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Interactive Whiteboards and Implications for Use in Education

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INTERACTIVE WHITEBOARDS AND IMPLICATIONS FOR USE IN EDUCATION

by

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Dedication

For Charlton.

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Abstract

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Interactive whiteboards (IWBs) have increasingly become a technology tool used in the educational field. IWBs are touch-sensitive screens that work in conjunction with a computer and a projector, and which are used to display information from a computer. As a qualitative case study, this study investigated the SMART Board-infused instructional practices of four teachers who participated in a specialized SMART Board professional development. The purpose of this research was to capture the most commonly used instructional strategies of those acquired by the participants who attended a series of SMART Board professional development workshops, and to discover which tools and features of the SMART Board they were implementing. Within these instructional practices, the visual, auditory, and kinesthetic learning modalities being deployed were sought. Furthermore, participants' perceptions of factors that enable and hinder the use of the acquired strategies, tools, and features were included. These 4 participants were hand selected to attend the training based on their advanced level of technology skills and the value they place on technology in the classroom. Six themes emerged from the data: 1) teacher- vs. student-centered instruction; 2) rationale for use of instructional strategies; 3) patterns of use for SMART Board tools and features; 4) reasons for participants' use of SMART Board tools and features; 5) perceptions of integrating visual, auditory, and kinesthetic (VAK) learning modalities; and 6) enabling and hindering factors for use. Developing a sense of how these participants used the SMART Board in the classroom can help in planning future professional development

related to the SMART Board and other technology. The implications for this research are informative to teachers, professional development coordinators, school administrators, technology staff, and teacher educators.

Keywords: Educators, Interactive Whiteboards, Professional Development, SMART Board, Technology Training

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Chapter 1 - Introduction

The importance of incorporating technology into today's classroom is increasing due to the critical need for students to develop the 21st Century skills required to achieve rigorous academic standards and career success (Partnership for 21st Century Skills, 2011). This is evidenced in the increased accessibility of technology in the classroom. A national survey of elementary and secondary public school teachers revealed 97% had computers in their classroom, while 48% had a digital projector, and 23% were equipped with an interactive whiteboard (IWB) in their classroom (Gray, Thomas, & Lewis, 2010). Leaders in education believe that technology integration in the classroom will allow students to develop necessary skills which will be beneficial to their academic success and in their careers (USDE, 2001).

In Gray et al. (2010), results showed IWBs rank third as the most available technology medium in classrooms. The interactive touch screens, via a computer and a projector, display computer images; and when the user touches the screen, he or she can interact with the board through software by pressing the board in a way that is similar to clicking a mouse (Shenton & Pagett, 2007). Greater access to IWBs provides teachers with a variety of multimedia tools through one portal. However, having access does not automatically mean teachers utilize this variety of tools and features; in fact, they may only use a limited set. For teachers to learn new technology and merge it with instruction, and more specifically with their content areas, a shift in pedagogical beliefs has to occur (Deaney, Chapman, & Hennessy, 2009; Jones, 2001). Adequate professional development must also be available.

Weaving multimedia tools into instruction gives teachers alternate avenues for presenting content. Using multimedia, interactive lessons can be crafted when incorporating IWBs. Interactivity is said to engage students with the content of the lesson. This engagement stems from teachers who provide multi-modal representation of content (Beeland, 2002; Marzano, 2009; Murcia, 2010; Sessoms, 2008; Shenton & Pagett, 2007). Since students interact with technology outside of the classroom through smart phones, gaming systems, and e-readers, students will be more captivated during class when instruction is delivered through varied sensory channels.

From the viewpoint of teachers who happen to also be certified SMART Board trainers, the goal of this research was to probe for instructional strategies embracing the use of SMART Boards and to ascertain the perceived factors underpinning the use of this technology.

Definitions

To help frame this information probe, it is beneficial to define key terms used in establishing the themes of this study. The definitions help connect the educational practices with the functionality of IWBs. The following definitions inform this study:

Auditory Learning Style. Auditory learning style is the learning style which processes information presented using auditory stimuli to construct knowledge.

Differentiated Instruction. Differentiated instruction presents instruction using different sensory modes.

Instructional Strategies. Instructional strategies are the methods utilized by teachers as they present course content material to students.

Interactive Teaching. Interactive teaching refers to the demonstration of information and construction of knowledge using dynamic methods, whereby the teacher engages students in the learning process using an IWB.

Interactive White Board. The interactive white board is a touch-sensitive screen that works in conjunction with a computer and a projector.

Kinesthetic Learning Style. Kinesthetic learning style is the learning style in which students interact with information as it is presented for processing and constructing of knowledge.

Visual Learning Style. Visual learning style is the learning style which processes information presented using visual stimuli to construct knowledge.

Focus of Research

To shift outdated instructional practices to ones that embody technology as supported by the Partnership for 21st Century skills, teachers must be offered opportunities to learn new technological devices and software. The opportunities can be in the form of professional development, peer-to-peer collaboration, or self-learning situations (Overbay, Mollette, & Vasu, 2011; Plair, 2008). Even so, simply learning about technology and how to use it is not sufficient. Educators must also be exposed to ways of applying technology within their content areas (Plair, 2008; Stein, Ginns, & McDonald, 2007). Forming a support network is beneficial to teachers as they integrate technology (Jones, 2001; Overbay, Mollette, & Vasu, 2011). Technology-rich lessons, through the use of multi-modal representations, should also encourage interaction between the content and the students (Smith, Hardman, & Higgins, 2006). Insights gained from this research can be used as a framework for developing valuable

professional development for teachers geared towards integrating IWBs into instructional practices.

Purpose and Research Questions

The purpose of this research was to capture the most commonly used instructional strategies of those acquired by the participants who attended a series of SMART Board professional development workshops, and to discover which tools and features of the SMART Board they were implementing. Within these instructional practices, the visual, auditory, and kinesthetic learning modalities being deployed were sought. Furthermore, participants' perceptions of factors that enable and hinder the use of the acquired strategies, tools, and features were included. For the purpose of this research, SMART Boards were defined as interactive touch-screens that work in conjunction with a projector, computer, and Notebook software. The premise of the technology is the screen, when connected to the computer, displays the computer image, and the compatible software interprets any contact with the screen as mouse clicks. This study was guided by four research questions:

1. What instructional strategies presented during the SMART Board professional development workshop do participants use most often?
2. Which of the SMART Board tools and features shared during the workshop do participants most often use?
3. In what ways are visual, auditory, and kinesthetic learning modalities embedded in lessons which utilize the SMART Board?
4. What factors have influenced the instructional strategies, tools, and features that participants use most often?

Limitations and Delimitations

For this study, multiple limitations were revealed. Being a qualitative study, the findings expressed the participants' insights of incorporating the SMART Board in the classroom. The study, adhering to its qualitative standards, cannot be used to make generalizations based on the results.

Participants in the study are from the same school district. These four participants were chosen to attend an on-site, SMART Board certification training workshop led by a SMART Technologies consultant. After receiving certification, participants were expected to train fellow colleagues to use this technology. Participants were selected because of their technology ability and the value they placed on incorporating technology into instruction.

These participants now are certified SMART Board trainers. The information provided evolved from their take-a-ways from the training. Other teachers using SMART Boards who have not attended training or one hosted by a participant of this study may show other prominent instructional strategies promoting tools and features of the SMART Board and multi-modal teaching styles. Also, participants in this study represented grades 6 through 12. Teachers in Pre-kindergarten through grade 5 may feature alternate instructional methods using SMART Boards.

While other brands of IWBs are available, only the SMART Board brand was considered in this study as it is installed in almost 100% of the district's classrooms.

A small number of participants was used in this study. The limited number of four participants was due to the restricted enrollment of the SMART Board training workshops. Data gathered were representative of their instructional strategies and their

individualized methods of how to integrate the SMART Board in the classroom. It has been approximately a year and a half since the training; teachers are still exploring the use of the technology and instructional strategies.

With regards to data collection, there was a lack of probing and follow-up questions during the interviews by the researcher and follow-up interviews were not conducted. This is addressed in the Future Research section in Chapter 5.

Significance of the Study

Intentions of this study are aimed at understanding how teachers incorporate SMART Boards into their teaching practices. Examining these practices will help pinpoint methods for transforming pedagogical styles to accommodate technology and support the migration to interactive-based lessons. Since the district offers on-site professional development to its teachers, having an understanding of these methods will guide the design of future professional development. Bringing to light the factors and issues associated with fusing SMART Boards and instruction can serve as a valuable support tool for teachers. Research from this study will inform areas of educational technology, professional development for technology integration, and teacher education.

Chapter 2 – Review of Literature

For this study, the review of literature provides a synopsis of research related to the instructional implications for incorporating SMART Boards in the classroom. The review of literature is divided into four sections: the first section discusses the current state of interactive whiteboards including the tools and features specific to the brand SMART Board; the second section discusses the use of interactive whiteboards in the K-12 setting including benefits and future areas of research; the third section discusses instructional strategies for interactive teaching, encompassing differentiated instruction through the use of visual, auditory, and kinesthetic sensory modes; and the fourth section discusses influential factors supporting the integration of SMART Board technology in classrooms. Implications for future research are also discussed.

Interactive Whiteboards

Once a technology tool primarily designed for and utilized in the business sector (Bell, 2002), Interactive White Boards (IWBs) have crossed over to the education world. This business-to-education transition is proving to be successful, as interactive whiteboards are noted as the third most common technology device in K-12 schools (Gray et al., 2010). Before looking into the potential reasons for this increase, it is helpful to discuss how IWBs work and what features they bring to the classroom.

The IWB is a touch-sensitive screen that works in conjunction with a computer and a projector (Shenton & Pagett, 2007). The premise of the technology is the screen, when connected to the computer, displays the computer image, and the compatible software interprets any contact with the screen as mouse clicks.

Features of IWBs such as text, graphics, access to resources on the Internet, split screens, and drag-and-drop type teacher applications are elements that support interactive teaching (Marzano, 2009; Shenton & Pagett, 2007). Multiple sensory modes are stimulated with the use of IWBs. Concepts can be represented in multiple forms, solidifying students' understanding, and students who prefer a particular learning style such as auditory or kinesthetic can be accommodated (Beeland, 2002; Murcia, 2010). According to Sessoms (2008), "the interactive board helps facilitate the interactive learning environment by affording students the opportunity to engage with content in multiple ways" (p. 89). The multi-modal representation of concepts aids in lesson continuity, allowing students to bridge concepts of the lesson, as found in a case study analyzing videos of lessons of primary science teachers (Gillen, Littleton, Twiner, Staarman, & Mercer, 2007).

Common IWB Tools and Features

Many IWBs come with a series of tools and features activated with the press of a finger. Following are some commonly used SMART Board tools and features, along with their functions:

- Notebook software enables the user to create and save typed information, handwritten notes, and graphic images
- Recorder allows you to record and save each step in any program as well as saving audio narration with the use of a microphone.
- Video player allows you to play and annotate videos viewed from a file, DVD, or device such as a camera.

- Keyboard tool lets the user enter information at the IWB, eliminating the need to shuffle between it and the computer keyboard.
- Floating tools provide quick access to pens, highlighters, erasers, and more. It is customizable to feature most frequently used tools.
- Instant conferencing initiates a teleconference between users on site or at a distance. The computer display is shared, and a collaboration session forms as the users interact with the shared information by using the tools.
- Welcome Center is a portal for quick access to some of the most commonly used components. Three tabs, Quick Start, Tools, and Help/Support, are used to group these components. Quick Start directs users to open recent Notebook files or begin a new one, to initiate a conference call, to calibrate board orientation, or to establish configuration settings in the control panel. The IWB tools are accessible under the Tools tab. Support, troubleshooting, and links for assistance are provided in the Help/Support tab.
- Screen shade hides the screen entirely or partially. It can be pulled from top, bottom, left, or right, leaving or revealing only the portion of the screen that is desired.
- Spotlight highlights a particular part of the screen as the user adjusts its location. It can be in the shape of an ellipse, rectangle, or star, and the transparency levels can be modified.
- Magnifier enlarges a selected section of the screen. For this feature, two windows are used, one displaying the original screen where the user selects the area to magnify, and the other one showing the enlarged view.

- Calculator is an onscreen calculator that can be toggled between standard and scientific versions. It is operated with finger presses like the keyboard.
- Pointer is an arrow that can be rotated and moved to any part of the screen to direct the audience's attention to specific areas.
- Screen capture toolbar lets a snapshot of any screen be taken and inserted as an object in Notebook.
- Control panel is a one-stop place to adjust settings on the IWB hardware and SMART Tools, orient the board, review software and product support, set default language, or to run the connection wizard.
- Orient is the process of aligning your IWB to more precisely recognize user touch.
- Check for updates monitors for IWB software updates. This can be done on a routine basis or manually as desired.
- Help center connects the users to FAQ, how-to information, tips, and troubleshooting information (SMART Technologies ULC, 2008).

IWBs have infiltrated classrooms as teachers embrace the need to incorporate technology in their teaching. The excitement of the IWBs emanates from its architecture, which promotes interactive teaching (Cuthell, 2003). Using the IWB technology provides teachers another medium to reach students and enhance the educational experience. However, to be successful, implementation of technology needs to be a result of careful planning and purposeful design. Technology should not be used simply because it is available. Rather, knowing when and how to effectively and properly use technology results as users becomes technology literate. According to Davies (2011),

"technology literate people know what the technology is capable of, they are able to use the technology proficiently, and they make intelligent decisions about which technology to use and when to use it" (p. 47).

Teaching with Interactive Whiteboards

As seen in the overview of interactive whiteboard functions and features, by design, IWBs promote collaboration and interactivity in the classroom, both of which are instructional strategies emphasized as critical for student success. This section discusses interactive teaching, national standards, benefits, and research explaining the reasons that IWBs are in K-12 schools.

Interactive teaching. Smith et al. (2006) define interactive teaching as dialog between teachers and students, with ideas being shared and analyzed collectively. Teachers utilizing interactive lessons can captivate the learners and stimulate their thought processes, resulting in deeper knowledge construction. When technology is used in conjunction with interactive teaching, a learning environment providing students the opportunity to be actively engaged in learning develops (Sessoms, 2008). Contributing to the day-to-day teaching environment, technology is an "essential partner" and becomes "an authorship tool for critical and creative problem solving and communication," (Riddle, 2010).

National standards. The International Society for Technology in Education (ISTE) organization developed the National Educational Technology Standards for Teachers (NETS-T) to articulate the technology skills students are to learn, and the skills teachers are to use in instruction (ISTE, 2008). In addition, students attending schools in states which have adopted Common Core State Standards (CCSS) will have to use

technology to produce digital artifacts to demonstrate academic proficiency (Riddle, 2010). Together the ISTE and CCSS encourage teachers to use interactive lessons. In some instances, teachers' pedagogical ideas have to be modified to allow for the interactive based learning (Deaney et al., 2009; Jones, 2001; Türel & Johnson, 2012).

Benefits. The educational benefits of IWBs' tools and features to stimulate interactive teaching can be categorized as two-fold for this study. First, the tools enable teachers to develop and use an interactive approach to instruction. Second, by using the tools, information can be delivered to students through multiple channels to engage them in the learning process. Researchers assert that "interactive whiteboards are designed to engage a wide variety of students in the learning process" (SMART Technologies ULC, 2009, p. 6). The tools and features afford teachers ways to make lessons more dynamic. The IWB has been categorized by Smith, Higgins, Wall, and Miller (2005) as "a tool to enhance teaching, and as a tool to support learning" (p. 92). Focus on tools and features related to instruction do not include instant conferencing, the Welcome Center, the Control Panel, orienting the IWB, or the update or help centers for IWB.

As the IWB is the focal point for instruction, all students can view information being presented. They do not have to hover around a computer monitor, glare at a sheet of paper that is held up by the teacher, or rifle through handouts replicating displayed information. Because more students can see, a higher level of student participation can occur.

Clear and crisp presentations are essential if students are to fully grasp the content. Students are able to cope with more complex concepts as a result of clearer, more efficient and more dynamic presentation (H. Smith, as cited in BECTA, 2003).

Any image on the computer can be projected. Teachers can retrieve information from the Internet, access software, or play videos providing a more thorough explanation of the lesson. Beeland asserts that "the touch-sensitive board allows users to interact directly with applications without having to be physically at the computer which is projecting the image onto the board" (2002, Literature Review section, para. 1).

Spotlight, magnifier, and pointer tools are available to draw students' attention to specific information. All tools can be used on screen displays or videos.

Sound and audio are other elements which create more vibrant lessons. Sound files used as attention grabbers or feedback signals, like applause or a buzzer, are available (Marzano, 2009).

Using the screen capture feature, a snapshot of the notes and objects added to the projected image can be saved for future use. Any screen can be digitally captured for use at a later time, or it can be printed if a hardcopy is needed.

Notebook software aids the teacher in organizing and sequencing lessons (Winnipeg School Division, 2008). Information is created in the software on pages. The pages can be arranged and grouped by using a drag and drop motion. Creating lessons involves simply typing information, inserting images, creating shapes, and linking to the Internet or a document. Screen captures are automatically inserted in the software. Lessons can then be saved for future use and more easily adapted and improved upon.

Saving the lessons for future use (Royer & Richards, 2011; Shenton & Pagett, 2007; Türel & Johnson, 2012) suggests the pace of instruction is improved because of quicker access to resources and the capability to retrieve saved lessons. Royer and Richards (2011) assert that the pace is quicker because the lesson's path is determined by

reusing the saved files. Some teachers value the flexibility and experimentation of lesson flow afforded by using the IWB (Hodge & Anderson, 2007; Shenton & Pagett, 2007); however, others perceive the quickened pace as a drawback. Wood and Ashfield (2008) argue that ". . . the role of the teacher is instrumental in maintaining an appropriate pace to ensure children are challenged and yet not confused by the speed of delivery" (p. 93). Wall, Higgins, and Smith (2005) report this as an area of concern in their study, with a student comment suggesting the teacher moved through material too quickly. Increased pace could also be attributed to quicker retrieval of instructional materials for review or re-teaching. The teacher does not have to recreate notes and drawings. Additional elements added during the instructional process can be deleted without destroying the original saved file (Wood & Ashfield, 2008).

The screen recorder is beneficial to record a demonstration or process of steps. Each step the teacher makes, whether it is a key stroke or mouse movement, is recorded. This is an easy way to make tutorials for access at a later time (Boyle, 2002).

Lessons saved or recorded can be stored in a centralized location such as a Wiki or webpage. Students who are struggling or have been absent can access the lessons to catch up (Boyle, 2002; SMART Technologies ULC, 2009; Wetzel, 2009). They can also serve as resources for other teachers.

Interactive whiteboard research. Interest in the impact of the use of IWB to increase student engagement and transform teaching practices is growing. Areas of growing research related to IWBs include the following:

- determining if instructional practices utilizing IWBs are teacher- or student oriented (Smith et al., 2006),

- assessing interactivity of IWBs as technology or pedagogy related (Beeland, 2002; Levy, 2002; Smith et al., 2005),
- examining methods of successful implementation of IWBs (Beeland, 2002; Smith et al., 2006),
- studying student achievement as a result of IWB instruction (Beeland, 2002; Glover, Miller, Averis, & Door, 2005; Smith et al., 2006),
- identifying IWB tools and features which improve student achievement the most (Beeland, 2002),
- comparing IWB use between pre-service and in-service teachers (Sessoms, 2008),
- studying the benefits of IWBs to enhance learning by specific content areas (Glover et al., 2005; Royer & Richards, 2011), and
- establishing provisions for adequate training and support systems (Beeland, 2002; Glover et al., 2005; Levy, 2002).

Although there appears to be a well-supported rationale for the increased number of classrooms equipped with IWBs, the question of how IWBs support varied instructional strategies remains.

Interactive Whiteboards and Differentiated Instruction

Exploiting the interactive instructional methods available with the IWBs is in the hands of the teacher. It is important to consider incorporating various modes of presenting information when designing lessons. In addition, being aware of the different channels students can receive information and knowing how the tools and features of the IWBs complement these channels will aid the teacher in transitioning to interactive

teaching practices. In this section, differentiated instruction, interactive lessons, and the implications for interactive teaching are discussed.

Differentiated instruction. Instructional strategies are the schematics teachers use to disseminate information to learners. They are used to organize information by concepts or themes, and they help sequence material in a logical order. Instructional strategies should be thought of as the means that will be used to reach the prescribed learning objectives (Clark, 2011; Merrill, 2000). As defined for this study, differentiated instruction uses a variety of sensory modes to present instruction.

Various theories on learning styles exist, providing different philosophies on how an individual receives, interacts, and processes information for the purpose of learning. These theories are rooted in an individual's personality, abilities, perception and senses, and how information is processed and encoded in memory. A learner's attitude, the learning environment, and experiences the learner encounters are also defining aspects of learning theories.

Merrill (2000) proposes that consideration of a student's learning style should be secondary to the choice of instructional strategies. Strategies which support the goals of instruction and facilitate learning should be the primary concern. Also, students "must engage in . . . activities" (p. 4) if they are to learn. Because of this necessary engagement and the emphasis regarding the interactive teaching aspect in this study, focus is given to the ways in which teachers present instruction by incorporating visual, auditory, and kinesthetic (VAK) modes of disseminating information. This focus is facilitated by the tools and features available with the SMART Board that afford the teachers options of differentiating instruction to address different modalities. Not only are visual, auditory,

and kinesthetic modes of presenting material, they are also channels through which students receive information. When teachers present information using more than one sensory mode, learners can receive information in multiple formats, eliciting a greater interaction between student and content.

Visual, auditory, and kinesthetic (VAK) are sensory modes, or channels, by which learners receive and process information to form knowledge (Clark, 2011). Student learning preferences vary. In one setting, students may prefer one style, yet in another setting, prefer a different one. Carson (2009) points out that "typically, each of us exploits a distinctive learning preference, while some individuals exhibit more balance in their approaches than others" (p. 96). Individuals have a preferred method of learning and usually possess one or two dominant styles. Clark (2012) goes on to state that ". . . we do NOT learn best by using our style of learning, but rather we prefer one or more styles over the others" (Warning section, para. 9).

There are conflicting views on the relevance of knowing a student's preferred learning style and the extent to which this knowledge impacts the learner's ability to interact with instruction. Pashler, McDaniel, Rohrer, and Bjork (2008) supported the "meshing hypothesis" (p. 108) of modes of instruction with student learner performance; instructional strategies should match student learning styles. However, in their cross comparison of studies and review of literature, they found little supporting evidence for the "meshing hypothesis." Results of Marzano's meta-study (as cited in Clark, 2012) showed that meshing instructional strategies with a student's learning style was not important for groups, but when searching for deeper causes of a student's learning problems, the meshing can actually be of importance.

Instruction is only effective if the desired outcomes are achieved. Strategies aligned with the goals of instruction help create effective lessons (Clark, 2012; Merrill, 2000), and it is the presentation techniques of lessons that facilitate learning. Even if students have difficulty reaching lesson goals, the instructional strategies can be adjusted to engage the learner at the current level or at a deeper level in order to elicit the desired level of learning.

In discussing the problem with relying wholly on learning styles when preparing teaching strategies, Clark (2012) also points out that a reliable method of inventorying student learning styles has not been created; frequently, teachers rely on their personal choice of learning styles when developing instruction (Carson, 2009), which may not be the students' preferred style. According to Carson (2009), "whatever the mix of learning preferences in a class, no one approach or single presentation style maximizes learning for all students" (p. 96). Students should be subjected to learning experiences challenging their non-instinctive styles (Carson, 2009). Carson adds that " 'stretching'—assigning different avenues to arrive at the same goal—makes our classes more engaging for us as well as for students" (Carson, 2009, p. 100**).**

The various learning preferences that exist in one classroom can be stimulated with the IWBs (Beeland, 2002; Bell, 2002; Cuthell, 2003; Wetzel, 2009). In Cuthell's (2003) summary of teacher responses from an online questionnaire seeking information on IWB use, he concluded, "there is an awareness on the part of all of these teachers that the individual learning needs and styles found in the students whom they teach are more effectively met by the facilities offered by the boards" ("Teacher Perspectives", para. 10).

