she changed slides and wrote down the homework. Students were already packing up

and she reminded them to sit down, write the homework, and glue in the pages to their notebook. Students waited until the bell rang before they left.

Debriefing

The researcher allowed two weeks between the lesson that was presented and the day of the interview to allow Caroline time to reflect on her experience. Since the time of the lesson and the interview, Caroline found a job teaching high school chemistry in the same district. The researcher went to her classroom to conduct the interview where he focused on four main topics: the perception of the instructional videos, Caroline creating her own lesson with ActiveInspire, how the lesson on Mitosis went, and her reflection on the overall experience. Caroline began this process by watching the six videos in chunks. She started with three videos on the first day and three videos the next day. After watching the videos, she began to brainstorm ideas for a lesson. Afterwards she re-watched the videos while creating her lesson on mitosis.

Perception on Instructional Videos

The researcher wanted to learn if the videos were helpful and if so, what parts supported her learning. The researcher asked when watching the videos what did she like the most. Caroline explained: “the quality of the video was really important, I liked how it was recorded in high quality and the sound was great”. She continued: “also the pacing was really nice. You scaffolded the videos which really helped with my understanding of the content.” Also, “you did not speak too fast and you spoke clearly.” In fact, Caroline enjoyed the videos so much, she said she would prefer the videos over an instruction manual of how to implement these tools. This was surprising because in her initial interview she said she would prefer to have a booklet over the videos. When asked what changed her mind, Caroline explained how she liked the ability to pause and go back and see a step-by-step process of a tool being implemented.

When probed about what aspect helped most with her overall learning, she brought up a few topics. First she discussed how the scaffolding helped by breaking down the videos into three categories of beginner, intermediate, and advanced. Not only were the videos broken down step by step but she brought up how you could watch each one on its own without prior knowledge of the previous videos. She also emphasized that the quality was important and how the clear videos and the creator's clear voice added to her learning experience. Finally she discussed how the pacing helped with her understanding by not speaking too fast.

When asked what part of the videos did not help with her overall learning, Caroline said that some of the instructional videos did not help towards the lesson. The tool restrictors did not seem to lead to students learning more if that tool was implemented into the lesson. This could be due to the fact that the video only showed how to create restrictors in a general tool but did not show how it can be implemented into a lesson. Another thing that did not help was Caroline already knew some of the content, especially when watching the video on marquee handles. She explained that she fast-forwarded through part of the video because she already knew the content. In order to fix these problems the researcher wanted to know what could be changed about the videos to make them more helpful. She explained that the videos presented the information in one of two ways: general or content specific. Whenever the videos were content specific it would present the tool in the domain of science or mathematics. She would like to see this in other subjects such as the Humanities, or electives to show a wider range of the use of the tool. This might help other teachers become inspired when creating a lesson. Initially she said she would not want to watch a video that was longer than five minutes. Three of the videos were longer than this time, with the longest one being just under nine minutes. She said that this was not a problem and explained she did not think the videos seemed too long.

Caroline was able to access these videos on a website created by the researcher. When asked about her thoughts and overall impressions about the website, she explained she liked the simplistic presentation of the website and expressed her pleasure with "not a lot of bells and whistles" and liked how it was straight to the point. She appreciated how the descriptions of the videos were straight forward, which made the website easy to navigate and knew exactly what she was going to learn before she clicked on the video. She shared how she explored the other pages on the website like the "Welcome Page" and "About the Creator" because she was curious, and liked finding out why the researcher was creating this website.