Also, teacher responses maintain the use of IWBs "powerfully supported" visual, auditory, and kinesthetic (VAK) learning styles (para. 3).

Visual. Visual learners prefer information to be presented using visual aids, such as pictures and charts. Learners preferring this style take notes, highlight information on handouts, or find other ways to make information stand out visually. Some learners may comprehend material easier if it is presented using videos, presentation tools, or simply by watching what the teacher writes down (Clark, 2011; Promethean, n.d.; SMART Technologies, Inc., 2004). Incorporating colors into instruction is another way to aid this type of learner. Research shows that "the use of colours, movement, the ability to move backwards and forwards between stages of a process all provide learning reinforcement for students" (Winnipeg School Division, 2008, Visualization section).

Visual learners benefit as they can "see" the connections between content being presented (Sen, 2011). One student comment in a study of student perceptions of the use of IWBs in the classroom conducted by Wall et al. (2005) aligns with this notion. The student said, "the pictures help you to understand what the teacher is talking about" (p. 860). Beeland's (2002) research consisted of having twenty students, two from each of the 10 participating classes, answer open-ended questions seeking to measure their attitude toward the use of the IWB. Students reported that "they learned better because the visual aspects of the whiteboard made it easier to understand what the teacher was teaching" (Beeland, 2002, Results section, para. 6). The 10 teachers also completed an attitude questionnaire. Results suggested learning was enhanced due to the IWB catering to students who prefer visual stimulation (Beeland, 2002). Similarly, Türel and Johnson

(2012) presented teacher survey responses indicting IWBs are advantageous to the visual depiction of course content.

Auditory. For auditory learners, written information, diagrams, and charts can be a barrier to their comprehension of a lesson. According to Promethean, "auditory learners are captivated by stimuli they can hear, such as verbal reinforcement, group activities, and class discussions" (n.d., "A Interactive Whiteboards Project", para. 4). These learners benefit from hearing information or being able to transfer the presented information to a verbalized form (Bell, 2002; Clark, 2011; Sen, 2011).

IWBs have the capability of embedding sound clips such as drum-rolls and applause to use as attention grabbers or feedback signals (Marzano, 2009; Wood & Ashfield, 2008). Sound can also be used to teach concepts themselves. For instance, Wiggins and Ruthmann (as cited in Smith et al., 2005) highlight the benefit of teaching music by attaching the sounds of musical notes to their pictorial representation.

Kinesthetic. Kinesthetic learners benefit when they are provided the opportunity to be involved with the learning process. This involvement can come from movement or touch. These learners prefer to be up and moving (Clark, 2011) and may be portrayed as someone who tries first and reads later. Allowing kinesthetic learners to explore in their learning is beneficial (Sen, 2011). Hands-on activities stimulate their thought processes.

Activities promoting students to move or use their hands benefit kinesthetic learners (Clark, 2011). While objects can be manipulated and drag and drop activities can be performed with the computer mouse, the IWBs touch screen facilitates the kinesthetic learner's need for contact and physical interaction. *Ostensiveness*, learning through pointing, is considered a form of kinesthetic learning in the sense that the mouse

or the teacher pointing and interacting with content on the board allows students to process information (Gillen et al., 2007; Virtual Learning, 2003; Wall et al., 2005). As learners watch the actions carried out by the teacher on the board, it is perceived as they are physically interacting.

Interactive Lessons. For this study, interactive teaching refers to the demonstration of information and construction of knowledge using dynamic methods, whereby the teacher engages students in the learning process using an IWB. Smith et al. (2006) express interactive teaching as dialog between teachers and students with ideas being shared and analyzed collectively.

Interactive teaching is a means to open lines of communication between teachers and students to pool ideas and explore their meaning and make connections (Smith et al., 2006). Glover et al. (2005) believe interactive teaching can be fostered through the use of IWBs. As teachers' competencies grow for bridging instruction and technology, the lessons they develop will evolve to a more interactive state.

In Cuthell's (2003) summary, teachers indicated that IWBs had transformed the learning process into one that was interactive and where students were engaged. As Boyle (2002) asserts, "students, like everyone else, enjoy slick, colourful and evocative images and it makes senses to capitalize on this" (para. 3). In learning environments integrating the IWB, students focus on stimulus presented by the teacher; and the student, either verbally or physically, interacts with the interactive board (Sessoms, 2008).

Although IWBs may be regarded as a high-tech presentation device used only to display what is on a computer screen, they are more. Boyle (2002) says that incorporating the features and tools of IWBs "adds professionalism and impact" (para. 2)

to lessons by capturing students' attention. When using IWBs, learning morphs into an interactive state including students in their learning (Cuthell, 2003). Taking advantage of IWB tools and features can turn a typical lesson into one that is interactive, captivates students, and boosts students' interests (BECTA, 2003; Boyle 2002; Wood & Ashfield, 2008).

Teachers utilizing interactive lessons can captivate the learner and stimulate their thinking process, resulting in deeper knowledge construction. For example, as an extension to a discussion on a current event appearing in a newspaper, a copy of the article could be scanned and displayed for the entire class to see. Additionally, a video related to the article could be played for another instructional dimension. Utilizing an image of the article and a video may increase the potential for collaboration opportunities (Cuthell, 2003). Through thoughtful planning, teachers can make lessons more information rich when using the IWB.

Text, graphics, shapes, and animation are other features to incorporate in differentiated instruction. In reference to the scanned current event article example, once it is displayed, the pens and highlighters can be used to add annotations and highlight pertinent information. Alternate colors and tip sizes can be added for emphasis.

Many teachers effectively use IWBs, appealing to multiple senses and learning styles within the same lesson (SMART Technologies ULC, 2009). Numerous strategies exist and are intended to equip teachers with a toolbox of interactive teaching tools. It is worth noting that care should be taken when selecting the tools and features of the IWBs to use in instruction. Utilizing too many in one lesson may actually be a distraction and divert students' attention from the actual meaning of the lesson (Levy, 2002).

Case studies conducted by Haldane (2007) on four English primary schools were used to identify how the IWB tools supported interactive teaching. Through observations, video recordings, and interviews with teachers and selected students, positive interactive teaching practices were discovered in tune with the interactive teaching definition for this study. As teachers prepared lessons, they were able to structure lessons to best present content; however, as they were teaching, the IWB allowed them to venture to outside resources such as videos and Web sites. Glover et al. (2005) analyzed recorded lessons, and the phrase "enhanced interactivity" (p. 28) was derived. Teachers carefully planned lessons taking advantage of the technology features of the IWBs to optimize student interaction with the content. Science lessons analyzed in the research of Gillen et al. (2007) portrayed innovative techniques of embedded self-recorded videos and digital still images to teach science concepts. Hodge and Anderson (2007) praised the ability to embed video in the lesson in their study. In this instance, the videos were used to prompt discussions to enhance learning.

Descriptions of two lessons are given. Each one illustrates the interactive lessons characterized in Haldane's (2007) and Glover's et al. (2005) studies.

Interactive Lesson 1. The first interactive teaching example is Murcia's (2010) case study examining how IWBs were used in science classrooms promoting multi-modal teaching. The lesson covered "relationships between the Sun, Earth, and Moon" (Murcia, 2010, p. 25). When discussing the moon, the lesson incorporated video files of Neil Armstrong landing on the Moon and President J. F. Kennedy's response to Armstrong's accomplishment. "The teacher paused the video and annotated the page with arrows and

text," Murcia said. (p. 26). As more information was presented about the moon, outside resources were accessed through embedded links to Internet sites on the Notebook pages.

This type of interactive lesson capitalizes on multiple learning styles. Videos enhanced students learning process through imagery and sound by targeting visual and auditory learning channels. Annotating the video with text added another engaging factor for visual learners. Auditory learners benefitted from the whole class discussion that erupted from the lesson (Murcia, 2010).

Interactive Lesson 2. Games are an excellent way to stimulate students. Mole Game (Metz, n.d.), a spin-off of the "Whack-A-Mole" game, is a teacher-made interactive math review game on the concept of slope. A starting page with images of moles is displayed. Each mole is linked to a page which contains a review question. The premise of the game is to select review questions by whacking a mole. To whack a mole, students throw koosh-balls at the IWB, which advances the page to the question correlated with the particular mole that was whacked.

Visual interactivity is provided through the use of the mole graphics and the slide transitions as the game is played. The use of the koosh-balls supports the need of physical interaction for kinesthetic learners. Class discussion can also evolve from the lesson to attract auditory learners.

To summarize this section, visual, auditory, and kinesthetic modes are sensory channels used to receive and process information. Differentiated instruction incorporates these different modes for instructional purposes. Visual learners prefer to "see" information. The use of written information and videos are a benefit to these learners. The uses of sound or audio are means for addressing auditory learners, who process

information better when it is heard. Students who learn better by being involved in learning are kinesthetic learners. Physically involving them in the learning or merely projecting the idea that they are involved can help these students. Preference for a specific learning style varies from student to student and, in some instances, on the information being presented. The greatest learning opportunity for students can occur by selecting instructional strategies to optimize lesson goals and by invoking a greater interaction between student and content.

Instructional strategies to accommodate visual, auditory, and kinesthetic (VAK) learning styles are facilitated with the IWBs (Beeland, 2002; Bell, 2002; Cuthell, 2003; Wetzel, 2009). Clark (2011) defines VAK as styles that appeal to the senses of seeing, hearing, and touching and doing, respectively. Selecting tools and features to meet the multiple learning styles of the students is important. Carson (2009) warns teachers of commonly selecting an instructional strategy for a lesson to suit their personal learning style preference. It is important for teachers to have a clear understanding of factors that influence choices regarding the integration of IWBs into instruction.

Influential Factors

An early transitional phase for the use of IWB has been described as progressing "from novelty to normality" (Glover et al., 2005, p. 29). Initially, when IWBs are used, teachers' and students' curiosities are a motivational factor for its use. There comes a point when the new wears off and the driving force to incorporate the technology switches to how it can be used to impact teaching. Davies (2011) implies that the technology becomes a tool, and it is used seamlessly in the learning process.

Influential factors for the successful use of IWBs include teachers' value of IWB technology, pedagogical changes, professional development, an internal support system, and adequate technology access. Valuing IWB technology is associated with teacher beliefs, while the others are related to the school's environment. Those environmental factors are aimed at "developing a culture of use" (Glover et al., 2005, p. 28). When value is placed on IWB technology and a culture promoting its use intersect, teachers will be enabled to successfully use IWBs.

Teachers valuing IWB technology. Valuing IWB technology can be attributed to the teacher's current level of technology skills and to his or her vision for its place in the classroom. In Mims, Polly, Shepherd, and Inan's (2006) analysis of Preparing Tomorrow's Teachers to Use Technology (PT3) grants they recognized a lack of opportunity for pre-service teachers to learn technology skills and meaningfully incorporate them into teaching. Value of the technology in the classroom had not been modeled. It is conceivable then that current teachers have not had the opportunity to develop a technology-laden pedagogy either.

A range of values of technology integration are evident, with the lowest placement seen when teachers merely use IWBs as a replacement for a blackboard/whiteboard. The highest level of value possessed is seen in teachers who are highly proficient with technology and continually search for ways to integrate technology in their lessons as well as to engage their students (Beauchamp, 2004; Glover et al., 2005). Glover and Miller (2003) correlate teachers' valuing of IWBs with how the teachers come into contact with technology. Some have an innate talent to search for tools and support others in using it. Others simply happen across technology, finding it

interesting but afraid to use it. The last group adamantly opposes IWBs. They will have to be mandated to use it (Glover & Miller, 2003). It could be that the value placed on technology may be directly related to the teacher's skills.

Teachers, given time and opportunity to practice IWB skills, can amplify the emphasis placed on its use. Reaching a higher interactivity-based lesson will take time; however, the IWBs are a technology tool that has a "shallow learning curve" (p. 87) and teachers should not think they have to master the tool to use it (Sessoms, 2008). A substantial time investment on the front end may be necessary to develop interactive lessons, but that investment is offset by careful planning and realizing the lessons are reusable (Levy, 2002; Shenton & Pagett, 2007). Hodge and Anderson's (2007) self-study substantiated the idea that learning how to use the IWB and merging it with instructional practices takes time. They stated that "Sue was becoming a much more confident user as time passed" (p. 280). Johnson asserts that "day-to-day professional use lays the most successful foundation for the curricular use of technology" (2006, p. 31).

Transformation of pedagogy. In Ertmer's (1999) discussion on relationships between barriers associated with technology integration in general, she stresses changes must be made at the root of teachers' pedagogical ideology if they are to fully embrace technology as a teaching tool.

Interactive teaching is created when teachers adopt a pedagogy revolving around technology (Sessoms, 2008). For some, technology is only being used to support traditional teaching practices (Sessoms, 2008). As Jones (2001) asserts, "Modifying traditional teaching techniques to incorporate technology is not easy" (p. 36). Many teachers are still locked into a teacher-centered style; and without a transformation in

pedagogical beliefs, using IWBs will not shift teaching to an interactive style (Starr, 2010). However, from survey responses collected by Türel and Johnson (2012), teachers believed their instructional strategies had morphed due to their use of IWBs. This was interpreted as a pedagogical change resulting from the use of IWBs.

If teachers do not see a need for IWBs or resist changing their current teaching practices as the educational field changes, technology integration will flounder (Plair, 2008). In some instances, teachers are willing to use IWBs but are not comfortable designing lessons utilizing them. Plair (2008) notes that "knowing how to select the best technology tools to support and enhance learning and instruction . . . eludes many teachers" (p. 71). Once teachers adopt pedagogy modifications derived by an "enhanced pedagogic understanding" (Glover et al., 2005, p. 29) and an increase in technology value, it will be easier to create interactive lessons (Plair, 2008).

Professional development. Initial professional development can focus on the basics of IWB use (DeSantis, 2012). Providing teachers opportunities to attend quality professional development testifies to the importance placed on developing skills and integrating IWBs in the classroom. Boyle (2002) states that "to be successful with an interactive whiteboard, teachers need confidence, which comes by guidance from colleagues and in-house training sessions" (para. 13). This is a key point for successful use of IWBs by teachers.

After initial training, users should have the opportunity to practice what was presented in the training sessions (Levy, 2002). According to Boyle, "The best way to gain confidence is through practice—by making mistakes and learning from them" (2002, para. 14). Participants in Beauchamp's study (2004) emphasized their preference on

learning a set of skills first before advancing. Ertmer (1999) suggests that in addition to teachers having time to hone their skills to operate a piece of technology; those skills should also be developed within the curricular spectrum. Professional development must be a continual process, and the skills learned should be assimilated into the context where they will be integrated.

Because professional development is ongoing and due to the variances in teacher's skills, training should be customized to target subgroups based on the teachers' skills (Beauchamp, 2004; Buckenmeyer, 2010; DeSantis, 2012; Levy, 2002; Plair, 2008). Designing a long-term plan for IWB training by which instruction is scaffolded with regards to IWB features, uses, and teachers' capabilities can boost IWB use in the classroom (DeSantis, 2012).

Internal support system. Administrators who use technology effectively gain teachers' support in its use (Glover & Miller, 2002; Jones, 2001). Even teachers with advanced skills who use IWBs can motivate others (Glover et al., 2005). A positive correlation between leadership and teachers exists that affects the rate and depth of change in instructional practices. This evolves as teachers see the transformation in student motivation, achievement, and interactive teaching benefits (Glover & Miller, 2003).

An internal support system is ideal to provide continual support to teachers within the district. Networking between teachers is a beneficial resource. Collaboration has been shown to aid in the use of IWBs (Glover et al., 2005). Teachers can share ideas and resources and seek technology and pedagogical advice while honing their skills (DeSantis, 2012, Johnson, 2011; Levy, 2002; Mims, Polly, Shepherd, and Inan's (2006)

et al., 2006). Starr (2010) states "teacher collaboration fostered by the introduction of technology also has the potential to introduce teachers to new instructional strategies they may not have discovered independently" (para. 16). Seventy-six of 164 respondents reported they rely on colleagues to learn how to use the IWBs in the study by Türel and Johnson (2012). Johnson (2011) found that teachers in the study believed collaboration was necessary to assist them in their use of IWBs. As noted by Johnson (2011) this dependence could be a result of teachers being insecure with how to incorporate IWBs into their teaching.

Technical support must be available to help resolve issues with the day-to-day operation of IWBs (Smith et al., 2005). Teachers can be reluctant to use IWBs if they perceive technical issues could occur (Beeland, 2002). They must overcome this and understand that, when using technology, there will be times when teaching does not go smoothly. An increased level of confidence for technology use and having back-up plans in case of technical problems can help relieve their hesitations (Beeland, 2002; Ertmer, 1999; Levy, 2002), but it is foreseeable that teachers successful in using IWBs may abandon their use if they do not receive timely support when needed (Buckenmeyer, 2010).

Adequate technology access. Providing teachers with a level of access that does not hinder their use of IWBs in teaching is critical. There have been instances where teachers find cool Web sites, videos, or programs the morning before their first class. Limited access to these tools or restrictions on what they can personally install on their computers is a roadblock. Teachers do not want to have to make a request and wait days or even weeks to be able to use these resources.

Not only should teachers have an appropriate level of control, access to the right equipment is also needed (Glover et al., 2005). For example, Cuthell noted that "there was a strong link between the levels of enthusiasm and the number and location of boards within a school" (Cuthell, 2003, Teacher Perspectives section, para. 1). Developing IWB skills comes through practice. Levy (2002) suggests teachers who have limited or inconvenient access to an IWB will not be motivated to develop interactive lessons that use the technology.

Implications

Interactive whiteboards (IWBs), touch-sensitive screens connected to a computer and a projector, seem to be finding their place in education as more classrooms are becoming equipped with this technology. Hailed as a beneficial medium aiding teachers with interactive teaching strategies, IWBs boast tools and features that promote interactive teaching and provide avenues for teachers to create dynamic lessons that captivate and focus students. The multitude of tools and features accompanying the IWB to support interactive teaching are at the teachers' and learners' fingertips. They can enhance presentations (Boyle, 2002) and result in information being more accurately depicted. Furthermore, through careful planning, the lessons teachers create can address the varied learning styles existing in a classroom (SMART Technologies ULC, 2009).

Because of the increased interactions and multiple modalities reached, students in IWB classrooms may have a boosted instructional experience. IWBs also give teachers the opportunity to save lessons for future use and make modifications easier, which can be a time saver for both the teacher and student. Critical factors for the successful implementation of IWBs can be categorized as teachers' beliefs and the schools'

environment. The value teachers place on IWBs is related to their own level of technology skills and to their pedagogical foundation. For success, teachers must value and see the benefits of the technology's use in the classroom. This may require a pedagogical change for the teacher (Beauchamp, 2004; Ertmer, 1999). Furthermore, different phases of acceptance of IWBs are connected to teachers' beliefs and skills (Beauchamp, 2004; Glover & Miller, 2003). Some can merely see the IWB as a blackboard/whiteboard replacement; others can push the limits of what IWBs can bring to the classroom. Türel and Johnson (2012) suggested that when teachers who are hesitant or unwilling to use IWBs are continually encouraged, positive attitudes often form, IWB use is adopted, effective integration takes place, and coping skills regarding technical issues grow.

In reference to the school environment, Glover et al. (2005) describe a culture of use. Within this culture, professional development, internal support systems, and adequate technology access are necessary for teachers to effectively use the IWBs and become interactive teachers (Ertmer, 1999; Glover et al., 2005; Plair, 2008; Sessoms, 2008). Time and opportunities to practice skills are necessary if the value of IWBs is to improve. Structuring professional development based on teachers' skills and allowing time afterwards for teachers to practice the new skills can help build confidence. Quality professional development opportunities should be given to teachers, and it should be scaffolded to support teachers' varying skill levels. Buckenmeyer (2010) generalizes in her study by stating that "effective technology integration will only occur through sustained training and professional development activities, which requires time allotted to that purpose" (p. 34). Internal support systems are crucial to successful implementation.

Administrators using technology demonstrate to teachers it is valuable. Teachers who are technology literate can also provide internal support. When teachers need help, they can collaborate with more advanced users to increase their comfort level as they use IWBs more often and develop contingency strategies when a lesson does not go as planned. Adequate and convenient access to IWBs and resources to use with them is necessary for teachers to incorporate this technology in their teaching. Johnson (2006) emphasizes this point and purports that with any type of technology adoption, a culture shift will not occur without easy access and a push to use it.

Interactive teaching strives to engage students with the content of the lesson (Beeland, 2002; Glover et al., 2005; Haldane, 2007). Because of the numerous features of IWBs, teachers have a range of choice in lesson design (SMART Technologies ULC, 2009). As their comfort level with technology increases, their lessons reflect a more interactive style.

Chapter Summary

Utilization of IWBs in education is on the rise. IWBs allow teachers to interact with a computer via a touch-sensitive screen connected to a projector. The plethora of tools and features available with them fosters teaching with a multi-modal approach. Content can be presented in multiple sensory channels, which can result in students engaging with content more deeply. Graphics, text, sound, and content manipulation afforded by the IWBs supply teachers with a toolbox to design interactive lessons. Enhanced instructional strategies result when teaching with IWBs. However, careful consideration should be used when designing instruction with technology. The use of technology should have a purpose and not be used merely because it is available.

The influx of IWBs in K-12 schools can be attributed to many factors, a major one being the need to transform teaching to an interactive platform. Technology plays a critical part in this transition. To facilitate success in creating and sustaining interactive learning environments, the National Educational Technology Standards for Teachers has outlined which skills must to be taught to students and used for instruction by teachers. Benefits of IWBs can be categorized by the tools available to teachers to support interactive teacher and by the multiple delivery methods of instruction to engage students in learning. Furthermore, use of IWBs tools and features allows a clearer and more accurate depiction of content, which can result in a more streamlined instructional pace. As IWB use increase, further research on the educational impact will be needed. Areas of consideration are teacher- or student-centered instruction, student achievement, benefits by content areas, and measures for successful implementation and integration in education.

A variety of instructional strategies is beneficial to learners. Varied strategies can present content in different formats, levels, and sequences. For this study, those instructional strategies aimed at presenting information using multi-modal styles were investigated. Learning styles distinguished by the channels which information can be presented and received were discussed. The benefit of selecting the instructional strategy to match goals of instruction rather than a student's preferred learning style was also highlighted. It is thought that students can receive information regardless of their preferred style; however, it may take additional instruction for some if it is not presented in the way they prefer. Visual, auditory, and kinesthetic (VAK) sensory modes are channels learners receive and process information. Visual learners prefer to have

information presented using visual aids, and they prefer taking notes. They transfer information to a visual representation. Auditory learners' thinking process is stimulated by sound. This sound could be through narration or sound clips. Kinesthetic learners prefer to be involved with the content, either by physical involvement or by an involvement portrayal. Interactive lessons demonstrating the capabilities of IWBs to appeal to multiple modes and illustrating the constructs of interactive lessons were given.

IWBs, like most technology, have influential factors that support the integration of the technology in the classroom. The value placed on IWB use stems from teachers' personal value of technology, which can be related to their technology skills. Actual level of IWB use can also be related to the teachers' level of technology skills. Time to adjust and learn technology is necessary for successful integration, and modification in pedagogical foundations is essential. Pedagogy also has to embrace technology and accept that this change will require effort, including quality and continual professional development that matches teachers' skills throughout the phases of implementation. An internal support system that can be accessed outside of training is also important, so that novice teachers can call upon advanced users for guidance. Lastly, adequate access is a must if teachers are going to be expected to use IWBs. Teachers will not want to use IWBs without readily available access. Access also refers to the capability to retrieve external resources like Internet sites and videos.

Chapter 3 - Methodology

The purpose of this research was to capture the most commonly used instructional strategies of those acquired by the participants who attended a series of SMART Board professional development workshops, and to discover which tools and features of the SMART Board they were implementing. Within these instructional practices, the visual, auditory, and kinesthetic learning modalities being deployed were sought. Furthermore, participants' perceptions of factors that enable and hinder the use of the acquired strategies, tools, and features were included. For the purpose of this research, SMART Boards were defined as interactive touch-screens that work in conjunction with a projector, computer, and Notebook software. This study was guided by four research questions:

1. What instructional strategies presented during the SMART Board professional development workshop do participants use most often?
2. Which of the SMART Board tools and features shared during the workshop do participants most often use?
3. In what ways are visual, auditory, and kinesthetic learning modalities embedded in lessons which utilize the SMART Board?
4. What factors have influenced the instructional strategies, tools, and features that participants use most often?

Research Design

A qualitative, case study was the method of inquiry used in this study. Merriam (2009) characterizes qualitative research as a means to "understanding the phenomenon of interests from the participants' perspectives, not the researcher's" (p. 14). Baxter and

Jack (2008) indicate the nature of this type of research requires exploring a phenomenon through the lens of the participants and within the context it is being studied. By capturing the participants' viewpoints about instructional strategies and functions of the SMART Board, a more descriptive account and heightened meaning of the issue within the environment in which it will be studied results.

Data sources for collecting data in a case study may include documents, interviews, observations, and physical artifacts (Baxter & Jack, 2008; Merriam, 2009); and in this case study, interviews were used to collected data. Qualitative research is not meant to make predictions or used for unveiling facts. Because data collection is mainly carried out by the researcher, an inductive and interpretative approach is used in analyzing data (Merriam, 2009). The researcher forms patterns to make sense out of the data for the purpose of answering the research questions, and findings are shown as descriptive accounts of the participants' experiences rather than numerical results. Merriam (2009) further defines case study as "particularistic, descriptive, and heuristic" (p. 43). Particularistic means there is a concentrated focus on a phenomenon or event. This study specifically related to four participants that attended a specialized SMART Board training. According to Merriam, "descriptive means that the end product of a case study is a rich, 'thick' description of the phenomenon under study" (p. 43). The inductive, interpretive approach to analyzing data allowed patterns to be categorized into themes and detailed findings presented that described the participants' use of instructional strategies, use of SMART Board tools and features, approach to different learning modalities, and influential factors for using the SMART Board. Findings of this case study are informative to teachers, professional development coordinators, school

administrators, technology staff, and teacher educators. Merriam suggests the heuristic aspect of case study serves to "illuminate the reader's understanding of the phenomenon under study" (p. 44).

The aim of case study is to focus on a phenomenon, of which, specific characteristics are used in defining it. These delimitations are the boundaries of the case. As defined by Merriam (2009), "a *case study* is an in-depth description and analysis of a bounded system" (p. 40). To define the unit of analysis for this study, the case was bounded by the site, the time frame, and the participants of specific SMART Board certification training. The site of research, participants, interviews, data analysis, risk and benefits, and ethical considerations were elements of the case study which helped shape the phenomenon within its context.

Participants

For this case study, purposeful sampling was used in the participant selection process. Chein and Patton (as cited in Merriam, 2009, p. 77) assert that to gain a rich description of the case being studied, it is necessary to seek participants who can contribute the greatest insight and an in-depth understanding of the topic being investigated.

The school district selected five participants to attend an in-house SMART Board training workshop. Only four of the five participants were selected to participate because the researcher of the study is the fifth participant in the SMART Board training. It was the participants' specific experiences gained from the training that were under investigation. The participants included three females and one male.

Selection of these five participants to attend the workshop was based on their advanced technology skills, and the value they place on the use of technology as an instructional medium within the classroom. Also, participants were intermediate level SMART Board users. Upon completion of the 3-day workshop, 18 hours of professional development were awarded to each of the five teachers. By enhancing their current ability to work with and expand their knowledge of SMART Boards, the district felt these trained teachers would be an asset to the district. The teachers would serve as lead SMART Board users and, in turn, would host workshops for other teachers within the school district.

Participants were teachers who represented grades 6 and 9 through 12. Content areas included economics, history, mathematics, media sciences, and sciences. Among the four participants, multiple content areas and five grade levels were represented.

The average number of years teaching within the school district for the four selected participants was 10.25 years and average total number of years teaching was 12.5 years. For both within the school district and total years teaching, the minimum was three years and the maximum was 16 years.

At the onset of the interviews, the purpose of the study, the procedures for conducting the study, participants' rights, and confidentiality were explained. Pseudonyms were used to distinguish the participants, and participants had the opportunity to select their alias at the time of the interview. An Informed Consent Form was completed by each participant. (A copy of this form is provided in Appendix A.) To validate the participants' information, member checks were utilized.

Site of Research

The study was conducted in a public, K-12 school district in a rural town in the southeastern part of United States. While the school district is within the city limits, most students live outside of the city limits in the encompassing county. The county population is approximately 42,000, and included in that count is the city population of approximately 26,000. The school district has a college preparatory focus with a mission of meeting needs of the students. The school district will be referred to as GCT.

Enrollment is approximately 3,400, and the study body is predominately Caucasian with 2% being of other ethnical backgrounds.

The faculty is 100% Caucasian. There are 266 faculty, and 19 administrators. The student teacher ratio is 13 to 1. Faculty members' years of service range from 1 to 48, with the average being 19 years.

The district hosted the SMART Board training as a train-the-trainer model to continue efforts for integrating various technologies in the school district. This type of professional development has limited funds, so only five participants were enlisted. Participants will serve as district trainers in future SMART Board professional development sessions to educate other teachers.

For the school district, 45% of the student population receives free and reduced meals. The student population for the participants who are regular classroom teachers is 238 students, and approximately 35.3% receive free and reduced meals. Additionally, 10% of the students have been retained in at least one grade.

Data Collection

The purpose of this research was to capture the most commonly used instructional strategies of those acquired by the participants who attended a series of SMART Board professional development workshops, and to discover which tools and features of the SMART Board they were implementing. Within these instructional practices, the visual, auditory, and kinesthetic learning modalities being deployed were sought. Furthermore, participants' perceptions of factors that enable and hinder the use of the acquired strategies, tools, and features were included. Data was collected using in-depth face-to-face interviews and conducted on an individual basis, aligning with Patton's stated purpose "to allow us to enter into the other person's perspective" (Patton, 1990). A semi-structured interview format was used as it allows for a structured process, for interviewees to respond to the same questions which keep the study's scope in perspective, and for analysis of data to remain in line with the purpose of the research (Patton, 1990, p. 348). Interviews allowed participants to share their own perceptions using their own words. Merriam (2009) points out that this type of interview is beneficial when information associated with a specific topic is desired but flexibility to adjust the interview process based on interviewees' responses is also important.

Each interview question was aligned to one of the four research questions. Careful consideration was given to the interview questions and their alignment to the research questions. Figure 1 depicts the correlation of the interview questions with their respective research question.

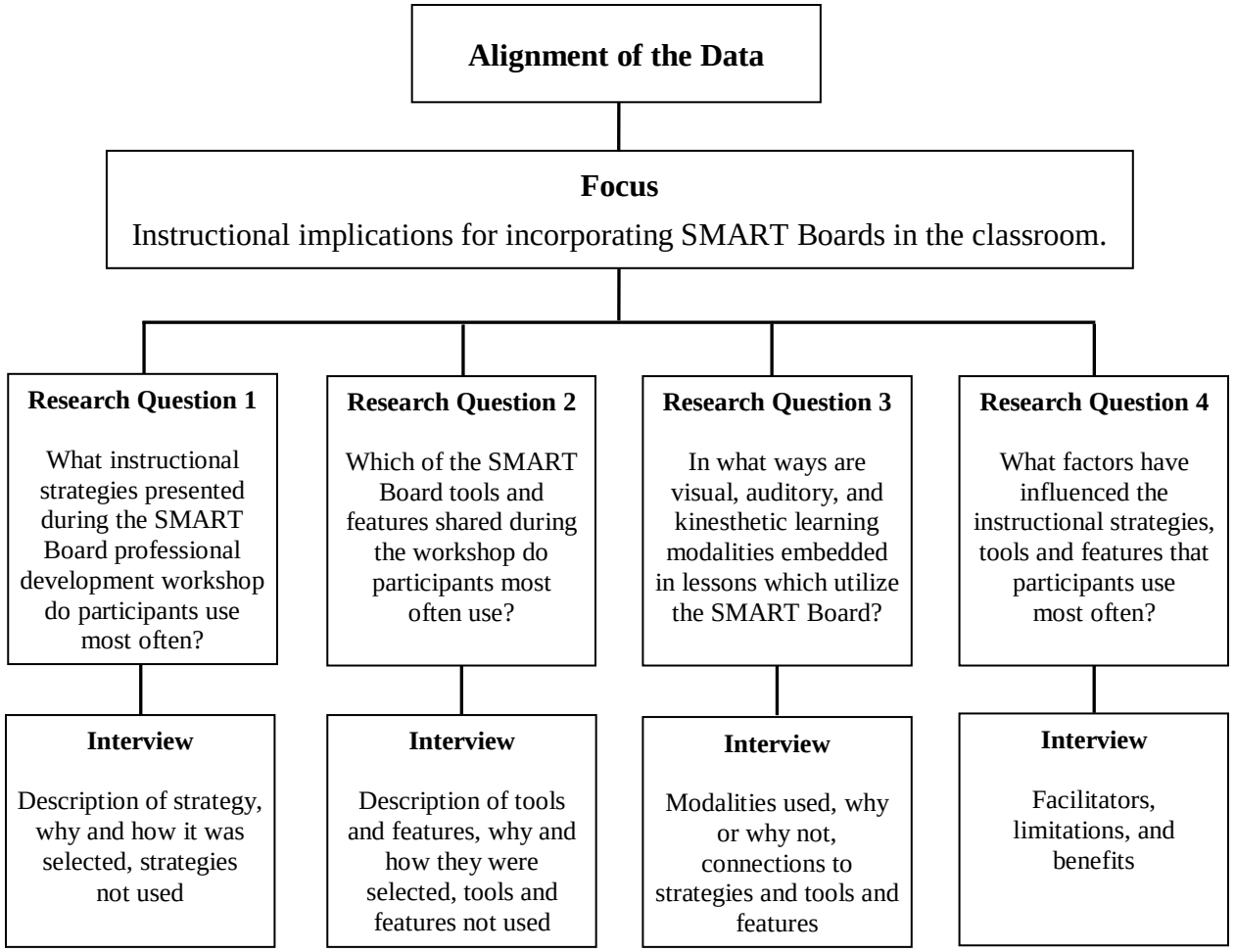


Figure 1. Research questions and data collection.

Data collection process. The first phase of data collection, scheduling interviews, was initiated by sending an email (see Appendix A) to the four prospective participants of this study to solicit their participation. One participant immediately responded to affirm participation and schedule the interview. On the same day, a second participant, who works in the same building as the researcher, scheduled her interview face-to-face. It was not until the following day the remaining two interviews were scheduled. The researcher made phone calls to the remaining two participants. One participant scheduled her interview over the phone. The remaining participant did not email or return the phone call. The interview was finally scheduled after visiting the participant face-to-face. The interviews were scheduled for the upcoming Monday and Tuesday, and the second participant's interview had to be changed from Tuesday to Monday. A research journal was used to document this phase of the data collection process. The journal also served as a log for thoughts and ideas during data collection. Below is an excerpt from the research journal documenting the interview scheduling process:

Thursday, January 17, 2013

1. *Sent email to* [redacted] *&* [redacted] *to solicit dates for interviews*
2. *Talked with* [redacted] *in person, scheduled her interview for Tuesday, January 22, 2013 @ 3:30*
3. *Received email from* [redacted] *and scheduled interview for Monday, January 21, 2013 @ 4:20ish when he finishes bus route*

Friday, January 18, 2013

1. *Called* [redacted] *at 9:11 a.m., left message with* [redacted] *for her to call me back on my cell*
2. *Called* [redacted] *at 9:10 a.m. to find out* [redacted] *conference period time (10:40-11:20)*
3. *Called* [redacted] *back at 1:42 p.m., scheduled interview on Monday, January 21, 2013 at 12:30 at High School Media Center*
4. *Cleared my time away from campus with* [redacted] *, my principal*

5. *Secured [redacted] to watch my class while I am conducting interview with [redacted]*
6. *Printed consent form, workshop agenda, and interview protocol for each interview*
7. *Stopped by Middle School for personal visit with [redacted]. Scheduled her interview for Tuesday, January 22, 2013 at 3:30 [redacted] room.*

An Informed Consent Form was completed by each participant (see Appendix B). The face-to-face interviews were based on the interview protocol available in Appendix C. Each participant was informed that two recordings were being made: a cassette recording and a digital voice recording. The purpose of this study and the participant's rights and confidentiality were explained at the beginning of the interview. No data collection had started at this point. Participants were also asked if they preferred using a pseudonym; three of the four declined. For consistency, the one participant's suggestion was not used. Instead, each participant was referred to as "Participant #". To refresh the participants' schemata of the SMART Board training, a typed agenda outlining the topics covered during the training was presented (see Appendix D). Each participant was given up to five minutes to review the agenda. Each interview lasted approximately 45 minutes. Table 1 summarizes the roles and responsibilities of the researcher and participant during the data collection phase. Table 2 illustrates how the collected data relates to the research questions of this study.

Data Analysis

The data analysis process began after the first set of interviews. Merriam (2009) upholds that data analysis is the process of constructing meaning from the data for the purpose of answering the research questions. Meaning is arrived through a continual comparison of data and occurs simultaneously with data collection. Three of the four interviews were conducted on the first day, and the final one on the following day. Two

Table 1

Data Collection Roles and Responsibilities

Role	Preliminary Work	Interview	Follow Up
Participant	Read and complete participant consent form	Participate in interview	Review member check documents
			Provide clarification if necessary
Researcher	Select participants	Gather consent forms	Evaluate interviews and prepare for analysis
	Obtain participant consent	Conduct interviews	Prepare member check documents
	Schedule interviews		

Table 2

Research Questions and Data Source

Question	Source
1. What instructional strategies presenting during the SMART Board professional development workshop do participants use most often?	
• Lesson with instructional strategies from workshop	Interview
• Value of this lesson and rationale for instructional strategies used	Interview
• Instructional strategies not being utilized and Self-constructed instructional strategies	Interview
• Benefits of presented/self-constructed instructional strategies	Interview
2. Which of the SMART Board tools and features shared during the workshops do participants most often use?	
• Lesson with tools and features from workshop	Interview
• Value of these tools and features	Interview
• Tools and features not being utilized/Self-taught tools and features	Interview
• Benefits of presented/self-taught tools and features	Interview
3. In what ways are visual, auditory, and kinesthetic learning modalities embedded in lessons which utilize the SMART Board?	
• Modalities used/not used and rationale	Interview
• Interactive whiteboard lesson incorporating different modalities	Interview
• VAK connections in described instructional strategy lesson	Interview
• VAK connections in described tools and features lesson	Interview
4. What factors have influenced the instructional strategies, tools, and features that participants use most often?	
• Factors influencing the use of instructional strategies	Interview
• Factors influencing the use of tools and features	Interview

recordings were made during each interview: cassette and digital. After the first round of interviews was completed, the cassette recording was delivered to a third party to be transcribed. The next day, the final interview was completed, and the cassette tape was delivered to the transcriptionist.

Preliminary analysis. Between the time of the interviews and receiving transcripts, the researcher listened to all digital recording two times. As they were listened to, notes were made in the researcher's journal about important ideas and connections to what other participants stated, including similarities and contradictions. An excerpt from the journal follows:

> *Monday, January 21, 2013*
> *I listened to two of the three digital recordings tonight. While listening, I made notes about important comments the participant made, what it was referencing, potential meaning. The time these comments were made was recorded for future reference.*

Initially, two transcripts were received from the transcriptionist. They were read through once to orient the researcher to the information. No coding was done during this reading. This process was repeated when the remaining two transcripts were received. In some cases, there were blanks in the transcripts where the transcriptionist could not hear the tape. The digital recordings were reviewed by the researcher to fill in the missing participant responses.

Phase I. After all transcripts had been read once and blanks in the participants' conversations filled in during this reading, the researcher commenced reading through the transcripts a second time, highlighting important words and segments. Any information that could possibly be used to answer the research questions was coded. Merriam (2009) refers to this type of coding as open coding (p. 178). The first round of coding consisted

of comparing the key points highlighted in the transcripts from the second reading with notes that had been made when listening to the recordings during the preliminary analysis. Notes were also made about information that supported other research questions. Figure 2 is an image of a partial transcript after the first round of coding.

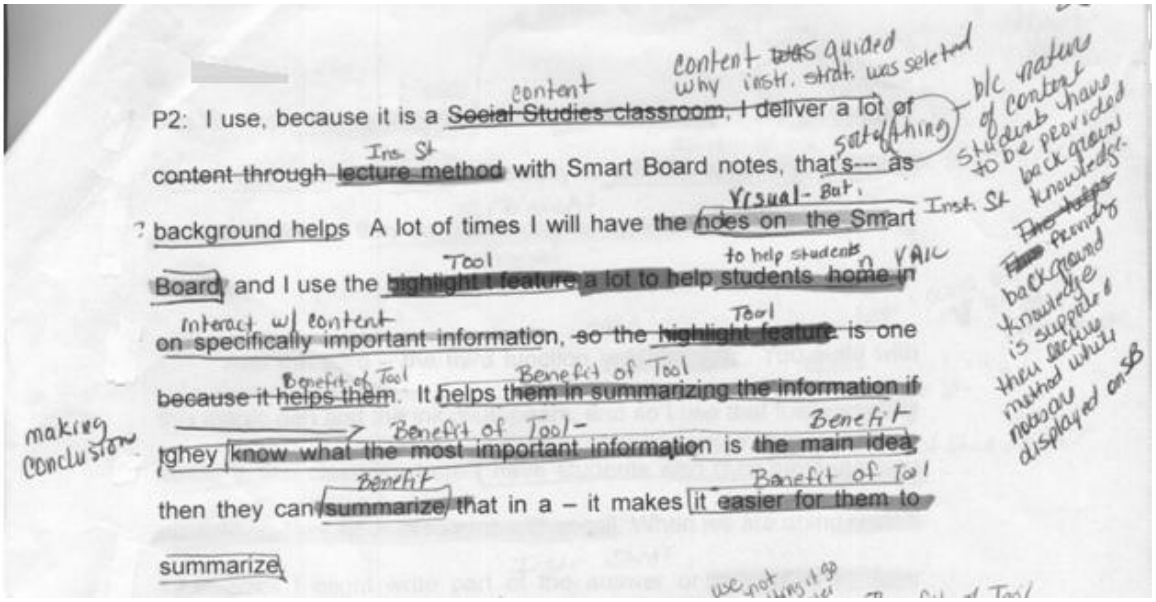


Figure 2. Excerpt of highlighted participant interview.

To facilitate this process, the highlighted information was entered into an Excel spreadsheet (see Figure 3) to collectively be able to review the data for all participants. The original spreadsheet included columns for a participant code, interview question order, interview question, participant response, key points, and "1st Coding." Using the coded transcripts, a second round of coding was done by reviewing the information to identify patterns, condense data, and construct categories underpinned by recurring patterns. Also as Merriam (2009) points out, certain sentences can be dissected so that part of the sentence supports one idea while another segment a different idea (pp.185-186). This second coding pass was aimed at identifying emerging themes from the

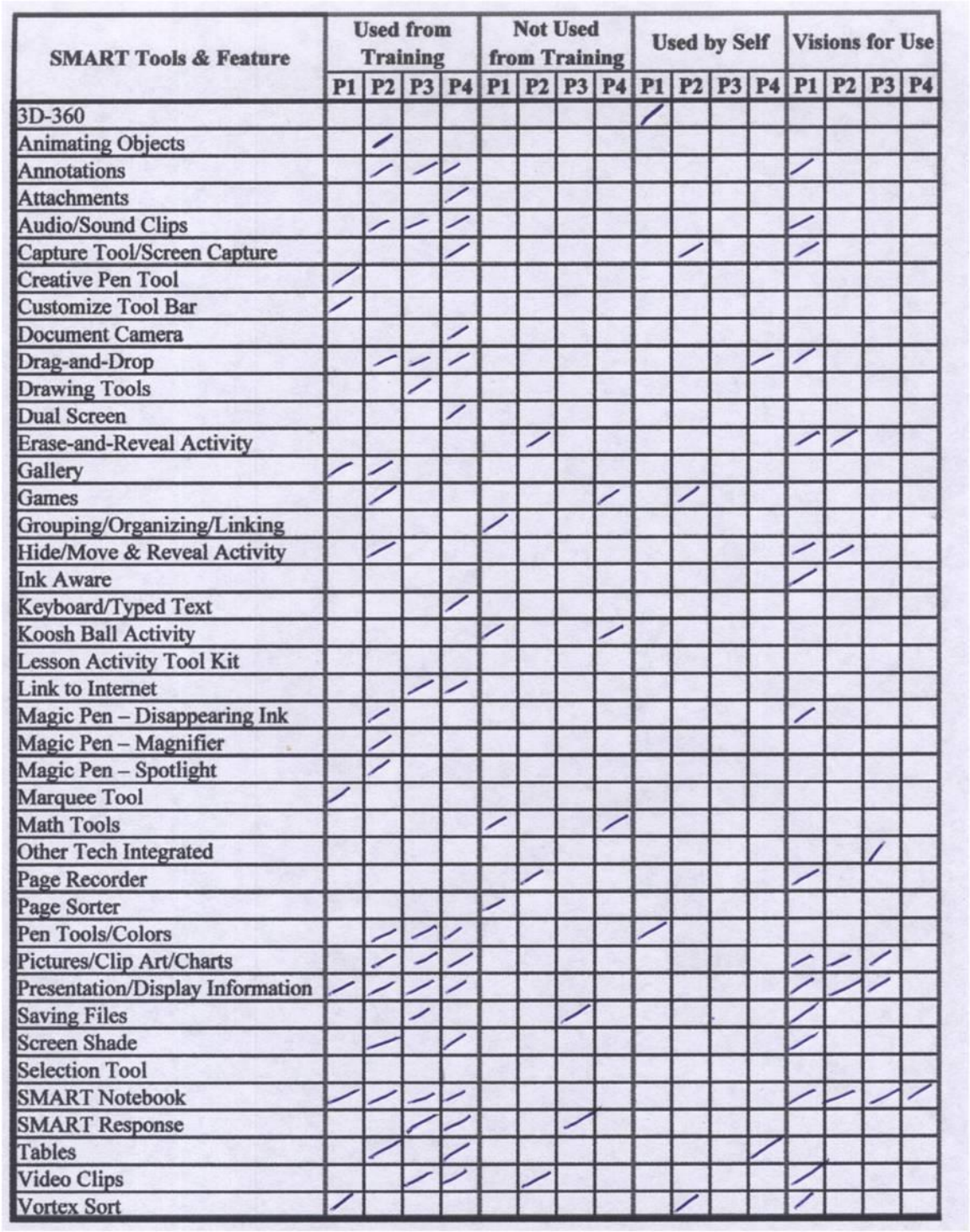
	A	B	C	D	E	F	G	H
2	P#	? Ord	**Question**	**Response**	**Key Points**	**1st Coding**	**2nd Coding**	**3rd Coding**
159	P4	154	*What factors have enabled your use of these Smart Board tools and features?*	***The training and then you just sit down and work with it and talk with other teachers, how they --- in the rooms and I've got to teach a couple of classes that I have in the district. I learned stuff there, different ways they use it too, so***	Training has helped with use of SBTF; talking with other teachers; taught classes for district	A better knowledge of SBTF stems from training	SBTF cannot be used unless SB users know they exist	Enabling Factors for SBTF - Training
160	P4	155	*Are there tools and features presented at the workshop that you are not using?*	*the math tools, like I said, I don't usually use that much because I don't teach math a* ***nd I haven't used much of the game design because they usually prefer the SMART response system because they have a piece of technology in their hands***	Don't use game design as kids prefer to use SR where have something in hand	Interest in using SBTF varies between teachers; use may depend on students too	SBTF may be preferred by teacher	Reasons for Not Using SBTF - Preference for TF
161	P4	156	*Are there tools and features presented at the workshop that you are not using?*	***the math tools, like I said, I don't usually use that much because I don't teach math*** *and I haven't used much of the game design because they usually ---response ----------because they have a piece of technology in their hands*	Math tools are used; I don't teach math	SBTF not used because don't teach math	SBTF not used by teacher if not related to content area taught	Reasons for Not using SBTF - Teacher Content Area
162	P4	157	*What factors have hindered your use of the Smart Board tools and features?*	*Again,* ***the Board working and the technology behind it. The --- and the glitches,*** *and the time. It's hard to get a lesson pre-made—between planning and grading, those things --*	Board working, technology behind it	SBTF cannot be used if technology does not work	Using SBTF depend on equipment working/available	Hindering Factors for SBTF - Lack of Access to Equipment
163	P4	158	*What factors have hindered your use of the Smart Board tools and features?*	*Again, the Board working and the technology behind it. The --- and the glitches,* ***and the time. It's hard to get a lesson pre-made—between planning and grading, those things --***	Making lessons using SBTF requires time and hard to get one made with other tasks	Using SBTF in lessons requires time	SBTF may not be used because of time required to do so	Hindering Factors for SBTF - Time