Creating the Lesson

Since the initial interview Caroline created her own flipcharts from scratch, but the observed lesson was the first time she has created a flipchart after watching the videos. She explained that the videos were supportive and they "helped inspire a little more creativity into my lessons," and she enjoyed the flexibility the software offered when creating a flipchart. She also appreciated the interactive aspect of creating, such as adding custom colors and opportunity for active participation for students (i.e. coloring and group discussions). When creating slides, she wanted to construct a lesson that would allow students to come up to the board either manipulate objects or annotate in order to raise students engagement. When asked if the videos helped with this process she said "yes, definitely." She continued to talk about how prior to watching the videos she has either used certain tools such as Magic Ink on pre-made slides or had seen her guide teacher use them but has never been able to replicate the tool until after she watched the video. After watching the video she said she was able to integrate Magic Ink in her lesson right away. Not only were the videos helpful in implementing tools for the students, but also saved her time when creating the lesson. She described how she was able to use the Drag

and Copy tool to make duplicates of slides she needed so she did not need to recreate them. Finally she talked about how the videos helped support her learning on tools she thought she understood such as the use of Marquee Handle. She described how the video went into detail, and while she skipped part of the information she already knew, she was able to learn and deepen her understanding and use Marquee Handles with more confidence when creating her lesson.

Caroline emphasized that the videos were helpful, but when asked if there was anything challenging when creating she found time was an issue. For her to create a lesson she spent almost two hours creating one lesson. Several reasons accounted for this large amount of time such as watching the videos, learning the content, then creating the actual lesson. The videos allowed her to implement the tool in the lesson but she admits she was not a master of the software and would need to refer back to the videos to become fluent using the software. It is also important to note that she received a job offer at a high school and the lesson the observer saw was her last day on campus.

Caroline was at a disadvantage because she was able to see other tools from her master teacher but did not know how to create these tools. For instance, when creating a pie chart she wanted to color code the sections and fill them in different colors. When she attempted to do this the entire circle would change to that color. She explained this lead to frustration because she knew it could be done but was unable to execute this function in her lesson.

When asked if the videos helped her in creating a lesson and implementing a tool she discussed overall it did help her but also found some of the tools were not helpful for her lesson. For instance she was able to watch the video on how to embed a YouTube video but found the video small and the quality not great for her lesson. While the video showed a way to make the screen size larger, she found it easier just to bring up the link on a web browser. Also she

watched a video on restrictors and said: “I could not brain storm a way to use that tool, and did not think they were necessary to incorporate into the lesson.” She also added that she felt this would not add to the overall learning for students.

The researcher made six instructional videos: Marquee Handles, Containers, Restrictors, Magic Ink, Embedding a YouTube Video, and Drag and Copy. When observing the lesson the researcher only noticed one of the tools implemented in the lesson, which was Magic Ink. When asked why she only used one of the tools, she explained that almost all the tools were used in the creation of the lesson but not the presentation for students. For example, when creating the lessons she used the marquee handle to group and moved images and changed the size of an object. She also stated that she did embed a YouTube video but chose to take that slide out of the lesson right before class started. She used the drag and copy tool to create duplicates of the slides of her drawing of mitosis so she did not need to recreate the image. She stated “I wanted to do containers by having students match parts of the cell but it would have taken too long,” and thought enough was going on in her lesson where she did not need to add that tool. The only tool she chose not to include in her lesson was restrictors. Overall she watched six instructional videos which resulted in three of these tools being used in the creation of the lesson, one being used during the lesson, one being left out because of lack of time, and one being left out because she did not find it necessary to include.

View on Lesson

After Caroline reflected on her teaching she recalled what went well during the lesson. She expressed what she liked about the lesson by saying how the board supported student learning and helped them stay engaged. She also enjoyed the ability for students “to come up to the board and brain storm as a group.” She felt this added to students learning because they were

able to come up to the board and share their ideas with the class. By offering students the opportunity to participate by writing on the board, students were eager to share their answers. She liked the flexibility in adding new slides in an instant where she could draw pictures to help answer students' questions. She also enjoyed the ability to draw the cell in advance and move parts of the cell to demonstrate parts of mitosis. She thought this process was helpful for both her and the students to show the movement of a cell while the students were drawing the picture.