Figure 3. Excerpt of Excel spreadsheet used for interview coding.

categories which eventually resulted in the themes for this study, and the codes were inserted in the column "2nd Coding" (see Figure 3). Phase I consisted of three readings of the transcripts and two rounds of coding

Phase II. This phase of data analysis consisted of at least three rounds of reviewing the data in Excel while referencing the transcripts. A third round of coding was undertaken as the researcher continued reviewing the data to start condensing the key points into preliminary themes. Comparison within each participant's data and across all participants' data was done to help define the preliminary themes. The column "3rd Coding" was added during this phase of data analysis. By having the interview information in Excel, the researcher could more easily see evidence supporting the way the preliminary themes were being formed. (This is noted by the bolded excerpts of the interviews in the "Response" column in Figure 3.) Approximately 100 codes were condensed to 43 categories by looking for common ideas and seeking ways the codes could be aligned to the research questions. Below is another excerpt of the researcher's journal:

> *Wednesday, February 6, 2013*
> *I read through the transcript of Participant 2, highlighting key points and making notes about categories and potential themes. At this point, I decided to create an Excel spreadsheet to record the interview data of each participant. Columns to denote the participant and question number were to be used along with an ordinal for future sorting purposes. The thought was to have each participant's data coded such as P1-1 to represent Participant 1 - first response. As the key points would be further condensed and sorted, this type of labeling would help me should I need to sort the data back to the original interview path.*
>
> *When looking at factors determining their relationship to instructional strategies or SMART Board tools and features, overlaps in the factors were emerging. For example, participants contributed time constraints and limitations as reasons instructional strategies and tools and features were not being used.*



SMART Tools & Feature	Used from Training				Not Used from Training				Used by Self				Visions for Use			
	P1	P2	P3	P4	P1	P2	P3	P4	P1	P2	P3	P4	P1	P2	P3	P4
3D-360									/							
Animating Objects		/														
Annotations		/	/	/									/			
Attachments				/												
Audio/Sound Clips		/	/	/									/			
Capture Tool/Screen Capture				/						/			/			
Creative Pen Tool	/															
Customize Tool Bar	/															
Document Camera				/												
Drag-and-Drop		/	/	/								/	/			
Drawing Tools			/													
Dual Screen				/												
Erase-and-Reveal Activity						/							/	/		
Gallery	/	/														
Games		/						/		/						
Grouping/Organizing/Linking					/											
Hide/Move & Reveal Activity		/											/	/		
Ink Aware													/			
Keyboard/Typed Text				/												
Koosh Ball Activity					/			/								
Lesson Activity Tool Kit																
Link to Internet			/	/												
Magic Pen – Disappearing Ink		/											/			
Magic Pen – Magnifier		/														
Magic Pen – Spotlight		/														
Marquee Tool	/															
Math Tools					/			/								
Other Tech Integrated															/	
Page Recorder						/							/			
Page Sorter					/											
Pen Tools/Colors		/	/	/					/							
Pictures/Clip Art/Charts		/	/	/									/	/	/	
Presentation/Display Information	/	/	/	/									/	/	/	
Saving Files			/				/						/			
Screen Shade		/		/									/			
Selection Tool																
SMART Notebook	/	/	/	/									/	/	/	/
SMART Response			/	/			/									
Tables		/		/								/				
Video Clips			/	/		/							/			
Vortex Sort	/									/			/			

Figure 4. Check sheet for recording use of SMART Board tools and features.

In determining what SMART Board tools and features were used, the researcher read through the transcripts for the sole purpose of identifying the tools and features. Each participant was asked to describe a lesson which used SMART Board tools and features demonstrated in training. They were also asked if any SMART Board tools and features shown in the training were not being utilized. Additionally, participants were asked to describe a lesson utilizing SMART Board tools and features learned outside of the training. From their responses to these questions, a list was compiled for the tools and features mentioned by each of the participants (see Figure 4). After all interviews had been reviewed, the tools and features were grouped by purpose, and columns for each participant under each use-level were inserted. The transcripts were read again to ensure all tools and features had been determined with the correct use-level.

Phase III. In this next phase, the 43 categories were aligned to the research questions and organized into 15 preliminary themes. Upon further analysis, the 15 preliminary themes were condensed into 6 overarching themes. As shown in Figure 5 on page 53, six overarching themes emerged in correlation to the research questions. The six themes are 1) teacher- vs. student-centered instruction; 2) rationale for use of instructional strategies; 3) patterns of use for SMART Board tools and features; 4) reasons for participants' use of SMART Board tools and features; 5) perceptions of integrating visual, auditory, and kinesthetic (VAK) learning modalities; and 6) enabling and hindering factors for use. The structure of Chapter 4 presents data by research question.

Validating the interpretation of data was a reflection of the participants' perceptions; each theme with corroborating data was emailed to them for member checks.

If there were no discrepancies, participants were informed that no response was necessary. A summary of the phases of data analysis is illustrated in Table 3.

Table 3

Process of Data Analysis

Data Analysis Process
Preliminary Phase • Listened to digital recordings two times • Recorded notes of thoughts, themes, and information between participants in research journal • Interviews being transcribed by third-party • Read transcripts as they were received to fill in blanks due to inaudible tapes
Phase I • Read through each transcribed interview • Highlighted main points in each interview • Transferred highlighted main points of each interview to Excel • Made notes in journal about main points
Phase II • Numerous passes through data in Excel • Began condensing key points into preliminary themes • Compared coding across interviews for consistency • Created check sheet SMART Board tools and features by use for each participant • Made notes in journal about possible emerging themes and sub-themes
Phase III • Aligned data/preliminary themes with research question • Overarching themes and sub-themes emerged for each research question • Sent member check information to participants

Trustworthiness

Due to the study being one of a qualitative nature, various steps were taken to ensure the reliability of the research. During the interviews, notes were written, and if the participant's response was unclear, the researcher asked for clarification. Digital,

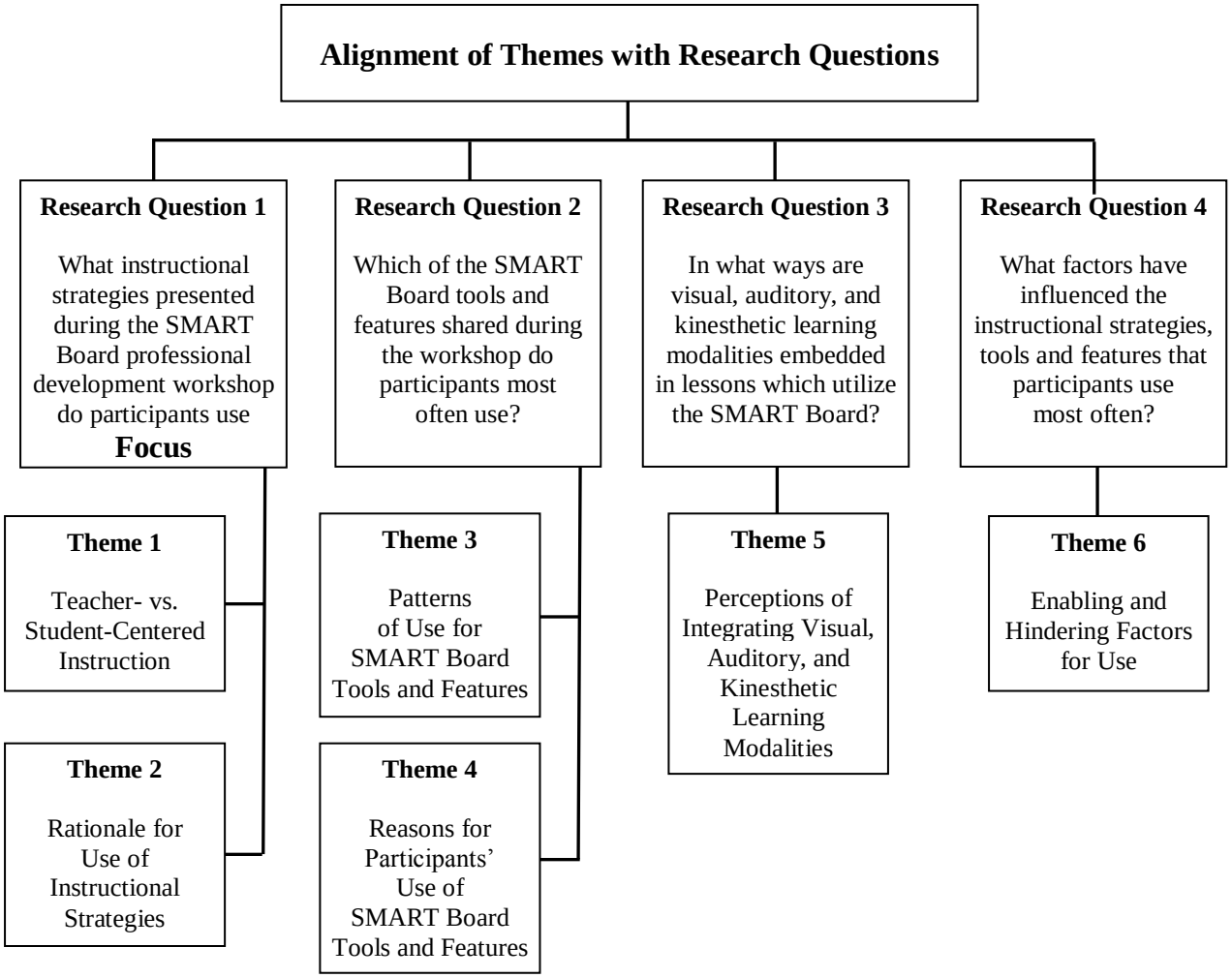


Figure 5. Research questions and themes.

recordings and transcripts were reviewed multiple times. A journal was used throughout the process of data collection and data analysis. Through the use of member checks participants were asked to validate the information for content and confirm the researcher's interpretations of their responses.

Researcher's Perspectives and Biases

The use of technology in the classroom is another medium for reaching students and enhancing their learning experience. SMART Boards provide interactivity to engage students and facilitate that process of reaching deeper levels of thinking skills. Simply integrating technology will not necessarily improve teaching or learning. However, students are more likely to "buy-in" to learning when giving the opportunity to take an active role in their learning. Simply installing technology in classrooms or making it available to teachers and students does not mean it will be used. Using this technology has a learning curve associated with it. Teachers with no prior experience and who are uncomfortable using technologies in general may be reluctant to incorporate the SMART Board. Teachers who are not willing to modify their current teaching practices may not see the benefits that can arise from its use either.

Interacting with teachers falling within a broad spectrum of technology use, I find if they are shown how to use the technology, and more specifically, technology within their content area, it becomes a higher priority for them to start using technology. I believe that identifying common instructional strategies, tools used, and effective ways of using the SMART Board can improve the integration of the interactive teaching tool. Once teachers gain confidence in this tool, they are more apt to adopt other uses of technology.

As mentioned in the participant section, I revealed I am the fifth participant of the SMART Board training workshops. I am a certified SMART Board trainer, and I do conduct workshops for clients. Additionally, I use this technology on a daily basis in my classroom.

Ethical Considerations

During this study, the ethical considerations were as follows:

1. Participants were informed they were participating in research.
2. Participants were informed their participation was completely voluntary and does not affect their teaching position.
3. Participants were informed that they could withdraw from the study at any time with no penalty.
4. Participants' confidentially was to be maintained.

Chapter Summary

In this chapter, the methodology used to conduct this qualitative, case study research was detailed. The selection process for participants was explained, and the site where research took place was described. Interviews were used to gather data. Data was reviewed simultaneously as it was collected. Digital recordings were listened to as transcripts were typed. Multiple passes of the data were conducted to help reduce data into themes. A coding technique for labeling information that had potential to answer the research questions was used. The codes served to form themes. Steps were taken in this study to ensure the reliability of the research, to outline the researcher's perspectives and biases, and to uphold ethical considerations.

Chapter 4 - Report of the Findings

This study investigated the SMART Board infused instructional practices of four teachers who participated in SMART Board professional development. It explored instructional strategies, tools and features of the SMART Board, as well as various learning modalities addressed in their instruction. Factors supporting and thwarting the teachers' use of the SMART Board were also examined. Data analysis resulted in six themes. As demonstrated in Figure 5, the first two, teacher- vs. student-centered instruction and rationale for use of instructional strategies, align with research question one. Theme 3, patterns of use for SMART Board tools and features; and theme 4, reasons for participants' use of SMART Board tools and features, are aligned with the second research question. Theme 5, perceptions of integrating visual, auditory, and kinesthetic (VAK) learning modalities correlates to the third research question; and theme 6, enabling and hindering factors for use correlates to research question four. Data collection and analysis consisted of interviews; and by employing an inductive approach, as inherently distinctive in a qualitative research study (Merriam, 2009, p. 15), data was extracted and correlated with each of the themes as presented in this chapter. The participants' use of SMART Board tools and features was one focus of this research. The SMART Board components considered in this study, which are labeled by SMART as tools are: Calculator, Floating Tools, Keyboard, Magnifier, Notebook, Page Recorder, Pointer, Screen Capture, Screen Shade, Spotlight, and Video Player. These will be referred to as tools in this study. Notebook has its own collection of tools and features that are accessible when it is being utilized. In this study, tools and features that are specific to Notebook will be referred to as features. The presentation of findings is

arranged by research question. As data were organized into themes, sub-themes and categories, it became evident some information coincided with multiple themes.

Instructional Strategies

Research Question 1: What instructional strategies presented during the SMART Board professional development workshop do participants use most often?

As defined in Chapter 1, instructional strategies are the methods utilized by teachers as they present course content material to students. Two themes, teacher- vs. student-centered instruction, and the rationale for use of instructional strategies, emerged from the analysis of the interviews and are presented in this section. It should be noted that the participants' responses to these interview questions were not as robust as hoped. This could be addressed in future research by revisiting the interview protocols.

Theme 1: teacher- vs. student-centered instruction. The first theme emerged from participants' responses to interview questions. Each participant was asked to describe a lesson utilizing instructional strategies presented during the workshop and to tell if other instructional strategies from the workshop were not being used. They were also asked to describe an instructional strategy used that was learned outside of the SMART Board training. Responses provided by the participants can be divided into three sub-themes: 1) instructional strategies utilized, 2) instructional strategies not utilized, and 3) visions of using instructional strategies. Each of these sub-themes is presented next.

Instructional strategies utilized. This sub-theme emerged as the participants described the instructional strategy they were using from the training. Analysis revealed

two categories of instructional strategies: teacher-centered instruction and student-centered instruction.

Teacher-centered instruction. Based on participant responses, the most commonly mentioned used strategies can be categorized as teacher-centered instruction. Three of the four teachers described instructional strategies in which they presented information to students by displaying content and guiding students through the lessons or by explicitly pointing out relevant information.

The first example of teacher-centered instruction was shared by Participant 4. This participant described an English lesson in which the SMART Board was used to display a poem to analyze for figurative language:

> Participant 4: *We do a lot of hands-on activities with the SMART Board as far as, a lot of times I will take an image of an activity that we are going to work on. For example, a poem like we did today…we'll put the poem actually up on the SMART Board and then we start analyzing it, looking for maybe figurative language…they may add text by taking pens and they actually write down what it means and where it is located. They may annotate or come back, look at it and see if there are prepositional phrases.*

In this lesson, the poem is displayed on the SMART Board for the students to view as the teacher guides them through the process of identifying figurative language and prepositional phrases. As is the nature of teacher-centered instruction, the primary role of presenting instruction was filled by the teacher. The teacher and students were engaged in whole-class discourse as the English concepts were articulated through the lesson. For the most part, teacher-centered instructional strategies place students in a passive role. As indicated by the teacher's description of letting the students add text with the pens, defining the figurative language, and locating it in the poem, students had a more active part in learning as they interacted with the SMART Board. Typical of this

instructional strategy, students practiced the concept after it had been taught to help them understand the concept. In this lesson, practice was provided as students used the IWB pens to locate figurative language in the poem and write a related definition.

Participant 1 provides another example of teacher-centered instruction in describing a SMART Board lesson in which the learners used the IWB to practice the skills being taught:

> Participant 1: *For example, when I teach others how to use the marquee tool, I don't simply tell them what it will do. To learn how to use the SMART Board, you need to be able to practice. . . . you're going to introduce a concept and then they're going to practice using it at their computer station. I explain the function of the marquee tool while showing them how it works. They are at computers, so they can follow along with me and practice using the tool. Then, I invite them to come to the board and practice it there.*

This lesson exemplifies teacher-centered instruction based on a demonstration approach. The teacher starts the lesson by describing the marquee tool to the learners and then proceeds to demonstrate how it works. The learners are at individual computer stations, granting them the ability to practice the computer-related skill. Because the marquee tool is a SMART Board feature, the learners were also permitted to practice using the tool at the board. They were given a more active role in the instructional process than is typical of teacher-centered instruction.

Participant 2 also shared an example of teacher-centered instruction. This participant described a social studies lesson where the notes were displayed through the IWB and tools of the SMART Board were used to present information:

> Participant 2: . . . *because it is a Social Studies classroom, I deliver a lot of content through lecture method with SMART Board notes. A lot of times I will have the notes on the SMART Board, and I use the highlight feature to help students hone in on specifically important information. . . . It helps them in summarizing the information if they know what the most important information is.*

. . . to help students focus on important information, draw their attention to main ideas, I use the Magic Pen.

This participant used lecture as the teacher-centered instructional strategy to present social studies content information to the students. The students are in a passive role in this setting. While explaining the information to the students, the teacher uses the SMART Board tools to highlight and call the students' attention to the main ideas.

Student-centered instruction. This type of instructional strategy allows the student to be in more control of the learning process and the teacher acts as a facilitator. Participant 3 described an experience that was categorized as a student-centered instructional strategy, an Advanced Placement Environment Science lesson in which the SMART Board was used to model data:

> Participant 3: *In my mind, I am flipping the classroom. This is an AP class. . . . I'm having the students show me what they know. They have to articulate their understanding . . . I have students engaged at the board. The only time I actually put my hands on the board is to emphasize something that the students have pulled up. We were looking at how sea levels rise in coastal areas, predominately in the Caribbean and Hawaiian Islands, based on seasonality and determining where global climate changes levels. The AP question was a . . . preformed question. There are graphs that go along with it and different sources . . . when students finish one model, a mathematical module, they pull up another model and based on numbers from the first one, they are able to project to the other model. The students have to integrate their graphical interpretation with the previous question and with a map of the satellite image . . . Yes, the students are accessing NASA generated available Web site. Then the students have to integrate their graphical interpretation using the SMART Board.*

In a student-centered instructional strategy, the instructional process is in the hands of the students. In this lesson, the graphs of sea levels are displayed on the SMART Board. Students are provided data that they have to mathematically manipulate and then construct a graphical model to represent the information. Additional data models are constructed and then compared with the previous model. The teacher is

present to guide the students through the learning process; not to simply relay information. Students are active in this learning process, which is the foundation of student-centered instruction.

The data show that participants use a variety of instructional strategies that were presented at the SMART Board training. It appears more instructional strategies were aligned with direct instruction as opposed to indirect instruction. While this section has highlighted lesson examples that teachers have mentioned using in the classroom, their description of instructional strategies not used and ones that have the potential of being used are just as important.

Instructional strategies not utilized. Participants were asked which instructional strategies from the training they were not using and why they were not being used. Participants' rationale for not using these strategies is presented under theme 2.

When asked about instructional strategies demonstrated during SMART Board training they do not utilize, three different activities were presented. All three are categorized as teacher-centered instructional strategies.

Three of the participants straightforwardly identified instructional strategies from the training they do not use. Two of these three participants cited the koosh ball activity.

> Participant 1: *In the training they did a lot for elementary or either high school kids above it, where you throw the koosh balls at the Board to select. Kind of like throwing a dart at balloons. Well, that doesn't work anymore. It doesn't work with the new boards that we have here in the high school. I don't know what version of board that they finally changed, but they've done something to the surface and that does not work anymore. It's still by touch, you know, like it's always been, but for some reason when you throw things at the board, it doesn't select any more. It doesn't imprint or it doesn't cause enough of an indention on it that it will – I think the Boards now are more solid. The old Boards were more kind of honeycombed, you know, and a little more cushy or cushiony. They're not like that anymore. It's almost like a white board surface.*

> Participant 4: *I haven't used the koosh Ball where you throw it at the Board . . . I have a hard time keeping my board aligned so I don't use that one.*

As presented in the training, the koosh Ball activity was demonstrated as a drill-and-practice activity which is indicative of teacher-centered instruction. This instructional strategy promotes kinesthetic interaction between the learner and content displayed on the SMART Board. Both participants state they do not use the activity due to equipment-related issues. Participant 1 has a new version of the SMART Board, and the contact design has been changed. The contact of the koosh ball is not recognized. The SMART Boards have to be aligned, or oriented, to keep the contact point on the board in relevant position of the user's touch. Participant 4 has issues keeping the board aligned, and therefore does not use the koosh Ball activity. Based on these participants' experiences, the koosh Ball activity is not used because of the equipment not working correctly.

The third participant, Participant 2, shared that she has not used the erase-and-reveal activity. She said, "*I don't use the erase-to-reveal. . . . It's time consuming to set it up, to create those lessons."*

As it was illustrated in the SMART Board training, the erase-and-reveal activity was based on a teacher-centered instructional strategy, too. It was shown as a way to reinforce concepts or help students learn new information. Participant 2 does not use the erase-to-reveal activities. These activities take additional time to create and set-up beyond what the participant wants to dedicate. Based on this participant's experience, an instructional strategy that requires more time to create may not be used.

When Participant 3 was asked to describe an instructional strategy that was presented during training not being used, he didn't give a definite answer: "… *I have a*

SMART Response [system] . . . [It's] *very, very difficult, not impossible, because I had used for AP* [course]."

Here Participant 3 acknowledged having access to the SMART Response system and even that it could be utilized. However, the following statement from the participant affirms it is not used:

> Participant 3: . . . *because a lot of what we do on a day-to-day basis is more of a current event course, you need to pull up data that's being generated on—technology that's being generated and put out there for us to gain access to—you couldn't get in a book . . . primarily because of the material.*

This information suggests the participant does not use the SMART Response system because of the type of course content. The content of the course is not structured so that the SMART Response system could easily be used to teach a lesson. The course is based on information that is generated from external sources, and the information changes because it is related to current events; therefore, the SMART Response system is not used. It should be noted this participant provided contradicting information about the SMART Response system. He presented it here as an instructional strategy, but also discusses it as a SMART Board feature that is not used later in a sub-theme, reasons for not using SMART Board tools and features, under theme 4.

As the data suggest, all four participants could isolate an instructional strategy shown in the training that they are not utilizing. All of the responses described by participants can be categorized as teacher-centered instructional strategies. In addition, it was revealed one participant viewed a SMART Board feature as an instructional strategy.

Visions of using instructional strategies. This sub-theme emerged as participants expressed potential strategies for using SMART Board that they envisioned, but had not

learned during the professional development. Data analysis resulted in two categories: teacher-centered instruction and student-centered instruction.

Teacher-centered instruction. Based on participants' responses, three of the four participants' envisioned instructional strategies were categorized as teacher-centered instruction. These descriptions portrayed the teacher presenting information to the students, guiding students through the lessons, or explicitly pointing out relevant information.

Three of the four teachers described instructional strategies in which they presented information to students by displaying content and guiding them through the lessons. The SMART Board activities provide the practice element, typical of teacher-centered instruction, to the students.

Participant 1 described a potential lesson to teach elementary students about shelving books. The SMART Board was used for a drag-and-drop activity as a teacher-centered instructional strategy. Following is a description of the lesson:

> Participant 1: *If I was going to do* [this] *in the library, say elementary library, and you're talking about shelving books . . . you would have your shelf and then you would have books over to the side and you would actually have the students come and drag those books and put them on the shelf in the order they should be*.

This teacher-centered instructional strategy would engage media specialists and students in discourse about shelving books. The students would be guided by the teacher in the lesson, and the students only have an active role in the lesson when using the drag-and-drop activity at the SMART Board. The drag-and-drop activity serves as vehicle for practicing the shelving books concept.

The next lesson example provided by Participant 2 was a sorting activity. Its description was not linked to any specific content and could be easily adapted to any

content. It was a teacher-centered instructional strategy. Following is the lesson description:

> Participant 2: . . . *but that particular activity you have two groups and then you put your information in and it's – whatever your characteristics are that you want to include, you type them in and then it comes up on the screen for the students and you've got one category on the right, one on the left, and the students drag the characteristics to the appropriate one, and if it's correct, it will accept it and it will disappear. But if it's not, it will spin it around and kick it back out so they know that it doesn't belong with that category*.

Signifying a lesson based on teacher-centered instruction, the participant describes how information is provided to the students on the SMART Board. The students are in a passive role. Using the drag-and-drop activity, the students categorize information, and based on the immediate feedback, the students' understanding is reinforced.

Participant 4 envisioned a lesson teaching figurative language at the SMART Board. Students will still be interacting with content, with a teacher-centered instructional strategy. This lesson also supports the use of the SMART Board for students to practice the skills being taught. Here are the details for the envisioned lesson of Participant 4:

> Participant 4: *Well, one of the ways we use it* [SMART Board], *not the way we learned, is using a table for sorting activities. I know we talked about entering information in the cells and maybe graphs, but the actual sort activity wasn't mentioned. I got the sort ideas from dyslexia training, and we use the cells to do it. For instance, when we are doing figurative language, I can put headers at the top like similes and metaphors; and then I can have each block filled with different examples of similes and metaphors. They have to drag it to the correct place up there on the SMART Board. . . . a lot of times I will give them a paper copy to use at their desk, too. So they are manipulating at their desk and they're manipulating the SMART Board.*

The instructional strategy illustrated by this participant evolved by merging concepts presented in two different trainings. An interactive lesson could be developed

by taking the sort idea from dyslexia training and merging it with the knowledge of the SMART Board tools acquired from training. The students would be provided with the information needed about figurative language, and then they have the opportunity to practice. A drag-and-drop practice exercise is provided to the students at the SMART Board, and at their desk, they have a handout that matches the one displayed on the SMART Board to use for practice.

Student-centered instruction. Only one of the lessons envisioned by participants was classified as student-centered instruction. This type of instructional strategy allows the student to be in more control of the learning process while the teacher acts as a facilitator.

Integrating technology with the SMART Board for the purpose of promoting data representation and comparison in a student-centered instructional strategy was the vision of Participant 3. The lesson concept is described below:

> Participant 3: *I have not used the particular strategy because I did not have the equipment. However, I did use it in Laying the Foundation training . . . We had a SMART Board and they were basically showing us how we could create a cheap version of a tablet . . . what they did was . . . hook an Apple TV receiver up to the SMART Board and enabled it with and iPad. You could go from desk to desk . . . they were able to use their camera in the iPad to take a picture of a graph or maybe an illustration . . . and they were drawing things. They were able to take a picture and put it up on the SMART Board so everybody could see it . . . we didn't have to pass it around. We do have the Elmo or other document camera in our rooms, but those are tied to the desk, where these are really portable.*

In this student-centered instructional strategy, the students would be manipulating graphs and illustrations. They would be active in the learning process. Because of the integrated technology, their work could be captured and displayed for others to view. This could facilitate discussions to help students form knowledge. They would not be guided by the teacher necessarily. This lesson idea parallels the non-teacher directed

instructional strategy described by this participant when discussing the instructional strategy he presented earlier.

Evidence provided by the participants illustrated visions of teacher-centered and student-centered instructional strategies. The majority of the lessons envisioned are representative of teacher-centered instruction. This was also the case for the instructional strategies used. Three of the four participants described teacher-centered instructional strategies. All three teacher-centered instructional strategies had students using a drag-and-drop activity at the SMART Board. The student-centered instructional based lesson integrated technology with the SMART Board.

Theme 2: rationale for use of instructional strategies. In addition to being asked about the use of instructional strategies, as explained under theme 1, participants were asked why the lessons they described stood out. Reasons for not using an instructional strategy and the perceived benefits of using additional instructional strategies were explored. Responses given by participants were organized into two sub-themes: 1) reasons for using instructional strategies and 2) reasons for not using instructional strategies. Each of these sub-themes is described next.

Reasons for using instructional strategies. Participants' reasons for using an instructional strategy and the benefits cited for using additional strategies are presented here. Reasons for selecting the instructional strategies and the perceived benefits were organized into two categories: concepts to be taught and student engagement. This sub-theme is connected with the sub-theme enabling and hindering factors for instructional strategies, which will be discussed later in this chapter in theme 6.

Concepts to be taught. The concepts being taught in a lesson can influence the type of instructional strategy selected. Participant 1 makes the following statement:

> Participant 1*: . . . whenever I'm teaching teachers, you know, I don't just put it out there and they stay at their desks. We bring them up and they actually come to the board and do it hands on and interactive . . . It's more interactive, and I think that that's real important to get them involved.*

From her view as a SMART Board trainer, this participant feels a teacher-centered instructional strategy works best when teaching skills and concepts during SMART Board training. The skills and concepts are demonstrated first, and then practiced by the learners. In this lesson example, learners are provided more freedom to be involved with the learning process. The participant had them come to the board and illustrate their understanding of the material.

Participant 2 also provides evidence for instructional strategies being selected based on the concepts to be taught. An excerpt of the lesson description follows:

> Participant 2: *I deliver a lot of content through lecture method with SMART Board notes, that's because it helps with presenting background information. . . . I use the highlight feature to help students hone in on specifically important information. . . .* O*ne of the features we learned about was the Magic Pen and I use it a lot as well . . . it is a tool, but it helps the students again focus on important information, draw their attention to main ideas.*

Although the participant specifically states using the lecture method, which is a teacher-centered instructional strategy; the choice of the strategy was contingent upon the need to present background information. The participant was aware of the type of concepts to be taught, and by knowing the strategies that are best used to teach those concepts, the appropriate one was selected. In this example, background knowledge lends itself to being dispensed to the students directly from the teacher. The teacher's role was to directly relay the concepts and guide the students. Facilitation of this was

done by presenting the information through the SMART Board and using the Magic Pen to highlight information and focus student's attention.

Student engagement. Participants provided evidence for selecting instructional strategies based on the desire to engage students. They were considering the strategies that could be used to enhance the connections between the student and the lesson concepts. Two sub-categories emerged: construction of knowledge and incorporating learning modalities. They are discussed below.

Construction of knowledge. Information presented in this section relates to the selection of instructional strategies to engage students with the lesson for the purposes of developing thinking skills and articulated their understanding of material.

Earlier in this section, Participant 3 described a lesson from an AP Environmental Science class. Students were given data, manipulated it, generated graphs, and made comparisons between models. The participant gave the following rationale for using the student-centered instructional strategy:

> Participant 3: *Seat of the pants, whatever works. AP students are high functioning students. You need to do more of the what-ifs to keep them engaged, to find out do they really understand the problems and when they make connections.*

The participant's rationale supports the selection of the student-centered instructional strategy for the associated lesson because it gives students the opportunity to develop higher level thinking skills. The students were engaged in the lesson from the point they were given the data to the point they did model comparisons. Having the students generate graphs and compare models allowed them to articulate their understanding of the concepts.

This sentiment was echoed by Participant 2 from thoughts provided about benefits for using additional instructional strategies:

> Participant 2: . . . *with the shift to Common Core, we are focusing a lot more on creating. We want to do higher levels of blooms and creating is one of those things . . . . eventually I'm going to have two more computers in the classroom . . . I'm going to ask them to put SMART Notebook software on those, so that students will access to it and will be able to use it and create projects . . . based on the lessons that we've learned.*

The participant suggests that utilizing additional instructional strategies will address the need to provide opportunities for students to do more critical thinking and create artifacts to demonstrate their understanding.

The data show that both participants believe the instructional strategy selected can impact the level of engagement between students and lesson concepts. Both participants agree that engagement is needed for students to develop higher level thinking skills and to articulate their meaning of the lesson.

Incorporating learning modalities: Learning modalities are those methods of presenting instruction by using visual, auditory, and kinesthetic (VAK) sensory modes. In this section the connection between VAK and student engagement with the lesson is discussed. This sub-category is strongly connected to theme 5 which is presented later in this chapter.

Participant 4 described a lesson modeling a teacher-centered instructional strategy. The lesson focused on identifying figurative language in a poem. The participant was asked how this instructional strategy was selected and answered, "*I do a learning style and tutorial on my kids to see whether they are kinesthetic, visual, or auditory learners. . . . I try to get all of them."*

From this statement, it is suggested the participant based the instructional strategy for the figurative language lesson on the students' associated learning modalities.

When asked why the figurative lesson stood out, the participant replied this way:

> Participant 4: . . . *because they can manipulate it on something other than on their paper. They really like the technology aspect of it. As far as the SMART Board itself, you can highlight with so many colors that it can really stand out visually for them to see . . . It's easier for them to see and it . . . helps the ones who may have learning disabilities too to keep up with what they are supposed to be working on, what we are exactly looking at. . . . the color is also good for dyslexia students.*

These data support the selection of the instructional strategy because of the ability to incorporate visual and kinesthetic learning modalities to engage students in the learning process. Although not specifically noted, the auditory mode was evident because of the whole-class discourse that was mentioned in the original discussion of the figurative language lesson.

When explaining the benefits of using additional instructional strategies, two of the participants included a description of how different learning modalities within the instructional strategies could be beneficial:

> Participant 3: *Engaging kids . . . We are covertly in the classroom trying to adapt to the fact technology is in the hands of every one of our students . . . If we're doing a lab . . . each group could record their information on the two dry erase boards . . . to insure that everybody has a copy, I let them take a picture with their phones. I can also put them side-by-side on the SMART Board to do comparisons.*

> Participant 4: *You're going to get to more learners, better results of the kids learning. A lot of kids are . . . kinesthetic learners and they have to have that hands-on approach. A lot of our kids have attention problems and the SMART Board really helps. . . . It helps with engagement because they think it's fun. It's not just boring old stuff.*

Both participants explained that instructional strategies incorporating different learning modalities can benefit students. There are more opportunities for students to be engaged in the lesson when different modalities are used.

Data indicate that instructional strategies may be selected based on the concepts of the lesson being taught or for engaging students. Construction of knowledge and incorporating learning modalities were reasons given for using instructional strategies that engage students. Two of the four participants indicated concepts of the lesson as a reason for selecting instructional strategies. Participant 2 also acknowledged the need to use an instructional strategy to engage students, but did not provide further details.

Reasons for not using instructional strategies. Previously, participants provided an instructional strategy from training that they were not using. Connections exist between this sub-theme and enabling and hindering factors for instructional strategies, a sub-theme that will be discussed in theme 6. Analysis of the data resulted in three categories: course content, equipment, and time. The findings are presented here.

Course content. Course content refers to the topics that are present during the instructional process. Topics, resource materials, and the instructional strategies used to teach the course can vary, so certain instructional strategies may not be used because of specific course content. For example, Participant 3 explains that the SMART Response system is not used because the course being taught is based on current events.

> Participant 3: *I have SMART Response . . .* [It's] *very, very difficult, not impossible, because I had used for AP . . . a lot of what we do on a day to day basis is more of a current event course, you need to pull up data that's being generated on – technology that's being generated and put out there for us to gain access to, you couldn't get in a book, having to use technology to access the Internet and different Web sites then you compare, you know, there may be two entities that's creating the same using the same data, so they're creating two*

different images, or two different graphs, so I get some response for probably don't use as much as I could, primarily because of the material.

The perception of the participant here is that the instructional strategy is not being used because of content type. The content for the course is not governed by a textbook; it is based on current events. Resources used for teaching the course are generated frequently and have to be accessed from external sources like the Internet. The non-specific content associated with the course makes it difficult to use The SMART Response system.

Equipment. In this section, equipment is considered to be the SMART Board, the computer connected to the board, and the projector. The functionality of the equipment was offered as the basis for instructional strategies not being utilized.

As noted earlier, neither Participant 1 nor 4 used the koosh ball activity. Both participants cited equipment related issues for not using the activity.

> Participant 1: *Well, that doesn't work anymore. It doesn't work with the new boards that we have here in the high school. I don't know what version of board that they finally changed, but they've done something to the surface and that does not work anymore. It's still by touch, you know, like it's always been, but for some reason when you throw things at the board, it doesn't select any more. It doesn't imprint or it doesn't cause enough of an indention on it that it will—I think the Boards now are more solid. The old Boards were more kind of honeycombed, you know, and a little more cushy or cushiony . . . It's almost like a white board surface . . . They don't get to do the fun thing anymore.*

Or, here, concisely stated by Participant 4,

> *. . . I have a hard time keeping my board aligned so I don't use that one.*

Both participants believe that equipment functionality impacts the use of an instructional strategy. As presented here, the equipment was not working correctly; therefore, the koosh ball activity is not used.

Time. The decision not to use an instructional strategy may be related to time required to develop a lesson based on a particular strategy. Two of the four participants indicated time as a reason for not using an instructional strategy. This is evident in the participants' statements below:

> Participant 1: *I see all kinds of benefits but everybody doesn't see it the way I do. You know I would take the time create the lessons. You know a lot of people think 'Oh, this is grand and wonderful,' but they don't realize how many hours we're putting into creating that lesson. It's not instant. And most people don't want to give up the time to create those lessons . . . I think they don't see the benefit yet of using it, so they don't want to invest the time in creating it.*

> Participant 2: *I don't use the erase-to-reveal as much because it's time-consuming to set it up, to create those lessons, it's more time consuming to me . . . I would rather use the one where you create a table and you use the screen shades in the table. To me, that's quicker. I can set that up pretty quickly.*

Both participants associate time as a factor used in deciding on an instruction strategy.

The data indicate that instructional strategies may not be used because of course content, equipment, and time. One participant believed course content influenced the selection of an instructional strategy. Participants 1 and 4 provided evidence for not selecting an instructional strategy because of the equipment not working correctly. Participant 2, along with Participant 1 suggested that time is a determining factor in selecting an instructional strategy.

SMART Board Tools and Features

Research Question 2: Which of the SMART Board tools and features shared during the workshop do participants most often use?

To gauge participants' use of SMART Board tools and features, they were asked in the interview to describe a lesson they had taught that utilized tools and features from the workshop. Questions asked sought to distinguish participants' use of tools and

features, and data were categorized as follows: learned from training and used, learned from training and not used, learned outside of training and used. Table 4 is a summary of SMART Board tools and features generated based on participants' responses about their use of tools and features. Information was arranged by the tools, then the features. The features are categorized by their associated use. For example, features that can be used for annotating are in the category Annotating Features. The tools or features utilized by participants are marked according to each participant's described use: learned from training – used; learned from training - not used; learned by self - used; and visions for use.

As the interviews were analyzed, a "✓" was placed in the table based on the participant's first mention of use or nonuse of the tool or feature, accordingly. The recognition of the tool or feature being used more than once was not recorded. Theme 3 emerged from this analysis. In addition to the identification of the SMART Board tools and features used, analysis of the interviews yielded theme 4: reasons for participants' use of Smart Board tools and features. Theme 3 and theme 4 are presented in this section.

Theme 3: patterns of use for SMART Board tools and features. Theme 3 emerged from the participants' descriptions of their lessons as told during the interviews. Each participant was asked to describe a lesson which used SMART Board tools and features demonstrated in training. They were also asked if any SMART Board tools and features shown in the training were not being utilized. Additionally, participants were asked to describe a lesson utilizing SMART Board tools and features learned outside of the training. Four sub-themes emerged from participants' responses: 1) learned from

Table 4

Summary of SMART Board Tools and Features Used by Participants

SMART Board Tools & Features	Learned from Training								Learned by Self Used				Visions for Use			
	Used				Not Used											
	P1	P2	P3	P4	P1	P2	P3	P4	P1	P2	P3	P4	P1	P2	P3	P4
SMART Notebook	✓	✓	✓	✓									✓	✓	✓	✓
Annotating Features																
Creative Pen	✓															
Highlighter		✓	✓	✓					✓				✓			
Ink Aware													✓			
Keyboard/Typed Text				✓												
Gallery Features - Activities																
Drag-and-Drop		✓	✓							✓		✓	✓			
Erase-and-Reveal						✓							✓	✓		
Games								✓		✓						
Hide/Move-and-Reveal		✓											✓	✓		
koosh Ball					✓			✓								
Screen Shade-and-Reveal		✓														
Vortex Sort	✓									✓						
Presentation Features																
Dual Screen				✓												
Magic Pen – Disappearing Ink		✓											✓			
Magic Pen – Magnifier		✓														
Magic Pen – Spotlight		✓														
Marquee Tool	✓															
Screen Shade		✓		✓									✓			
Selection Tool			✓													
Presentation Features																
Grouping/Linking Pages					✓											
Page Sorter					✓											
Saving Files			✓				✓						✓			

(Table 4 continues)

(Table 4 continued).

Summary of SMART Board Tools and Features Used by Participants

SMART Board Tools & Features	Learned from Training								Learned by Self Used				Visions for Use			
	Used				Not Used											
	P1	P2	P3	P4	P1	P2	P3	P4	P1	P2	P3	P4	P1	P2	P3	P4
SMART Notebook (Continued)																
Specific Features																
3D-360									✓							
Drawing Tools			✓													
Math/Measurement Tools					✓			✓								
Tables		✓		✓								✓				
Screen Capture Tool				✓						✓			✓			
Tool Properties Features																
Customize Tool Bar	✓															
Object Properties			✓	✓												
Various Features																
Animating Objects		✓														
Audio/Sound Clips		✓	✓	✓									✓			
Pictures/ClipArt/Charts/Images		✓	✓	✓									✓	✓	✓	
Link to Internet			✓	✓												
Video Clips			✓	✓		✓										
Integrating Technology																
Document Camera				✓												
Integrating Other Technology															✓	
SMART Response			✓	✓			✓									
SMART Page Recorder																
Page Recorder						✓							✓	✓		

training and used, 2) learned from training and not used, 3) learned by self and used, and.4) visions for use. These sub-themes are presented next and correspond to the column headings in Table 4. Data are discussed in a top-to-bottom path within each column, beginning with Learned from Training – Used.

Learned from training and used. This sub-theme emerged as participants identified the tools and features presented during the SMART Board training that were being used. This data is also located under the column, Learned from Training – Used, in Table 4.

As demonstrated in Table 4, Notebook is the only tool mentioned by the participants as being utilized from the training, and all four participants indicated they use the tool. Features of Notebook that participants used offer the ability to annotate displayed information and videos, create activities, and to aid in presenting and designing a presentation. Additional features can be used as resource materials for teaching concepts (3D-360 and math tools); for adding animation, sound, images, and videos; for linking to the Internet; and for integrating other technology with the SMART Board. Further analysis of the data yielded 27 features the participants are using from the training. Participant 4 indicated the greatest number of features used, 13; and Participant 2 used the next highest, 12. Participants 3 and 1 indicated using 11 and four features, respectively.

The Annotating Features category consists of features that can be used for the purpose of annotating information through the SMART Board. All four participants used annotating features. It was revealed three different features of this category were used: creative pen, highlighter, and typed text. The highlighter was used most often. Three of

the four participants stated they use the highlighter. Participant 4 used two of the three annotating features mentioned, highlighter and typed text. Data show the creative pen, highlighter, and typed text are the three features participants are utilizing, and the highlighter is the most frequently used feature.

Three of the four participants indicated their use of activities available in Gallery Features. These activities can be used to teach or to reinforce concepts. Four specific activities were provided by these participants: drag-and-drop, hide/move-and-reveal, screen shade-and-reveal, and vortex sort. Participant 2 has used three of the four noted activities: drag-and-drop, hide/move-and-reveal, and screen shade-and-reveal. Only one of the four activities, drag-and-drop, was mentioned by more than one participant; Participants 2 and 3. Although Participant 2 revealed the use of the drag-and-drop activity as one used from training, she also stated it as one that was learned on her own and being used (see Learned by Self – Used in Table 4). Participant 2 also noted the use of the hide/move-and-reveal activity from training, but noted it under visions for other uses as well. Participant 1 uses the vortex sort. Four activities were used by participants: drag-and-drop, hide/move-and-reveal, screen shade-and-reveal, and vortex sort. Data supports that the drag-and-drop was used the most frequently of these four activities.

As demonstrated in Table 4, presentation features were divided into two categories: features used for presentations, Presentation Features; and those used for designing presentations, Presentation Design Features. The category Presentation Features is presented next, followed by Presentation Design Features.

There were seven features listed under Presentation Features: dual screen, Magic Pen – disappearing ink, Magic Pen – magnifier, Magic Pen – spotlight, marquee tool,

screen shade, and selection tool. All four participants indicated using at least one of the seven presentation features under this category. The screen shade was the most noted presentation feature, with Participants 2 and 4 stating they use the feature. Participant 2 used four of the seven features: Magic Pen – disappearing ink, Magic Pen – magnifier, Magic Pen – spotlight, and screen shade. Three of these features were the different Magic Pen options. The dual screen and screen shade features were both used by Participant 4. Screen shade was the only feature used by more than one participant, with two participants using the feature.

Presentation Design Features included three features demonstrated in the training: grouping/linking pages, page sorter, and saving files. Of these three, only the saving files feature was noted as being used, this by Participant 3. However, this participant also indicated this feature as one that was not used (see Learned from Training – Not Used in Table 4).

The Specific Features category, in Table 4, includes those features in Notebook that provide users the ability to depict objects in 3D, draw shapes and lines, access math tools like rulers and protractors, make tables, and take screen snapshots. Participants 2, 3, and 4 noted the use of features in this category. Features from training they used were drawing tools, table tools, and the screen capture tool. The feature for creating tables was the only one used by more than one participant, Participants 2 and 4. Participant 4 also used the most features in this category, tables and the screen capture tool. It should be pointed out that Participant 4 also provided the table feature as one which had been learned outside of training (see Learned by Self – Used in Table 4). As supported by the

data in Table 4, three features were used by participants: drawing tools, table tools, and screen capture tools. The tables feature was used the most often.

Characteristics of certain features can also be changed by the user and are presented in the category Tool Properties Features in Table 4. For example, digital ink colors can be changed or the toolbar can be customized to include user-preferred tools. Participant 2 is the only one who did not indicate the use of a feature in this category. Participants 3 and 4 used the object properties to change the color of shapes and pens, while the feature to customize the toolbar was used by Participant 1. The most used features in this category were customize tool bar and object properties; and overall, object properties was used the most frequently.

Notebook has the functionality to animate objects; add audio and sound clips; insert picture, clip art, charts, and images; link to the Internet; and embed video clips. These features are included in the Various Features category (see Table 4). From this category, three of the four participants cited using features they learned from training. The features cited were animating objects, audio/sound clips, pictures/clip art/charts/images, link to the Internet, and video clips. All three participants used audio/sound clips and pictures/clip art/charts/images. Additionally, Participant 2 used the animating objects feature, and Participants 3 and 4 used link to the Internet and video clips. Participants 2 and 3 also indicated they had ideas for other uses that included pictures/clip art/charts/images (see Visions for Use in Table 4). Although Participant 1 did not indicate the current use of features in this category, she did suggest ideas for using audio/sound clips and pictures/clip art/charts/images features in future lessons (see Visions for Use in Table 4). This could be based on the fact this participant was

providing information from a trainer's and a media specialist's perspective. Five features were listed in the Various Features category. Audio/sound and pictures/clip art/charts/images were the most frequently used and were equally indicated.