When asked what she thought the students liked most about the lesson, she explained how the students enjoyed participating in the lesson by coming up to the board and writing their answers or shading in parts of the cell and pie chart. She believed students enjoyed sharing answers and liked how their ideas were written on the board. They also liked the movement of textile objects to illustrate mitosis. She discussed how the wide range of activities that can be seamlessly integrated into a flipchart made the lesson more engaging for the students, and how students liked the real-time aspect of an IWB. This included adding pictures, videos, animations, advanced tools, and incorporating the students' thoughts and ideas into the lessons. She believed this all added to students' active participation and engagement in the lesson.

Prior to teaching with an IWB, Caroline taught most of her lessons with PowerPoint presentations. When asked what method she prefers presenting information to her students, she replied "ActivInspire." In fact she talked about her experience at her new teaching site, which does not have an IWB, and she now currently uses PowerPoint. She discussed the disadvantages of using PowerPoint such as "it is frustrating because the presentation is covering up the whiteboard and you can't annotate anything on a PowerPoint." She continued by saying how the tools an IWB offer help students focus, and makes the lives for teachers easier. For instance, when she is using a traditional whiteboard and is creating a diagram she "can't fill in a pie chart

on a whiteboard with expo markers." When asked how does an IWB influence students' motivation or engagement during the lesson she responded by saying the "biggest advantage with the IWB is not having to go back and forth, turning on the projector, putting down the projection screen, putting it back up and erasing the board. It takes away some of the hassle especially for a teacher which can lead students losing interest or start talking while I'm cleaning the board. It moves the process along and keeps them engaged and working together as a class."

When asked about what she thought did not go well during the lesson and what she thought students did not like, nothing involving the presentation of the material was mentioned, just the content of the information. For instance she expressed how she thought the slides were great for the demonstration of early, middle, and late prophase, but thought the information was too similar and would have liked to condense it into one slide. She had the students draw each phase but after further reflections believed it was "not necessary to have so many drawings with the kids." She believed the students could have benefited from separating the material from one day to a two-day lesson and incorporate more interactive tools such as an animation of mitosis. When asked if she would change anything she would have liked to have the pictures streamlined so you could see an evolution of mitosis in the different phases instead of just still images.

Caroline's Reflection

When the researcher asked Caroline if she felt more confident using an IWB and implementing more advanced tools she simply stated: "yes I do." While she admits she is not an expert on all the tools, she feels more confident but would want to re-watch some of the videos again and put more time in creating the lesson. The researcher wondered if the videos were enough support for teachers and Caroline said: "I think they are sufficient." In fact she preferred the videos over a manual or a trainer because it was easier for her to pause and rewind the video

when she did not understand something. She believed a trainer would make her uncomfortable because "if someone teaches you something and you feel you are bugging them, if you ask them the same question twice. Having the videos bookmarked in your web browser where you can go back to is a powerful tool." Lastly when asked if she could change anything about the process her response was, "make more videos."

Summary

The purpose of this study was to find what ongoing support teachers needed when enhancing their skill level with an IWB. The researcher interviewed three teachers to gain better insight of their skill level with technology, as well as their thoughts on online instructional videos, with the purpose of designing instructional videos that would help teachers better utilize IWBs in the classroom. One teacher was selected to watch the videos, create a lesson, and teach it to her students. The researcher was able to watch the lesson and take field notes. After the post-interviewing and analyzing of data the researcher found out the videos did support teacher learning. Factors that contributed to the learning of teachers was the high quality of the video, scaffolding of the lessons, pacing of the videos, concise content, and the ability to rewind and re-watch the videos as the user is creating their own lesson.

CHAPTER 5

DISCUSSION

School Districts over Southern California have been purchasing Interactive Whiteboard (IWB) technology for teachers with the hopes of more interactive and engaging lessons. Unfortunately these IWBs are being purchased and given to teachers with little to no training. This has resulted in teachers unable to use an IWB to its fullest potential. The purpose of this study was to identify teachers' needs in becoming more proficient users of an IWB and create instructional videos to help meet the needs of participating teachers. The design-based research approach used in this study emphasized communication between the researcher and educators, in order to better understand what skills teachers would like to develop and how they would like to learn that information. This chapter will summarize the findings and discuss further research in this area.