The final category, Integrating Technology, represents the features that allow other technology to be incorporated with the SMART Board. Two participants have used this feature by incorporating technology, as shown in the training, with the SMART Board. Participants 3 and 4 noted their use of the SMART Response system. It is also worth pointing out that Participant 3 contradicts himself as he also stated he did not use the SMART Response system (see Learned from Training – Not Used in Table 4). Participant 4 has also used the document camera. Because of the contradicting evidence given by Participant 3, the most frequently used feature related to integrating technology cannot be determined.

Of the SMART Board tools and features available for use, the data show that Notebook is the only SMART Board tool utilized by the participants. However, the participants cite many features that were learned from training and being used. The number of features used by participants ranged from 4 to 13. There were a total of 10 features that were used by more than one participant. From all of the features learned in training, the most used ones (in alphabetical order) were audio/sound clips, highlighter, and pictures/clip art/charts/images. Three out of four participants use these features. The next highest features are drag-and-drop activities, link to internet, object properties, screen shade, tables, and video clips. Two out of four participants use these features.

Learned from training and not used. This sub-theme emerged as participants identified the tools and features presented during the SMART Board training that were

being used. This data is also located under the column, Learned from Training – Not Used, in Table 4. The top-to-bottom path is still followed when discussing this data from the table.

Table 4 shows the SMART Page Recorder as the only tool demonstrated in training which is not being used. Participant 2 indicated the page recorder is not being used. However, there were several features given by participants that were not being used from training. The description of and categorization of the available features, as discussed in this sub-theme, are consistent with those presented above in sub-theme, learned from training and used. Data provided was assigned to five of the categories representing features that participants learned during training, but were not utilizing (see Learned from Training – Not Used, Table 4).

All four participants indicated there was at least one feature from training that they were not utilizing. There were nine features provided that spanned five of the eight feature categories. Those nine features are erase-and-reveal, games, koosh ball activity, grouping/linking pages, page sorter, saving files, math tools, video clips, and SMART Response. Participant 1 indicated the greatest number of features not used, with four. This is the same number the participant indicated as using. Participants 2 and 4 each noted three, and Participant 3 listed two.

In the Gallery Features, three of the four participants indicated they did not use activities shown in training: erase-and-reveal, games, and koosh ball activity. Participants 1 and 4 both stated the koosh ball activity was not used. Games were another activity not used by Participant 4. The erase-to-reveal activity was not used by Participant 2, but the participant indicated a vision for its use (see Visions for Use in

Table 4). The koosh ball activity and the math tools collection were the two unused features that were explained in training.

Presentation Design Features were not used by Participants 1 and 3. Grouping/linking pages and the page sorter were not used by Participant 1. Saving files was not used by Participant 3. As noted in the sub-theme, learned from training used, this participant stated the saving files feature was used.

Each of the following categories had only one feature listed as not being used that was demonstrated in training. In the Specific Features category, only math tools collection was given. Two participants, 1 and 4 specifically, stated they were not using this collection of tools. Video clips feature was the feature under Various Features which Participant 2 was not using. Participant 3 indicated SMART Response was not being used. This is shown under the Integrating Technology category in Table 4. Recall that this participant also indicated this was a feature that was used in Learned from Training – Used (see Table 4).

Information identified one SMART Board tool, the Page Recorder, and nine features not being used by the participants. All four participants gave evidence for either a tool or feature shown in training which they were not using. In addition, saving files and the SMART Response system were each stated as used and not used by Participant 3. Two of the features, the koosh Ball activity and the math tools, were both cited by Participants 1 and 4.

Learned by self and used. This sub-theme emerged as participants identified tools and features learned outside of training that were being utilized. Data for this sub-theme is shown under the column Learned by Self - Used in Table 4.

In the Annotating Features category, Participant 1 was the only participant to state a feature related to this category, and it was the creative pen.

In the Gallery Features category, drag-and-drop, games, and vortex sort were activities listed. The drag-and-drop activity was listed as learned by self by Participants 2 and 4. Additionally, Participant 2 noted games and vortex sort activities as learned by self. Ironically, Participant 1 listed the vortex sort as one she was using from training (see Learned from Training – Used in Table 4).

Each of the three participants who gave a Specific Feature listed a different one. Participant 1 has used the 3D-360 tool, Participant 2 the screen capture tool, and Participant 4 the table tool. Here again, Participant 2 has stated that the screen capture tools is something learned outside of training; whereas Participant 4 indicated use from training (see Learned from Training – Used in Table 4).

Data provided show three participants are using features that have been learned outside of training. There were seven different features among three categories that were listed. However, Participant 2 listed the vortex sort and screen capture tool, whereas those features had been listed by other participants, Participants 1 and 4, as being used from training.

Visions for use. This sub-theme emerged as participants described lessons, providing potential uses of SMART Board tools and features from training and outside of training. These envisioned uses are reflected under the column Visions for Use in Table 4.

Three of the four participants described potential uses for SMART Board tools and features shown in training or ones learned outside of the training. Participants 1 and

2 suggested the Page Recorder tool. Participants 1, 2, and 3, collectively gave 11 features across 7 of the 8 features categories. Participant 4 is the only one who did not suggest tools or features under Visions for Use.

Table 4 illustrates the features that participants have envisioned using. Data analysis yielded 11 features for potential uses. Participant 1 shared the most ideas, 11. This is almost three times as many as the participant indicated in Learned from Training – Used. This could be a result of her sharing ideas from her different roles, trainer versus media specialist. Participants 2 and 3 indicated three and two, respectively.

Two Annotating Features, the highlighter and Ink Aware, had potential uses according to Participant 1. Data provided show the highlight and Ink Aware features were equally noted as have potential uses.

For Gallery Features, two of the three participants had visions for use of these features. Three activities were listed: drag-and-drop, erase-and reveal, and hide/move-and-reveal. Erase-and-reveal and hide/move-and-reveal were provided by Participants 1 and 2. Participant 1 also suggested a use for the drag-and-drop activity. Erase-and-reveal and hide/move-and-reveal were the features with the greatest envisioned use.

Participant 1 is only one who shared ideas of uses in the Presentation Features, Presentation Design Features, and Specific Features categories, and the features suggested for use were the disappearing ink of the Magic Pen, the screen shade, the screen capture tool, and saving files.

Two features were given as visions for use in the Various Features category: audio/sound clips and pictures/clip art/charts/images. Participants 1, 2, and 3 all cited the pictures/clip art/charts/images feature, and Participant 1 also provided audio/sound clips.

The last category, Integrating Technology, included the use of integrating other technology. Participant 3 discussed integrating the iPad with the SMART Board. A future use of integrating other technology and iPad was offered by one participant.

Evidence is provided showing that Page Recorder and Notebook are the SMART Board tools for which participants had an envisioned use. Three participants discussed 11 different features, and Participant 1 shared all 11 of those. Two of the Gallery Features, erase-and-reveal and hide/move-and-reveal, had two participants mention their use; and pictures, clip art and charts had all three participants suggest uses for the features.

Theme 4: reasons for participants' use of SMART Board tools and features. As part of the interview, each participant was asked to explain why the described lesson using SMART Board tools and features stood out, reasons for not using certain tools and features, and perceived benefits of used tools and features. Responses given by participants were organized into two sub-themes: reasons for using SMART Board tools and features, and reasons for not using SMART Board tools and features.

Reasons for using SMART Board tools and features. Participants' reasons for using SMART Board tools and features and the benefits for integrating additional tools and features are presented here. This sub-theme is connected to the sub-theme, enabling and hindering factors for SMART Board tools and features used, which will be discussed later in this chapter in theme 6. Reasons for using the tools and features and the perceived benefits were organized into four categories: additional materials, multiple representations of concepts, student engagement, and teacher's knowledge of tools and features. The findings are presented in this section.

Additional materials. Evidence provided by participants supports the use of SMART Board tools and features for accessing and creating additional materials to be used in instruction. Two of the four participants gave an explanation of using SMART Board tools and features in a lesson for the purpose of generating additional instructional materials.

For the first example, additional resources, Participant 2 describes using the capture tool, a tool of the SMART Board, to generate instructional resources:

> Participant 2: *that's probably one of the main tools that I use because it's easier to pull information from other places with that capture tool. You have to be careful because some images are copyrighted and you got to know—be up on your copyright information and know whether it is material that you can use or not, but beyond that, it's a really easy tool to use. I use it a lot instead of importing stuff like from Word or Excel, that sort of thing, I will just use the capture tool and take a picture of it and put it, and you can't manipulate the information if you do, but most of the time I've gotten my information set before I do that. Also, previous lessons that I've taught like years past, I may find something and instead of having to recreate it, I can just use the capture tool, take a picture of it and put in the Smart Notebook and it doesn't need any kind of editing or anything.*

Using the capture tool to take screen shots allowed the participant to create additional resources. Screen shots of documents created in other software applications, like Word and Excel, were taken and used for instructional purposes. Previous lessons the participant used that were not in a compatible format with the SMART Board could be converted through the capture tool, and additional resources were easier to bring into instruction because of the tool. The participant also pointed out that care should be taken when using these types of additional resources, as they may be copyright protected.

Recalling the lesson, Participant 3 discussed integrating the iPad with SMART Board tools and features to create additional resources. Here the participant provides support for the use of tools and features in relation to the envisioned lesson:

> Participant 3: *I'm going to fudge here. I teach science, but I use a lot of maps and then I use graphs generated from those maps. I'm almost a social studies and geography type of class and what I've heard from social studies teachers is that they wish to do more interactive maps and things to feel . . . Most of my source materials I use with mine are sourced from U. S. Government or U S. Census, U.S.D.A. or NASA. I really haven't had time to go out because I know they're going to have more technology that is used, whether its GPS, GIS information; the majority of what I use is based on that. It's the source materials. Can you get source materials that hit topics where covering?*

When the participant described the envisioned lesson for using the iPad, the purpose was to create additional resources to use during instruction. Due to the nature of the course the participant teaches, maps and graphs are resources that are used extensively. Access to that material for the course is available through specific sources. It is more difficult in some subject areas to find relevant resources. Using the iPad would facilitate the process of creating additional source material. The material created would also be course- and concept-specific.

Multiple representations of concepts. The ability to represent information using a variety of methods is possible using tools and features of the SMART Board. Participant 3 explains the use of tools and features to create different representations of data in relation to the lesson on constructing population periods presented earlier:

> Participant 3: *It's a really telling thing when they construct it. You give them the data, have them construct, create, draw a graph in a shape. Ok, do one of Germany. Same scale, same graph, then you can interchange between them and then say why are they older or why do they not have more babies . . . it helps them visualize across the classroom a whole lot more. The more colors they use, the better it's received.*

Students were transferring numerical data to graphical representations. The SMART Board tools and features afforded the students the means to create multiple representations. Depicting data in various forms can help students interpret data. Students may have difficulty drawing conclusions from data presented in one form. The

graphical representation helped them to visualize the data and aided in their interpretation.

Student engagement. Student engagement can be supported with the use of SMART Board tools and features. Engagement is reinforcing or establishing a link between the student and information for the purpose of learning. Two of the four participants mentioned that tools and features were used for purposes of engaging students with the lesson.

Participants 2 and 4 provided support for the use of SMART Board tools and features to promote student engagement. Their comments are below:

> Participant 2: *I think partially because it is interactive. I can get the students up and they can, you know, actually physically get out of their seats and move the pictures and that sort of things and that's good for those students who are kinesthetic learners; they are not just sitting there listening and, you know, having to get everything through oral instruction. It gets them out of their seat and it gives several students the opportunity to come and explore*

> Participant 4: *Involvement, really encourages the kids to get out, sitting up, they are talking. They seem to work a lot better because they want to get up there. They have that interactive, and such a visual tech, age any way . . . Sorts again, when we do the sort activity* [cell sort for figurative language], *what they are doing on the SMART Board they've got another copy in their hands at the desk . . . they are actively involved even if they are not up at the board.*

The data show participants believe that using the SMART Board tools and features promotes interactivity. Students are not confined to their seats. They are involved with the lesson through data manipulation at the board, as well as at their desks. Participant 4 highlights the fact that even if students are at their desk, they can be an active part of the lesson that is being presented on the SMART Board. Participant 2 points out kinesthetic learners are benefited because they receive more than oral instruction, and Participant 4 suggests the tools and features encourage student discourse.

By involving the students, they are facilitating the students' interacting, exploring, and engaging with the information. The students are more willing to participate. The use of the tools and features can support student engagement.

The potential for incorporating different learning modalities during instruction is also enhanced by the use of SMART Board tools and features. Participants 2 and 4 provided evidence for increased student engagement when different learning modalities are used in instruction.

> Participant 2: *Well, obviously if I could use more tools, it would make my lessons more interesting. I think the more I use the Smart Notebook software the more interesting my lessons are. The more interactive they are, the more learning styles they address, instead of just addressing those auditory learners or those visual learners, being able to get those kinesthetic learners in there and helping them, definitely helps. So I think there's a connection there between learning styles and Smart Notebook software.*

> Participant 4: *Well, it's just going to expand the lessons and be better for the kids, can get more out of it, you know, if you, as far as the visual, if you move, audio clips or video clips into whatever you are working on, it makes it more interesting. If you're studying the Vietnam War, you include, you know, clips of famous songs from that era and talk about how it relates to the time period, it makes it more history come alive and much more interesting and they learn a lot more from that.*

Both participants believe student interest in the lesson can be influenced by the use of the tools and features, and the tools and features make the lessons more interactive. Participant 4 called attention to using animation and audio and video clips to add emphasis to lesson concepts. This strengthens the link between the student and the lesson as suggested for student engagement. Also, Participant 2 noted interactivity attracts students to the lesson. When this interactivity is promoted using different learning modalities, the attraction becomes stronger. SMART Board tools and features have the

capability to address visual, auditory, and kinesthetic learning modalities. Further conversation about VAK is presented in theme 5.

Teacher's knowledge of SMART Board tools and features. The selection of tools and features used can be guided by the teacher's ability to use them, and even more so if they can effectively use them. As participants gave reasons for using tools and features, two of the participants indicated it was because they knew the tools existed and how to use them.

Participants 2 and 4 gave the following rationale for the selection of SMART Board tools and features:

> Participant 2: *I just looked through all the different tools that were available to me and just, I guess, what I was able to come up with what I could create, 'cause it wasn't something that I got from a Web site or anywhere else. Just something that I took that I learned in the workshop and applied it and used it in that way. They seem to fit the lesson.*
>
> Participant 4: *Based on what is going to work best, and a lot of times, you know, I may start off with the pen and realize that the highlighter is going to be better, just kind of adjust as we go . . . When we are analyzing text, we use both pens and highlighters because that's what kids use at their desks. So, it correlates with what we're doing and they can see it, a visual element*.

These participants applied their knowledge of the tools and features to their content areas and used the ones that seemed feasible in context to the lesson. In both cases, selection was based on the tool supporting the lesson. The tools Participant 4 used were also matched with what students had available at their desk. The options of tools and features to use were known by the participants. Their decisions were based on this knowledge. Also, as supported by Participant 4, knowing how to use the tool is important. The participant discussed starting off with the pen and then realizing the highlighter would be better.

Evidence shows SMART Board tools and features may be selected because they provide additional materials for instruction, allow for multiple representations of concepts, encourage student engagement, and because of teachers' knowledge of SMART Board tools and features.

Reasons for not using SMART Board tools and features. Participants' reasons for not using SMART Board tools and features are presented here. This sub-theme is connected to the sub-theme enabling and hindering factors for SMART Board tools and features used, which will be discussed later in this chapter in theme 6. Reasons for not using the tools and features were organized into four categories: confidence level of user, lack of equipment access, preference for tool or feature, and teacher content areas. The findings are presented in this section.

Confidence level of user. The user's perceived confidence in terms of his or her ability and knowledge of using a tool or feature could be a reason for not using SMART Board tools and features. Participants 2 and 3 provided support for the confidence level of the user influencing the tools and features selected.

> Participant 2: . . . *The video embedding features, the tools that we can use to embed video into lessons, I have not used that. I'm a little intimidated by it I guess . . . I use other things I guess because it's because I feel more comfortable with them.*

> Participant 3: . . . *I had a topic, what I thought was black and white when presented, when they took the test, I had two students who passed . . . I wasn't too concerned about the grades as I was about the fact they didn't have the concepts. So, what I did was I took the test and I turned into a response* [SMART Response] *exam on the board, and I tried to get a poll on where did I lose them . . . I didn't find anything about what they did or didn't get . . . I don't know if I was discouraged or just the fact it didn't deliver what I wanted so I haven't went back to it*

Participant 2 described not being comfortable with the video feature. The decision not to use the video embedding feature was based on her intimidation of the tool. Tools and features were not being used because the participant was more comfortable with other ones. As for Participant 4, lack of confidence resulted from a particular experience using the tool. This participant felt discouraged when the desired outcome was not achieved having used the tool and had not used the tool again.

Lack of equipment access. For participants to use SMART Board tools and features, equipment has to be accessible. In some cases, tools and features could not be used because of the lack of equipment. Participant 2 stated the page recorder tool was not used due to not having the proper equipment:

> Participant 2: . . . *The Page Recorder was one of the tools that she talked about that I really, I was fascinated with it because if a student misses a class period, you can record your lecture with the lesson and then you can post it to the Internet, whatever kind of file, and students can come back and listen to it. That will be excellent because kids miss lecture and then they're just on their own to get the information and they miss the examples that are used in class and that sort of thing. And I've not used that either, and it's partially because I haven't got the headset that comes with the microphone, the tools that you need to do that. There are other tools you need in order to be able to do that and I've not gotten those.*

From the information provided by the participant, the page recorder tool was not used. The lack of use was due to not having the headset that comes with the microphone. Because the participant did not have access to the necessary equipment, the tool was not used.

In the next example, Participant 3 does not use the save feature because of inconsistencies in access to equipment:

> Participant 3: . . . *before we moved to new facility, I was in four classrooms a day because I moved from room to room to room. So, it was difficult technology-wise to have any type of continuity between what is presented in one class versus this*

> *class . . . sometimes I will go into a classroom that doesn't have a SMART Board, while I might have one that did.*

Participant 3 does not use the feature to save lessons. The participant floats between classrooms, and there are inconsistencies in the equipment between rooms. Because the participant does not have access to equipment, the save feature is not being used.

Preference for tool or feature. Preference for a tool or feature can sway a user's selection. The following quotes provide examples of participants using personal preference as a reason for a tool or feature not being used:

> Participant 1: . . . *probably the page sorter and grouping, you know when you group the pages together and so that you had different groups over here, they really are not into that. That was way more than what any of them wanted to do. They just want a basic 25 slides, . . . they don't want to group them and rename – you know, as far as organization. I guess it would be page organization . . . they're not interested in that.*

> Participant 4: *I haven't used much of the game design because they usually prefer the SMART Response system because they have a piece of technology in their hands.*

As suggested from a trainer's view, the page sorter and grouping features of the SMART Board were not used. The learners were not interested in the feature; therefore, they did not want to use it. Participant 1 suggested the more difficult a feature seemed to be to implement, the learners' interest could be altered. Participant 4 did not use the game design tool. Again, the determination to not use a tool was based on the preference of the learner. Students prefer to hold a tangible object. The game design tool limits the number of students interacting at one time. Because of this, it was not the preferred tool; rather, the SMART Response was because each student holds an object at the same time.

Teacher content area. The teacher's content area impacts the decision of which SMART Board tools and features are used. Certain tools are designed for specific subject areas. If teachers do not teach in that subject, they will not use that tool or feature.

The teacher's content area impacts the decision to use certain SMART Board Tools and Features. Below are two participants' comments as supporting evidence:

> Participant 1: . . . *the math teachers are about the only ones who wanted that*. *Some of the elementary teachers did*.

> Participant 4: . . . *I don't use the math tools because I'm not a math teacher . . . The math tools, like I said, I don't usually use that much because I don't teach math.*

From the views of a trainer and a teacher, math teachers are the only ones who would use these tools. This supports the idea that the type of content being taught can determine the use of tools and features.

To summarize reasons for nonuse, data show that SMART Board tools and features may not be used because of confidence level of user, lack of equipment access, preference for tool or feature, and teacher content areas.

Learning Modalities

Research Question 3: In what ways are visual, auditory, and kinesthetic learning modalities embedded in lessons which utilize the SMART Board?

Theme 5 emerged as participants were asked about incorporating visual, auditory, and kinesthetic learning modalities into their instruction. This theme is strongly connected to the sub-category incorporating learning modalities, which was presented earlier in theme 2. Findings related to participants' use of visual, auditory, and kinesthetic learning modalities are presented in this section.

Theme 5: perceptions of integrating visual, auditory, and kinesthetic (VAK) learning modalities. This emerged from participants' responses to interview questions. Participants were asked how they incorporate visual, auditory, and learning (VAK) modalities in their instruction using SMART Board tools and features. They were also asked to identify VAK connections in the lessons they described. Responses by participants were divided into four sub-themes: 1) support for identifying different learning modalities, 2) approaches to visual modality, 3) approaches to auditory modality, and 4) approaches to kinesthetic modality. These sub-themes are presented next.

Support for identifying student learning modalities. Using different learning modalities can appeal to multiple senses of the learner. Students can be more engaged in the learning process when different learning modalities are used to attract their attention to the information being presented. This sub-theme emerged as participants provided support for identifying students' preferred mode of learning as a way to help insure instruction includes a variety of learning modes. The following statements support these ideas:

> Participant 2: *The more interactive they are, the more learning styles they address, instead of just addressing those auditory learners or those visual learners, being able to get those kinesthetic learners in there and helping them, definitely helps. So I think there's a connection there between learning styles and Smart Notebook software . . . I do. I try to. Different students learn different ways. It's important to address all those different modalities. I actually give students a learning style quiz at the beginning of the year to kind of figure out what my classes are like, what they're set up like. When we do a unit of study, I always try to make sure that I don't – it's just* not lecture, do homework, take a quiz, take a test. *I try to stay away from that so that other modalities are covered . . . . I try to cover the modalities and the Smart Board does make it easier because it gives me opportunities to teach in a way that covers all those learning styles . . . if I do a lesson and it just uses one learning style, I try to go back before the end of the unit, before the end of the chapter, whatever, and cover it again in a different way, so it's just . . . You have to be intentional about it and sometimes it's just easier to teach it one way than to try to incorporate them all.*

> Participant 4: . . . *at the beginning of the year I do a learning style and tutorial on my kids to see whether they are kinesthetic, visual, or auditory learners and then I try to, I try to get all of them but I really get the ones that, for example, my second year, they were really strong kinesthetic learners, or they might be really strong visual learners and that' the ones I really focus on the hardest, the most because that's the way they learn the best . . . . I try to really incorporate all three in everything I do, as best I can.*

Data show that participants value the need to identify each student's preferred mode of learning, and they believe that students learn better when content is presented targeting those modes. Knowing the students' preferred mode can help in structuring the class to present instruction using the preferred mode. Participant 4 places emphasis on knowing the students' preferred mode to structure the class to meet the needs of the majority of the students based on their preferred mode of learning. Both participants point out they try to use all three modes. The use of varying modes may be a result of intentional efforts to do so as suggested by Participant 2. In addition, the type of information in the lesson may have an impact on the type of modes that can be used. A more strategic use of visual, auditory, and kinesthetic learning modes in a lesson arises from knowing individual student's preferred mode. Furthermore, Participant 2 claimed the SMART Board supports the ability to address visual, auditory, and kinesthetic learning modalities.

Approaches to visual modality. This approach is used to present information that stimulates the visual sense. This sub-theme emerged as the participants described ways the visual learning modality was embedded in instruction when they used tools and features of the SMART Board. Analysis revealed three categories of approach to visual modality: realistic depiction of information, multiple representations of concepts, and focusing student attention.