Study Overview

The purpose of this study was to determine if providing teachers with instructional videos on how to implement interactive tools would assist teachers on becoming more proficient user when working with an IWB. Design-based research methodology was best suited this study because the participants were collaborators and not subjects (Wang & Hannafin, 2005). Also, this study is framed not as finding one solution to a problem but an evolving discussion between the researcher and his teacher collaborators to yield changes in the real world (Barab and Squire, 2004; The Design-Based Research Collective, 2003; Wang and Hannifin, 2005). Initially, the premise of this study was that instructional online videos would help teachers better understand how to implement engaging interactive tools and how to incorporate them into a lesson. To

determine the needs of the teachers, the researcher interviewed three middle school science teachers who have access to an IWB. The goal was to gain their insight on their use of technology in the classroom and more specifically IWBs so that instructional videos can be created to better assist teachers utilize IWBs. This included what technology they have in the classroom, how they used it, and what they found difficult or easy about technology. Teachers shared their strengths and weaknesses about using IWB and what they would need to become more proficient at creating interactive lessons with the use of an IWB. All teachers perceived a website with instructional videos as beneficial for educators with implementing specific tools into their lesson. The interviews helped the researcher gain insight on what they would like to see in the videos as well as what is important to them while watching. This included themes such as content specific versus general tools, time, sound quality, pacing, and resolution.

Based on the teachers' feedback, a website that hosted six instructional videos was created. The instructional videos were categorized into three sections: beginner, intermediate, and advanced, with two videos in each group. The teacher that was identified as a beginner user was selected to watch all six videos and create a lesson on ActivInspire based of the information she learned. Next she presented her lesson to her 7th grade science class on an IWB. This teacher created the lesson from scratch and was observed by the researcher while she taught the lesson. The researcher scheduled a post interview two weeks after the observation of the lesson implementation to debrief the teacher to gain her insight on the entire process.

Findings Summary

The results of the study showed the instructional videos were helpful for Caroline, the teacher who watched them. They assisted her in creating her own lesson planning, delivery and in implementing most of the tools that were in the videos. After debriefing with her, she

reported several factors that contributed to her growth of using an IWB after watching the videos. First she explained the videos were created in a professional manner and took into account quality. The screen was recorded in High Definition resolution that made the video look professional. The audio was recorded on an external microphone, which made the audio sound better. Also, the researcher created an outline of each video to sound more professional and made sure to annunciate and speak at a steady pace to insure all listeners could follow along. All the videos had the same introduction, which made them sound like a cohesive series.

The second aspect that made the videos successful was the content and how they were delivered to the teachers. The website was created on Google sites and had a clean layout without a lot of clutter. There were only three pages: Purpose of the Website, Videos, and About the Creator. This design decision was made based on the initial interviews with the teachers who mentioned that they preferred minimal design to clutter. According the Caroline, the simple design of the website made going through the website easier and more enjoyable. Also the Video page was clearly labeled with a description of what the user will be learning. Again, this decision was made based on initial interviews with teachers who expressed a desire to see the learning objectives of each video. To ensure that the teachers easily understood the content, the researcher divided the content of the videos into smaller chunks. The videos were created with the assumption that those who watch have no to little knowledge of the content. Caroline believed that the way the researcher scaffolded the information in the videos was key to her success when understanding how to use a new tool because she never felt overwhelmed.

Third aspect was the consideration for the teachers' time. During the initial interviews the teachers reported the maximum time they would watch a video was anywhere from five to twenty minutes long. The researcher wanted to respect teachers' time and purposely made all

videos no longer than ten minutes. The time ranged from just over two minutes to nine minutes in length. This would allow the user to go back and watch the video quickly if needed as well as inform the user as quick as possible.