Participant 1's initially said this about the IWB's impact on visual modality: "*Of course, it's obvious that it's visual whenever you're doing a Smart Board presentation*. *You know, that's going to be visual . . .*"

This participant supports the use of the SMART Board in general for appealing to the visual learners. The visual learning mode will naturally be addressed when a lesson incorporates SMART Board tools and features.

Realistic depiction of information. This type of approach of embedding the visual learning modality in instruction uses visual elements for realistic depiction of information. Excerpts of participants' lessons are used to exemplify this approach:

> Participant 1: . . . *If I was going to do in the library, say elementary library, and you're talking about shelving books . . . . you would have your shelf and then you would have books over to the side and you would actually have the students come up and drag those books and put them on the shelf in the order that they should be . . . Book care . . . If you've got different examples of you're dog-earing the pages or putting it in a book bag or drinking or reading a book in the bath tub . . .*

> Participant 2: . . . *the visual kids, typically I try to put an element that helps each learning modality so there's always discussion . . . but with the lesson on the Smart Board I always try to include some kind of chart or graph, some kind of visual representation of the material that we are covering. So, for instance, if it's the three branches of government. It might be that I have like pictures that illustrate a three ring circus and they make that connection, you know* [between the], *three branches of government and you got your three rings of the circus and they just kind of – they make that jump. They make that connection, so that's for the visual kids . . . so I might have a picture of the White House and then executive branch might be somewhere else in the chart and they have to, if they touch the screen shade it goes away, and they see okay – this is the executive branch, then they have to find the White House because they know those two match, or the Supreme Court building and the Judicial branch . . .*

> Participant 3: . . . *to get on the Internet and pull up a global infrared satellite image. It could be a temperature thermal cloud image and students can look at, can delineate between cold water, hot water, warm parts, cold parts.*

> Participant 4: *I know there's a Web site you can click on that goes to Anne Frank, the actual the museum where she stayed and you can pan the room and see what*

all is in there and, you know, what it looked like and how small that space actually was.

Information provided supports that participants' instruction includes realistic depictions of information in their instruction. Pictures representing actual items, such as a book shelf or the White House, were used to appeal to the visual sense. Also, maps were retrieved to provide students actual satellite images. Participant 2 used actual pictures to represent the branches of government, through the use of a categorizing activity that has participants sorting the information in rings as a visualization process to help students associate the roles of the government with the designated branch of government. Videos can even be used to provide students a virtual tour related to the topic of discussion. The animation adds another visual element above still images and clip art. The lesson describe by Participant 1 also provides the student with a visual activity representing the process of shelving library books. Information can be realistically shown when using the SMART Board tools and features.

Multiple representations of concepts. This approach of embedding visual learning into instruction is done by using visual elements for the purpose of representing information in different forms. A lesson from Participant 3 is used to illustrate this:

> Participant 3: *The one that comes immediately to my mind is we do a lot with population pyramids; the concept behind that is population pyramids illustrate how do we have x , x + 1, x + 2, x + 3 age groups, how many are in the population, and then they can come back and look at the same type of graph from another country where you will see, for example, in Africa, what do you do if broad based pyramid because a lot of young people until get into high 30's, low 40's. . . . You give them the data, have them construct, create, draw a graph in a shape, ok do one of Germany. Same scale, same graph, then you can interchange between them and then say why are they older or why do they not have more babies or why . . . it helps them visualize across the classroom a whole lot more. The more colors they used the better it's received. . . . Over time, you see the light bulb go off, literally, when you're doing it . . . It's scientific challenged generated data but what is really turning the students on is "Oh my gosh, I can*

see it." It's really there. It's not just a number on the page. Look at how many more 25-35 year old females there were here, and look what population is three or four years later. That type of thing for connectivity.

This participant expounded on the way visual learning was used to bridge the actual population data to a visual interpretation of the data. By presenting information in multiple formats, students' understanding of the concepts can be increased. Participant 3 called attention to this when he mentioned how the students realize the data was more than numbers written down; they actually have meaning. Including visual modes of learning can be aimed at representing information in various formats.

Focusing student attention. This approach of embedding visual learning revolves on ways to attract and focus students' attention on the content. Participants described ways for focusing student attention when using SMART Board tools and features:

Participant 1: . . . *it's Martin Luther King Day, so that's what I'm thinking about, you know, a lot of people could, you could down load the "I have a Dream" speech and you can stop it at different places and make notes or whatever and talk about it and then start it again and it's all done through the Smart Board*.

Participant 2: *A lot of times I will have the notes on the Smart Board, and I use the highlight feature a lot to help students hone in on specifically important information, so the highlight feature is one because it helps them. It helps them in summarizing the information if they know what the most important information is the main idea, then they can summarize that in a – it makes it easier for them to summarize . . . Also, the Smart Board – one of the features we learned about was the Magic Pen . . . draw their attention to main ideas . . . if you draw a circle or an oval around some information, it highlights it. It's like a spotlight put on that information and it blacks out all the information around it and students just see that text or that picture or that piece of information. If you draw a square around the text or the information or the text or the picture, then it magnifies it . . . And the third . . . function is Magic Ink. You write with this magic pen and the ink disappears, and so I use that for prompting students, like classes where I have students who may have learning disabilities, they have problems with recall. When we are doing review information I might write part of the answer or prompt to jar their memory and that gives them a little bit of an—not an edge but it gives them a boost and help they need in order to feel successful in recalling information, and it disappears after like three seconds.*

> Participant 4: . . . *For instance, when we are doing figurative language, I can put headers at the top like similes and metaphors and then I can have – each block will have different examples of similes and metaphors and they have to drag it to the correct place up there on the Smart Board and then a lot of times I will give them a paper copy to use at their desk too . . . As far as the Smart Board itself, you can highlight so many different colors that it can really stand out visually for them to see, you know, similes were in yellow, metaphors were in pink and prepositional phrases in green. It's easier for them to see . . . We use the highlighter tool at different times – finding prepositional phrases or figurative language, nouns, verbs, anything like that, we use those a lot. We use the pen features for annotation. . . . We use the screen shade all the time for like when we go over study guides and different things like that to hide different aspects of what we're looking at.*

The data show that participants utilize visual learning to help students focus their attention on presented information. Focusing students' attention is done in various ways using SMART Board tools and features. Participant 1 discussed the ability to use annotation to facilitate student discussion. Distinguishing characteristics of concepts can be illustrated to students when highlighters and pens of different colors are used. Colors used at the board can correspond to the colors students are using at their desk to help keep them on track. Participant 2 described how students' attention can be directed to a specific area on the SMART Board by using the magic pens options to spotlight or magnify a selected area. This participant also suggested that a student's thought processes can be guided by using the magic pen's disappearing ink option. Participant 4 offered the idea that students can stay focused when the information they have at their desk is also being displayed. Focusing students' attention as a visual learning mode is available when instruction is presented using the SMART Board.

As shown in the data, the participants presented ways of embedding the visual mode of learning into their lessons which utilize SMART Board tools and features. The

approaches to embedding this mode of learning are realistic depictions of information, multiple representations of content, and focusing student attention.

Approaches to auditory modality. This approach is used to present information that stimulates the auditory sense. When lessons include elements like discussion, sound, speeches, and songs, the auditory learning mode is being addressed. This sub-theme emerged as participants explained ways to stimulate auditory senses within their instruction when they used tools and features of the SMART Board.

Two of the four participants expressed the following about the auditory learning mode:

> Participant 2*: . . . typically I try to put an element that helps each learning modality so there's always discussion to those, the auditory kids are always covered because that's just the norm, that's what we usually go for but with the lesson on the Smart Board I always try to include some kind of chart or graph, some kind of visual representation of the material that we are covering.*

> Participant 4*: Auditory ones are probably the ones most addressed. Typically, and by using the Smart Board and different kinds of technology, you can address all learners. You can hit all three . . . and then some kids are stronger, have a more are predominant style*

Both of these participants perceived that instruction inherently includes elements that are based on auditory learning modes. Participant 2 is suggested that discussion is always a method of using auditory learning, and perceived Participant 4 was stating the same idea.

Even though discussion may be the main form of auditory learning used, it has value. Participant 2 explained:

> Participant 2: *. . . students will, I mean, somebody has to read, you know, these are the characteristics and sometimes I will put them in groups and they will talk about it, so you got your auditory there, they hear each other speaking about it . . . I've done it several different ways and you know bring somebody up to the Board . . . you would have your visual kids, your auditory kids, your kinesthetic*

kid, all at the Smart Board talking about it, making decisions about what they need to do and then when they are finished, then I would go and check and check for understanding and typically they usually do very well when you do it that way because your auditory kid is talking about it and the other two, or they are all talking about it and they are able to guide each other . . .

This participant talked about the use of discussion when teaching. The way auditory learning is addressed can be from the teacher talking about the information or by engaging the students in an activity that has them talking between each other to help them learn the concepts. Discussion was promoted in the lesson which used the SMART Board.

Additional ways auditory learning can be embedded into instruction were explained by participants:

Participant 1: *And so then the only thing left would be the auditory and that's only if you're in, you know, putting in some kind of audio clip into your lesson . . . it's Martin Luther King Day, so that's what I'm thinking about, you know, a lot of people could, you could download the "I have a Dream" speech*

Participant 2: . . . *I occasionally include clips and we, I've been able to use like speeches, today's Martin Luther King, Jr. Day. I've been able to pull in his speech to a specific lesson and students click a button and they hear his speech as part of the lesson.*

Participant 3: . . . *the news media articles that are out there and even to the point of live media articles, webinars and that type of thing where presentations are going along that side-by-side . . . one of the techniques we use in our AP program, we try to get our students to go other schools or school districts for review sessions and there's a lot to be said when you hear even as a teacher instructing a class, when you hear another teacher instruct, delivering the same message, the same verbiage, that you presented.*

Participant 4: *If you're studying the Vietnam War, you include, you know, clips of famous songs from that era and talk about how it relates to the time period, it makes it more, history come alive and much more interesting and they learn a lot more from that . . . With the prepositional phrases, at the beginning of the lessons, we use uh – the Shurley Jingle, which is like a little song and they go through and they, you know, It's visual so they can see it, but then they also go through it and it kind of sings the song to help them learn the prepositions . . . .*

As the data show, speeches, webinars, and songs are additional ways to appeal to the auditory senses of students. Students can be connected to historical speeches by linking to external sources. Participants 1 and 2 both suggested the use of finding speeches, and both of them specifically mentioned the use of Martin Luther King's speech. From the quote provide by Participant 1, it seems that discussion as an auditory mode of learning has been discounted, and only specific auditory elements are considered. An alternate form of speeches, webinars, was used by participant 3. These can expose students to current topics. Webinars allow them to listen to presentations being made at conferences or meetings, and they could even be live presentations. Webinars give them access to information that otherwise they may not be able to hear. Participant 4 uses songs in instruction. Songs can be used in relation to history to help demonstrate the impact of an event. The Shurley Jingle was used as a supporting resource to help teach the concepts of prepositional phrases while examples were displayed on the SMART Board. Additional ways to incorporate auditory learning are possible when utilizing the SMART Board in instruction.

Data suggest various methods of including elements targeting auditory learning were used in instruction. These participants illustrated ways of embedding auditory learning into instruction by using SMART Board tools and features.

Kinesthetic modality. This approach is used to present information to facilitate the interaction between students and the information. This sub-theme emerged as participants explained ways that foster an interactive approach to instruction when the SMART Board tools and features were used. Following are examples of participants' ideas of using this mode of learning:

These participants describe ways of allowing students to interact with the content.

Participant 1: . . . *You would have your shelf and then you would have books over to the side and you would actually have the students come up and drag those books and put them on the shelf in the order they should be*.

Participant 2: *there's so many things that you can do like with the chart and screen shades, you know, they have to touch, and there are memory games that you can make where you have like words in one box and a picture in another and they have to make them, have to touch them and make them match . . . I have a lesson about the Constitution that I teach . . . And then I could animate the pictures and move the pictures to reveal some other fact, that sort of thing, and I use that fairly often. I use that every year actually, that lesson . . . I haven't done this – but in the future*[what] *I would like to do is set up what they use in elementary is stations, and I would like to set up different stations in the classroom with the Smart Board being one where they could go and they could do that lesson on their own and physically move the pictures to reveal more information and just kind of explore, I guess it's kind of like a digital treasure box is what it would be and, you know, there would be different information about, you know, it could be parts of the Constitution or different parts of government . . . They get up out of their seats. There's surprises built into it, you know, you push this and something else appears and they just, they remember it.*

Participant 4: *With the prepositional phrases, at the beginning of the lessons, we use a – the Shurley Jingle, which is like a little song and they go through and they, you know, It's visual so they can see it, but then they also go through it and it kind of sings the song to help them learn the prepositions. And then we go from that to actually going up there and finding the prepositions . . .sentences and discussing what they are and where they're at and why they're – what's their meaning, and the kids also do it at their desks too . . . When we first started Social studies this year, they had a hard time finding information on the text and I could put the Social studies book under there and they could come up and actually highlight in the book where it's at so other kids could see where we were finding that information from.*

Participant 3: *They are constructing population pyramids with tools and features of the SMART Board. In addition to different colors, they can save it and bring it up after the fact. The one that comes immediately to my mind is we do a lot with compilations pyramids, the concept behind that is compilations pyramids illustrate how do we have x , x + 1, x + 2, x + 3 age groups, how many are in the population, and then they can come back and look at the same type of graph from another country.*

Evidence of physical interaction or kinesthetic learning within instruction is demonstrated by these participants' examples. Students are at the SMART Board

practicing shelving books, exploring concepts of the Constitution by moving displayed objects to reveal information, or highlighting passages in a text. Participant 4 had students singing as a means of interacting with content on prepositional phrases and then transitioning to students actually identifying prepositional phrases displayed on the board. Participant 3 had students engaged at the board constructing graphs as a means of interaction. Participant 2 also mentioned the use of memory games or matching activities that would have students at the board working.

Furthermore, participants described ways of kinesthetic learning through perceived interaction with the content:

> Participant 1: *Anything they would have to do when they are up and being them up to touch the board, then that's going to be their hands-on work that they are doing . . . I taught business. If I was teaching business, I don't know how much I would have them actually coming to the Board to work. It would probably be more of my demonstrating and helping them to find where it is as opposed to them actually coming up and doing it on the Board, because, you know, when you're teaching spread sheet or data base or something like that, that's really not something that would have them come up to the Board. You would want them sitting at their computer doing their work.*

> Participant 4: . . . *We do a lot of hands-on activities with the Smart Board as far as, lots of times I will take an image of an activity that we are going to work on. For example, a poem like we did today. We analyzed a poem and we'll put the poem actually upon the Smart Board and then we will start analyzing it, looking for maybe figurative language, and they go through and they might highlight the figurative language that we find, or they may add – text and they take pens and they actually write down what it means and where it is located. They may annotate or come back look at it and see if there is prepositional phrases, . . . Sometimes we will do it right then together and they'll record it on their paper . . . Other times they'll say okay if it's like a sort and we're doing complex sentences and compound sentences, okay, I'll say go sort at your desk. You got three minutes and they'll sort and I'll say okay, let's do it at the Smart Board. Where does this one go? And they'll come up there. Who's next, and where does this one go? So, lots of times they use it as guidance instructional and sometimes they use it to go over independent work and then lots of time we use it for direct instruction too—very functional.*

Data show that students can be engaged with content through perceived interaction. Students are following along with a student or teacher at the board, while they are replicating or practicing the concept at their seat. They have the mindset of physically interacting with the information on the board.

All of the participants provided examples for ways of involving students during instruction that promote interaction with the content. Some of the interaction was direct, as with the digital treasure box lesson discussed by Participant 2 or the construction of population pyramids mentioned by Participant 3. Students were also given the opportunity to interact with content by shelving books or highlighting information in the social studies text book. Kinesthetic learning can also be provided in a way that students perceive they are interacting with the content. Participants 1 and 4 provide examples of teaching spreadsheets and using a sort activity to support this form of kinesthetic learning. Regardless of literal or perceived interaction, students are provided with kinesthetic learning through lessons using the SMART Board tools and features.

Data show there are ways of embedding visual, auditory, and kinesthetic learning modes into instruction. These methods can be done when instruction is presented using the SMART Board tools and features.

Influential Factors

Research Question 4: What factors have influenced the instructional strategies, tools, and features that participants use most often?

Theme 6, enabling and hindering factors for use, emerged from analysis of interviews and is presented in this section.

Theme 6: enabling and hindering factors for use. This theme emerged from participants' responses to interview questions. Participants were asked for their thoughts on factors enabling and hindering their use of instructional strategies and SMART Board tools and features. Four sub-themes emerged from participants' responses 1) enabling factors for instructional strategies, 2) hindering factors for instructional strategies, 3) enabling factors for SMART Board tools and features, and 4) hindering factors for SMART Board tools and features. Each of these sub-themes is presented next.

Enabling factors for instructional strategies. This sub-theme emerged as the participants described factors that enabled their use of instructional strategies. Analysis of the data revealed five categories: access to equipment, knowledge of students, participants' knowledge of tools and features, students' knowledge of tools and features, and training.

Access to equipment. Having access to equipment can be a factor that supports the use of instructional strategies. This category is connected to the category access to resources which is presented later in this section under the sub-theme hindering factors for instructional strategies.

Earlier, in theme 1 under the category student-centered instruction, Participant 3 provided the description of a teacher-centered instructional strategy. This instructional strategy was supported because of access to needed equipment.

> Participant 3: *This is an AP class. . . . I'm having the students show me what they know. They have to articulate their understanding . . . .I have students engaged at the board. The only time I actually put my hands on the board is to emphasize something that the students have pulled up. We were looking at how sea levels rise in coastal areas, predominately in the Caribbean and Hawaiian Islands, based on seasonality and determining where global climate changes levels. The AP question was a . . . preformed question. There are graphs that go along with it and different sources . . . when students finish one model, a*

mathematical module, they pull up another model and based on numbers from the first one, they are able to project to the other model. The students have to integrate their graphical interpretation with the previous question and with a map of the satellite image . . . the students are accessing a NASA generated available Web site. Then the students have to integrate their graphical interpretation using the SMART Board . . . The equipment being in the room, or that's the biggest thing as far as them using it, me utilizing it, presence in the room. I don't have to go anywhere else.

Without access to the correct equipment or technology, the participant would not have been able to use the student-centered instructional strategy that was used in this lesson. The technology allowed students to access data and graphs pertaining to the sea levels. The manipulated data was used to create graphical representations with the SMART Board tools and features. The graphs were displayed on the SMART Board and facilitated the interpretation of data across multiple models. The lesson was conducted in one room, and the teacher did not have to secure another location. In this participant's experience, access to equipment enabled the use of an instructional strategy.

Knowledge of students. Knowledge of students is considered to be the teachers' recognition of the students' personalities and their attentiveness to the students' abilities. Teachers can use this information to help plan instructional strategies that meet the needs of their students and engage them with the content. Three of the four participants mentioned knowing students helped in using instructional strategies. Following are their statements:

Participant 1: *I think high school kids are more inhibited about getting up in front of students, you know, especially I could see maybe with math, kids get up and do it wrong, they would be more inhibited not want, to not want to come up and do it at the board because they don't want everybody to see they don't know how or they don't want to make a mistake, peer pressure in high school . . . Elementary kids, they don't care. They just want to do it. They want their hands on it. You've got some high school kids that are that way, but I think high school kids are more reserved. They don't want to get up in front of everybody and do classroom work, because of the fear of doing it wrong.*

> Participant 2: . . . *like classes where I have students who may have learning disabilities, they have problems with recall. When we are doing review information I might write part of the answer or prompt to jar their memory and that gives them a little bit of an—not an edge but it gives them a boost and help they need in order to feel successful in recalling information, and it disappears after like three seconds.*
>
> Participant 4: *As far as the Smart Board itself, you can highlight so many different colors that it can really stand out visually for them to see, you know, similes were in yellow, metaphors were in pink, and prepositional phrases in green. It's easier for them to see and it's , you know, helps the ones who may have learning disabilities too to keep up with what they are supposed to, what we are working on, what we are exactly looking at. And that color is also good for dyslexia students.*

These participants believe that knowing their students can determine the instructional strategies used. For example, Participant 1 called attention to the idea that high school students may be more reluctant to be in front of the class when compared to elementary students. Participants 2 and 4 suggested that students may have learning disabilities and strategies can be selected to help these students. The sub-theme, support for identifying student learning modalities as presented under theme 5, is strongly connected to this category. Knowing the students can assist in the selection of instructional strategies.

Participants' knowledge of tools and features. Participants' knowledge of tools and features was thought to be an enabling factor in selecting instructional strategies. Knowing about the tools can aid in selecting efficient practices for presenting instruction and allows for easy adaption of lessons easily to save the user time. Participant 2 gave a thorough description of using the highlighter and Magic Pen to present a Social Studies lesson:

> Participant 2: . . . *so the highlight feature is one because it helps them. It helps them in summarizing the information if they know what the most important*

information is the main idea, then they can summarize that in a—it makes it easier for them to summarize.

Participants also believe that knowledge of tools saves times and influences the selection of instructional strategies, as the following statements attest:

> Participant 1: *Now if it was a ready-made lesson, you know, they could go out to SMART Tech and pick it up off a Web site, it's a ready-made lesson that they could turn it on and it works, I think that they will use those, but as far as creating their own, I think a lot of them shy away from creating their own.*

> Participant 2: *That's why I use the toolkit so much because it's premade. All I have to do is plug my specific information into it . . . There's a lot of templates in the tool kit and all you do is plug in your information, and it's several different games that you can use. I've also downloaded a lot of templates from SMART Exchange, where someone else has created a game like Jeopardy or Wheel of Fortune, or something like that, and then you put your information in it and so I use that a lot because it saves so much time . . . And also the that tool kit . . . it's less time on my part to put into it.*

> Participant 4: *. . . I have found some support materials . . . It has some ready-made things . . . like grammar . . . SMART Board lessons already made, so that's little bit of a time saver and that helps too.*

Having a working knowledge of the tools and knowing which tools are available influences the instructional strategy selected. Evidence provided by Participant 2 explains how knowing the functionality of tools and features supports the use of certain instructional strategies. The highlighter was available, and a teacher-centered strategy could be used. Notes could be displayed through the SMART Board and information easily pointed out with the highlighter tool. Other support given was in terms of saving time. Knowing tools were conveniently available with little or no modification required, participants selected certain instructional strategies. Participant 2 promoted the use of templates in the tool kit or downloading them, and Participant 4 had pre-made lessons. These participants provided support for knowledge of tools as an enabling factor for using instructional strategies.

Students' knowledge of tools and features. This category presents the students' knowledge of tools and features as an enabling factor for selecting instructional strategies. All participants, except Participant 1, suggested student's knowledge of tools as a positive factor:

> Participant 3: . . . *the functionality of the student using the technology, our AP students are a little bit more ability-wise to handle what goes where and when*
>
> Participant 4: *The kids have had a lot of exposure through the years and that helps as well . . . they like the technology aspect of it*
>
> Participant 2: . . . *the kids, because the students that I'm getting now, every year they are a little more Smart Board savvy because we've had them in the classroom for several years now and they know more about them. And because they know more about them, I spend less time having to explain how to use them or what to do. They've seen some of these instructional strategies before. Like the Drag to Reveal or the Drag and Drop or Erase to Reveal, all those things they've seen before in some of their other classes, so they're more familiar with it and that's a big plus because I don't have to teach them how to use the technology. They know how to use it already . . . Kids still like the technology, and it's still interesting to them . . . It gets them out of their seat and it gives several students the opportunity to explore.*
>
> Participant 1 did not suggest students' knowledge of tools as an enabling factor:
>
> . . . *turning it over to an interactive lesson is more work for them to have to create the lesson and then get the kids up and teach the kids what to do*

Although this perspective was negative, it still confirms that students' knowledge of tools impacts the use of instructional strategies.

Data show that instructional strategies are more likely to be used when students have a working knowledge of the tools and features that are used within that strategy. Three of the four participants claimed that because students' knowledge of tools has increased from previous exposure to instructional strategies, they are more inclined to use these strategies. When students have the ability to use the tools and features of the SMART Board and the teachers acknowledge this, more instructional strategies can be

used. From an opposite perspective, Participant 1 suggested teachers are not using certain instructional strategies because students may not have a working knowledge of the tools.