Caroline believed the videos were vital to her success over another medium such as a written manual or an on-sight trainer because of the nature of an online video. The results show that users like the flexibility to watch the videos at their own convenience and at their own pace. For instance, Caroline completed the videos in two sittings, and went back to re-watch the videos when creating the lesson. The videos also gave the user the freedom to pause, rewind, and re-watch whenever she had a question. This allowed the user to not feel ashamed or embarrassed when they did not understand part of the content, and put less pressure on the learner. Finally the ability to access the content on a web-browser made it easy and convenient for the user to access at any time. This aspect is particularly important given that during the initial interviews, all three teachers mentioned time as a barrier for them to learn more about using advanced tools of IWBs.

Not only did the results show that the videos helped users become more proficient using an IWB, but believe their students were more engaged in the lesson. It was reported that the bright colors, combined with the large text and images made it easier for students to see. Caroline also stated students appreciated the precision of her cell diagram. This is consistent with prior quantitative research that students report that an IWB can help due to the nature of the large display while being able to enlarge images and text while enjoying the accuracy of shapes, lines, graphs, and diagrams (Bell, 2002; Slay, Sieborger, & Hodgkinson-Williams, 2007; Smith, Higgins, Wall, & Miller 2005). The interactive nature of the lesson led to more active participation, and sharing of thoughts and ideas. Similar results were found in this study that students enjoyed coming up to the board and were eager to participate (Bell, 2001; Kennewell,

2001 & Olsen; Lamire & Baker, 2011; Lan & Hsiao, 2011; Shenton, 2007). Similar observations were reported in both this study and Hall & Higgins 2005 study on how an IWB is a one-stop-shop for presenting information combining audio, video, Internet, annotation, presentation, and images. Prior research supports Caroline's observation that IWB helps eliminate transition time from one activity to the next which cuts down on talking and keeps students focused on the task at hand (Ball, 2003; Glover, Miller, and Averis, 2003; Shenton and Pagett, 2007; Smith, Higgins, Wall, & Miller, 2005).

Educational Implications

There is a clear problem when teachers are provided with an IWB and are not provided with the proper training to discover the full potential it can offer. This study has shown that teachers not only learn how to implement the tools into their lesson, but based on the interviews with teachers, this is also their preferred method of receiving instruction. Videos allowed the user to move at their own pace, stop, pause, and rewind the video. It also allowed the user to go back and re-watch the video at any time. The videos can be more effective than on-site trainers because the videos do not cost anything to watch and users might feel intimidated or embarrassed to ask a trainer to repeat or review a topic that has already been asked.

The implication of knowing that instructional online videos can be an effective tool to teach educators how to use their IWB and develop more engaging lessons can help school districts assist in teacher professional development. Currently there are six instructional videos and an outline has been created to add an additional twenty four. If this website is completed it will provide educators step-by-step instructions on how to implement every significant instructional tool on ActivInspire. School districts would not need to hire expensive trainers to come on site and work with teachers in a class size of fifteen to one. Teachers would get

individual support, be able to watch at their own pace, and have the ability to access the video whenever they wanted. Having the videos broken up in skill level categories with a short description of the video allows users to choose what they want to learn instead of being told what to learn. Videos for instructional supports offer a solution to a problem many teachers are facing.

Schools sites that have purchased an IWB have invested thousands of dollars into this technology but need to find a way to provide ongoing training for teachers. Instructional online videos are a solution to this problem. School sites need to keep up to date with who has an IWB, and make sure they put them in the hands of teachers who not only want to use them in the classroom, but will put in time to learn how to use them. Pulling teachers out of class and hiring a trainer can be expensive, but online videos are easy to access, and to some teachers are the preferred method of learning. If a school site or teacher were to use my completed website or were to create a video bank of instructional videos that scaffold the lessons and organized them in a logical manner, they would be able to offer teachers a solution in providing teachers with the opportunity to enhance their skills as an IWB user.

Limitations and Future Research

While this study contributes to our understanding of how to support teachers in using IWBs, there are several limitations. First, the sample of this study was small. A similar study with larger number of teachers may yield different results. Second, this study was the first iteration of a design-based research approach. Ideally, the researcher would revise the videos based on Caroline's feedback after the lesson implementation, and ask another teacher to review the videos. For the study findings to be robust, multiple iterations are needed to better align the design of the instructional videos with teacher needs. A possible next step for this study is to

continue the cycle of design-implement-redesign until a larger number of videos are created. Such progress would yield more accurate data and align better with user driven design.

Furthermore, three teachers were interviewed but only one teacher was observed for this study due to time limitation. Testing the instructional videos with all three teachers would have provided a diverse set of perspectives on the utility of the instructional videos. Additionally, all teachers were from the same school, taught science, and were female. Future research should consider working with a more diverse teacher population. The data collected as part of this study could have been more representative if the researcher interviewed teachers across different schools or districts with different technology infrastructure and support.

Finally, in the future the website with a larger number of instructional videos should be tested as a whole experience. While instructional videos seemed to be an appealing idea for teachers, more research is needed to determine if teachers would prefer having a trainer come out on site and teach educators how to use an IWB, only watching the videos, or a blend where teachers are in a lab watching the videos and learning how to use these tools while one or two trainers are assisting teachers with their questions. This could inform not just the content of the instructional videos, but test the methodology of implementation of this approach to teacher training.

Lessons Learned

After completing this research project I have personally learned the importance of design-based research method. The ability to collaborate with my colleague and discuss the needs that they have and how to address those needs was helpful when I created the videos. I also found that design-based research allowed me to modify what I was working on, such as the videos or website based of my collaborators input. The flexibility gave me and the teachers real time

feedback. I enjoyed taking my interpretation of their ability and creating instructional videos based off our interviews. Hearing that the videos helped the teachers, it reinforced the idea that I knew how to interpret the interviews and create instructional aids based on their feedback. With the ability to work closely with the educators in the study, I was relieved seeing they were able to take the videos and use them to design and implement engaging tools into their lesson.

This process also changed my thinking on creating instructional videos. Before this process I would have created the slides with little to no preparation. I would not have sought out initial input on the design, and I would not have edited the videos when I made pronunciation mistakes. After interviewing and gaining insight on what teachers wanted in instructional videos, it helped me see what would support teacher learning. This process made me realize the value of quality in an instructional video, when the sole purpose is to help educators better understand how to implement a new tool into their lessons. This caused me to take several steps such as creating a script for each lesson, pre-making all the slides, rerecord when I would stumble over my words, and make sure I was speaking clearly and at a reasonable pace. Based on teachers response I took into account the length of the videos and tried to keep them as concise and to the point.

Initially I did not know the website would play a key part when helping teachers access the content. As far as I know there is not one place to access video content on IWB that is broken up by beginner, intermediate, and advanced skill level. I was informed the layout really helped teachers progress through the videos having them broken up in categories and giving short descriptions. This led to teachers choosing what they wanted to learn as well as giving them permanent access to the videos.

Conclusion

Interactive whiteboards have to potential to revolutionize the way information is presented to the twenty-first century student. They are a conglomerate of previous teaching technologies such as whiteboard, chalkboard, TV, audio system, Internet, etc. Unfortunately, the lack of training on these devices leaves much to be desired when it comes to educators' lessons. A solution to this problem is to offer teachers ongoing training in the form of online instructional videos. If the videos are well organized, consistent, created in high quality, and the instruction is scaffold to support teacher learning, they can be used to help educators implement more engaging tools into their lesson and help student learning. With this support teachers will have the knowledge they need for developing IWB lessons to help support student learning in the digital age.

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