Training. The on-site, SMART Board certification training provided to participants for them to learn and create instructional strategies using the SMART Board tools and features was shown as an enabling factor:

> Participant 4: *The SMART Board training. It really helped.*
>
> Participant 2: *I feel like the training that I got gave me the basic understanding of the material, the tools, the software, gave me a basic understanding of it so I can do pretty much anything with that, with the program . . .*

Two of the four participants felt training helped them to use instructional strategies. Training can provide users a working knowledge of tools and features, but it can also help them in knowing how to put them to use in context with the lessons they teach. The use of instructional strategies can be assisted when proper training has been provided.

The data indicate that factors enabling the use of instructional strategies can include access to equipment, knowledge of students, participants' knowledge of tools, students' knowledge of tools, and training.

Hindering factors for instructional strategies. This sub-theme emerged as the participants described factors that hindered their use of instructional strategies. Analysis of the data revealed four categories: access to resources, classroom dynamics, preference, and time.

Access to resources. For the purposes of this research, access to resources refers to software and access to functioning equipment. Out of the four participants, three suggested at least one equipment-related item as a hindrance for using instructional

strategies. For example, Participant 1 suggested availability to equipment was a hindrance:

> Participant 1: *3D-360 view, it's an additional add-on that you have to buy; . . . Well again, like the 360 . . . That's a matter of whether they're going to buy the functionality . . . you know, with the math teachers, if they buy all the math tools or you just got the basic tools.*

Equipment not functioning properly was cited by three participants as reasons for instructional strategies not being used:

> Participant 1: *The koosh balls . . . kind of like throwing a dart at balloons. Well, that doesn't work anymore. It doesn't work with the new boards that we have here in the high school. I don't know what version of board that they finally changed, but they've done something to the surface and that does not work anymore.*
>
> Participant 4: *I haven't used the koosh ball activity, where you throw the ball at the board. I have a hard time keeping my board aligned so I don't use that one.*
>
> Participant 3: *The equipment itself . . . it wasn't necessarily a software issue, am I able access SMART Board itself, it was hardware, how was it plugged up.*
>
> Participant 4: *Technology. Sometimes I have trouble with my document camera interfacing with the board . . . My response system* [SMART Response] *sometimes locks up.*

Evidence provided indicates that access to software and equipment that functions properly is a hindrance for using instructional strategies. Certain instructional strategies rely on equipment, and without availability or properly functioning equipment those strategies cannot be used. Participant 1 presented two collections of Notebook tools that require an additional purchase; unless they are purchased, instructional strategies that incorporate them cannot be used. Participant 1, along with Participants 3 and 4, suggested that even if equipment is available, it has to function properly. Unavailable tools or equipment that does not work can prevent an instructional strategy from being used.

Classroom dynamics. Classroom dynamics consists of the structure of the class and the student characteristics. Participant 1 mentioned classroom structure as an obstacle for using instructional strategies, and Participant 3 discussed class size as deterring factor:

> Participant 1: *I don't know, with high school, sometimes I think people are reluctant to do too much interactive because if it gets kids out of their chairs, you have to get them back in their chair.*
>
> Participant 3: *One of my problems especially with my large environmental science is a large class, packed left to right, front to back. My experience with students up in front in that particular instance doesn't bode well, because you lose half of them. Class size smaller, more intimate where you can keep students at the board* [and not lose] *the ones not performing the task or the activity, it's a lot easier to keep them engaged along with the other students . . . rather than a large class.*

Since teachers are hesitant to use instructional strategies that create an un-structured setting, instructional strategies that provide students with an interactive element are often not utilized. Participant 1 suggested that teachers do not want to deal with maintaining structure if students are allowed to move around. Participant 3 pointed out that larger classes are harder to control and keep engaged; thus, certain instructional strategies are not used. Data show that instructional strategies can go unused because of classroom dynamics.

Preference. Users may have a preference for a particular instructional strategy which can hinder the use of other instructional strategies. This is evident in the participants' statements below:

> Participant 1: *That was way more than what any of them wanted to do. They just want a basic 25 slides . . .they don't want to group them and rename – you know, as far as organization. I guess it would be page organization. They – they're not interested in that . . . you know, so far I haven't run onto anybody who's so technology savvy and so driven to have those lessons, that are just very extravagant, that, if it's not a ready-made template, then they just do the basics on*

the slides . . . they don't want to go any further. They're not really interested in all the bells and whistles.

Participant 2: *I don't use the Erase-to-Reveal as much because it's time consuming . . . I really like the tool kit. I'm a big fan of the tool kit, because it's already there. I mean it's already put together for you.*

Participant 1, as a trainer, pointed out that other teachers do not show interest in learning how to organize or group pages to help structure their instructional practices, a feature available within SMART Notebook. They prefer to keep instruction simple and in page-by-page progression and are not enticed by the bells and whistles that can be added. As asserted by Participant 2, preference for instructional strategies can hinder the use of another strategy. In this instance, the preference was to use pre-made lessons or templates instead of having to create one from the beginning. The participants provided support that preference can hinder the use of instructional strategies.

Time. Creating instructional strategies using SMART Board tools and features can require a significant time investment. Also, the time available to devote to creating these instructional strategies may be limited. For this category, time relates to the amount of time it takes to create an instructional strategy using SMART Board tools and features; and it is associated with the time available that can be devoted to the creation of the instructional strategies. Participant responses were organized into the following sub-categories: time required to create and limited time available.

Time required to create: Participant responses indicated that additional time necessary to create instructional strategies was a hindrance to using the SMART Board tools and features.

Participant 1: *I think most of us, whenever we get ready to do a lesson, or create a lesson, we're in a hurry, and we don't want to take the time to, you know, sit down and really organize, you know, people aren't doing that in their off-time,*

they're thinking, "Oh, I've got to do a lesson on this, bam, bam, bam – here's 12 slides, I'm done" . . . You know, I think that it's just, that's more in-depth than what most teachers are willing or have the time to do . . . They're not really interested in all the bells and whistles; they just want to get it done . . . "Oh this is grand and wonderful", but they don't realize how many hours were put into creating that lesson. It's not instant. And most people don't want to give up the time to create those lessons . . . If somebody else will create for them, they're all for it, but if they've got to sit down and do the creating part, they don't really want to do it.

Participant 2: *Just time. Time is the big one because to me those take longer to set up. It takes longer to create those lessons, and so I tend to not use it as often.*

As data show, the participants noted that creating instructional strategies that incorporate SMART Board tools and feature requires a great amount of time. Teachers can even be unaware of the amount of time it takes. Participant 1 emphasized the fact that teachers do not want to devote the time it does take to create them. Participant 2 simply stated the amount of time it takes to create the lessons discouraged her use of the instructional strategies.

Limited time available: There is limited time available in the day to devote to creating these instructional strategies. Also, participants provided evidence that time available outside of school is limited. The following statements were made:

Participant 2: *Well, last year I had more time and more time for planning. My personal children* [need me] *and so I don't have as much time to plan for lessons, but the things I have created with SMART Notebook Software I have kept and that's one thing that is good because it doesn't expire, it doesn't change . . . Time has been a factor. In the summers when I had time to put into developing lessons, then I was able to do that . . . Time. It always comes back to time I think. You know, we have limited amounts of time for preparation . . . we have forty-five minute periods, and so a lot of times you're just under the stress to get that information out there, get the information to the kids, and then try to assess in some way that they learned it, so time is the big issue.*

Participant 1: *Time for them. They just don't—they haven't figured out a way to use it that just flows in with their day. It's more time that they've got to spend preparing a lesson, because they've already done it, you know, the old way and turning it over to an interactive lesson is more work for them to have to create the*

lesson . . . you know, and they are saying they are so pushed for time, they don't want to take the time to do that.

The fact is that some instructional strategies using SMART Board tools and features require more time, and the data suggest that teachers' time available to create these lessons is limited. Planning periods have been reduced, and time outside of school is limited (as indicated by Participant 2). Both participants insinuated that even if the instructional strategies were developed, the amount of class time available to use them is limited as well. Participant 1 went on further to note that teachers do not want to use their limited time to reinvent current lessons that already serve their purpose.

Evidence shows that access to resources, classroom dynamics, preference, and time are hindering factors to the use of instructional strategies. Time was viewed to be a deterring factor because instructional strategies that use SMART Board tools and features require more time to create, and teachers have limited available.

Enabling factors for SMART Board tools and features. This sub-theme emerged as the participants described factors that enabled their use of SMART Board tools and features. Analysis of the data revealed three categories: participants' knowledge of tools features, students' knowledge of tools and features, and training.

Participants' knowledge of tools and features. Participants' knowledge of tools and features was considered an enabling factor for using SMART Board tools and features. Similarly, as participants' knowledge of tools helped in the selection of instructional strategies, knowing about tools and features supported the use of them. Participants' examples follow:

Participant 1: . . . *the marquee tool is one thing . . . a lot of people don't know they can use to highlight more than one object at a time, rather than selecting different*

ones in order to group . . . Customizing the tool bar . . . the different pens and making their own . . . importing a picture to customize a pen.

Participant 2: *Well, part of it is just knowing that they exist, learning about them through the workshop and knowing that they exist and seeing examples of them used in other content areas helps, because I'm not extremely creative on my own, and so I have to borrow from other people, but I can apply my content to any other type of lesson that I can find pretty much . . . I just looked through all the different tools that were available to me and just, I guess, what I was able to come up with, what I could create, because it wasn't something that I got from a Web site or anywhere else. Just something that I took that I learned in the workshop and applied it and used it that way. They seem to fit the lesson . . .*

If a teacher does not know a tool exists or they have limited working knowledge of the tool, this can influence the tools and features selected. Participant 1 talked about the teachers not knowing about tools and features. If they are not aware of tools and features, they cannot use them. Participant 2 offered support that simply knowing tools and features exists influences their use. Furthermore, being knowledgeable about a variety of the tools and features allows different ones to be applied to a lesson until the right fit of tools and features for the lesson is found. Being aware and then taking initiative to work with the tools and features to select the ones that will best support the lesson is necessary. Participants' knowledge of SMART Board tools and features can contribute to the use of the fools and features.

Students' knowledge of tools and features. This category presents the students' knowledge of tools and features as an enabling factor for using SMART Board tools and features. Only Participant 3's response indicates that students knowing how to use the tools and features facilitated the use of them: "*They* [AP Students] *bring talent and skills from somewhere else to my classroom."*

This participant believed that students have developed the skills needed to be able to use the SMART Board tools and features, and have done so outside of his classroom.

Since the students were knowledgeable of the tools and features, the participant was more inclined to use them during instruction. Students' knowledge of the SMART Board tools and features help in selecting the ones to use. It is worth mentioning that all four participants provided students' knowledge of tools and features as an enabling factor for instructional strategies earlier.

Training. Opportunities provided to participants for them to learn and practice SMART Board tools and features followed by a chance to practice using the tools and features is beneficial.

> Participant 4: *The training and then you just sit down and work with it and talk with other teachers, how have they used in their rooms. I've got*[ten] *to teach a couple of classes . . . I have learned stuff there, different ways they use it . . .*

Participant 4 believed that training has helped in her use of SMART Board tools and features. Attending training, practicing, networking with other teachers, and even teaching classes has helped reinforce her ability to use the tools and features. It is worth mentioning that this participant and Participant 2 also stated earlier that training was helpful in using instructional strategies. Based on the evidence provided, training is helpful for using SMART Board tools and features.

The data indicate that enabling factors for the use of SMART Board tools and features are related to participants' knowledge of tools and features, students' knowledge of tools and features, and training.

Hindering factors for SMART Board tools and features. This sub-theme emerged as participants identified factors that hindered their use of SMART Board tools and features. These factors were categorized as: lack of access to equipment, classroom dynamics, and time.

Lack of access to equipment. When equipment is not available for use or external devices needed to use the equipment are not available, this is lack of access to equipment. Three of the four participants indicated that not having access to equipment prevented them from using SMART Board tools and features. Additionally, Participant 3, as will be presented here, did indicate access to the equipment was beneficial: The following discussion illustrates these ideas:

> Participant 2: . . . *I've not used that* [page recorder] *either, and it's partially because I haven't got the headset that comes with the microphone, the tools that you need to do that.*
>
> Participant 3: . . . *before moving to new facility I was in four classrooms a day because I moved from room to room to room. So, it was difficult technology-wise to have any type of continuity between what is presented in one class versus this class . . . sometimes I will go into a classroom that doesn't have a SMART Board, while I might have one that did.*
>
> Participant 4: *the Board working and the technology behind it. The glitches . . .*

Participant 3 was asked for factors that enabled the use of SMART Board tools and features and gave the following statement: *Having it in the classroom.*

Three of the four participants indicate that not having access to the equipment has prevented them from using SMART Board tools and features. An external piece of equipment is needed for the page recorder to work, and some classrooms are simply not adequately equipped with the technology. The perspective of Participant 4 is that equipment not working properly has interfered with the use of SMART Board tools and features. If the equipment is not accessible, then the SMART Board tools and features cannot be used. Participant 3 clearly indicated that having access to the equipment enabled the use of SMART Board tools and features. This is consistent with the

participant's earlier support for access to equipment as enabling factor for instructional strategies.

Classroom dynamics. Classroom dynamics refers to the structure of the class and the student characteristics. One of the four participants acknowledged class dynamics as a deterrent for using the SMART Board tools and features:

> Participant 3: *One of my problems, especially with my large environmental science class, is a large class, packed left to right, front to back. My experience with students up in front in that particular instance doesn't bode well, because you lose half of them . . . Size of classroom, abilities of my students, how do I keep rest of class engaged while that student or a lab group is working . . . What it gets down to, if I'm* [the student] *not going to get to play with the tool, I'm disengaged.*

This participant discussed the inability to use SMART Board tools and features due to the large class size, student ability, and class structure. These classroom dynamics can make it difficult to use tools and features for instruction. In large classes, students may get off task if they are not specifically engaged for a period of time. In addition, using the tools and features may actually extend the time it takes to present a concept, and there will also be a diverse range of students' ability to actually use the SMART Board. Using the tools and features can be hindered by the classroom dynamics.

Time. Limited time available is presented as a hindering factor for using SMART Board tools and features. Participant 4 said it this way: *It's hard to get a lesson pre-made between planning and grading.*

This example supports the idea that limited time is available to use SMART Board tools and features. This was also a hindrance for using instructional strategies, in the sub-theme hindering factors for instructional strategies. They both indicated that time available during the day was limited and certain instructional strategies were not used

because of this time limitation. The use of SMART Board tools and features can be limited because of the time available.

The data indicate that hindering factors for the use of SMART Board tools and features are related to lack of access to equipment, class dynamics, and time.

Chapter Summary

Research conducted in this study explored the instructional strategies used of those acquired by participants who attended a series of SMART Board professional development workshops. It also investigated the participants' use of SMART Board tools and features as demonstrated during the workshop. The various learning modalities embedded into instruction and influential factors for the participants' use of the SMART Board were explored. Data were organized into themes and sub-themes**.** Data gathered through interviews revealed participants used teacher-centered and student-centered instructional strategies. The main strategy used was teacher-centered. In reference to the SMART Board tools and features used by participants, two SMART tools, Page Recorder and Notebook, were noted. Overall, it was the features within Notebook that participants discussed most often. Various methods for incorporating visual, auditory, and kinesthetic learning modalities were provided by the participants. Enabling and hindering factors were identified in relation to the use of instructional strategies and the use of SMART Board tools and features. Themes and sub-themes were presented by each research question.

Chapter 5 – Discussion and Conclusion

The purpose of this research was to capture the most commonly used instructional strategies of those acquired by the participants who attended a series of SMART Board professional development workshops, and the tools and features of the SMART Board they were implementing. Within these instructional practices, the visual, auditory, and kinesthetic learning modalities being deployed were sought. Furthermore, participants' perceptions of factors that enable and hinder the use of the acquired strategies, tools, and features were included. In Chapter 4, the themes that emerged from the data analysis were reported. In this chapter, the summary and analysis of these findings will be presented, followed by the limitations, recommendations for future research, implications, and conclusions.

Summary and Analysis of Findings

Six themes emerged from data analysis: 1) teacher- vs. student-centered instruction; 2) rationale for use of instructional strategies; 3) patterns of use for SMART Board tools and features; 4) reasons for participants' use of SMART Board tools and features 5) perceptions of integrating visual, auditory, and kinesthetic (VAK) learning modalities; and 6) enabling and hindering factors for use. Figure 5 illustrates the alignment of each theme with the corresponding research question. A summary and analysis of each theme is given by research question.

Instructional Strategies

Research Question 1: What instructional strategies presented during the SMART Board professional development workshop do participants use most often?

Themes 1 and 2 relate to the participant's use of instructional strategies presented during a SMART Board training. Theme 1 will be presented first, followed by theme 2.

Theme 1: teacher- vs. student-centered instruction. Participants described lessons depicting the use of teacher-centered and student-centered instructional strategies. Additionally, as discussed in Chapter 4, participants reflected on instructional strategies not being utilized from the training and ones envisioned for use. These strategies described were also teacher-centered and student-centered. Smith et al., (2006) indicates more research needs to be conducted for the purpose of establishing types of instructional strategies associated with the use of IWBs. The findings of this study inform this area of research proposed by Smith et al. (2006).

The teacher-centered instructional strategy was the most commonly mentioned strategy of the two strategies described in this study. One would think the instructional practices exemplified in this study would be more diverse. After all, these participants could be characterized as elite SMART Board users, considering they attended the specialized training conducted by a SMART trainer; and they were hand-selected to attend because of their value of technology-laced instruction. They are also certified SMART Board trainers. Many technology workshops are designed to only teach how to use the technology. This training went beyond this as the participants were provided time to put the technology into context with their subject area.

The goal of this SMART Board training was to provide the participants the skills

necessary to be district SMART Board trainers. As trainers, they will teach others how to use the SMART Board, with focus given to incorporating it into the classroom. It has been 18 months since participants went through training, which could have affected the participants' information regarding this study.

Even with the narrow focus of instructional strategies suggested in this study, the strategies embodied interactive type lessons. The teacher-centered strategies facilitated interaction between the students and the content indirectly, and the student-centered strategy put students in the midst of interaction.

Putting these strategies in context within interactive teaching is necessary as the appearance of interactive teaching varies between them. Teacher-centered instruction presents concepts to students and may have them engaged for the purpose of receiving information or demonstrating their understanding of a concept. In contrast, student-centered instruction has students engaged in the learning process for the purpose of constructing knowledge. Student involvement in a student-centered lesson requires them to construct knowledge during the learning process, not simply receive information from the teacher. Dynamic methods such as highlighting text displayed on the board, students modeling a task at the board, or students constructing a model of data are ways to engage students in the learning process through the use of the SMART Board. This reflects the findings of research conducted by Cuthell, 2003; Glover, 2005; and Sessoms, 2008. Additionally, SMART Technologies ULC (2009) upholds that the SMART Board provides the tools teachers can use to create interactive lessons (p. 6).

Different opinions exist as to whether a teacher-centered strategy utilizing the SMART Board is considered interactive teaching. Starr (2010) suggests that using a

teacher-centered style of instruction in conjunction with IWBs does not equate to an interactive style. Beeland (2002), Levy (2002), and Smith et al. (2005) propose there can be different types of interactivity: technologic and pedagogical. While it is perceived that student-centered instruction uses a more interactive approach with students, interactive teaching can be supported in teacher-centered instruction when SMART Boards are used. It is conceivable that the perceived biases against IWBs with teacher-centered lessons are based on the definition of interactive teaching used in this study, the demonstration of information and construction of knowledge using dynamic methods, whereby the teacher engages students in the learning process using an IWB. To settle the issue, further research investigating the types of interactivity used in association with instructional strategies that incorporate IWBs is needed.

Theme 2: rationale for use of instructional strategies. Participants gave rationale for the instructional strategies. Justification for using teacher-centered and student-centered instructional strategies included concepts to be taught and student engagement. Course content, equipment, and time were reasons for not using the instructional strategies the participants described.

Regarding concepts to be taught as justification for the use of instructional strategies with IWBs, participants described lessons where students needed foundational concepts or a skill had to be demonstrated before future concepts could be taught. For these lessons, it is believed the participants chose teacher-centered instruction because of the need to inform and guide students. They were selecting the instructional strategy that would meet the goals of the lesson and provide students a greater chance to learn. Merging technology and instruction for the purpose of meeting prescribed instructional

goals requires a certain level of technology literacy. These participants exhibited the ability to merge the SMART Board with instructional strategies that fit the goals of the lessons. Thus, the SMART Board was being used to support the lesson goals. This purposeful design of using technology with teaching supports the ideas provided by Cuthell (2003) and Davies (2011).

Student engagement was also suggested as the basis for the instructional strategies participants used, and it was formed on the desire to engage students. Data were further divided into construction of knowledge and incorporating learning modalities.

Construction of knowledge supports the reason for the student-centered instructional strategy. Details about the lesson provided evidence that students were not passive in their role of learning. From the data, it is thought that students had to be engaged with the content to process information and construct knowledge on their own. The teacher did not feed them information but acted as a facilitator. The participant structured the lesson allowing students to take control of the learning, and the SMART Board was incorporated for the purpose of letting students articulate their understanding of the lesson. Here again, the merger of technology and instruction was crafted to meet the goals of the lessons and supports the work of Cuthell (2003) and Davies (2011).

Incorporating learning modalities into instruction is thought to be another method of engaging students and is therefore a reason for selecting instructional strategies. Ways of using visual, auditory, and kinesthetic learning modes in lessons were explained, and as one participant discussed, the ability to address more than one learning style provided students different ways of engaging with the content. Students can be engaged in multiple ways fostering connections to be made between the content of the lesson. It is

believed that through differentiated instruction the learning process can be stimulated for more students (Clark, 2011). As one participant described her lesson to address the visual, auditory, and learning modes, it was clear the teacher was choosing strategies expressly to engage the students; the elements served a purpose in the instructional process. The teacher was also considering the students' learning styles and not relying on her personal preference. Both of these ideas reflect those of Carson (2009).

Incorporating different learning modes into instructional practices is not automatically done by the teacher. Sometimes when different modalities are used, it is only to add an aesthetic element to the lesson and not for the purpose of enhancing student engagement. The students' preferred learning style may be overlooked by the teacher, and personal preference may steer which visual, auditory, or kinesthetic components are used. A quote from Participant 2 emphasizes that there has to be a deliberate and methodical use for incorporating learning modalities into instruction aimed at engaging students: "*You have to be intentional about it and sometimes it's just easier to teach it one way than to try to incorporate them all."*

From this study, contributing factors for the use of instructional strategies were concepts to be taught and student engagement. Further evidence associated with student engagement pointed to incorporating learning modalities. However, data did not show one factor as being more influential than the other one. Merrill (2000) says student learning styles are secondary to concepts when determining the instructional strategy, but Pashler et al. (2008) and Marzano (as cited in Clark, 2010) support instructional strategies matching student learning styles. Findings here do not underscore the results for Merrill or Pashler and Marzano. They suggest it is not necessary for information to

be presented in a student's learning style for a student to learn, and perceptions are that students will learn regardless of the instructional strategies used, but certain strategies make it easier for the student to obtain and construct knowledge. These perceptions support those views of Clark (2011). There is potential for future research to help clarify if primary consideration should be given to the concepts being taught or to learning styles when selecting an instructional strategy.

Teacher-centered instructional strategies were the ones representative of not being used, and this was due to activities that were embedded into instruction. This strategy reflects one of the two types participants used and envisioned using. Interestingly, when comparing the reasons suggested for not using this teacher-centered strategy and those for using other teacher-centered strategies, there were no common ones identified. Data provided evidence for course content, equipment, and time as reasons deterring the participants' use of the teacher-centered activities, but concepts to be taught and student engagement supported the use of these teacher-centered strategies. It is suggested that the reasons for not using an activity were based on factors pertaining to creating or using the activity, but the ones identified to be used as teacher-centered strategies placed emphasis on presenting lesson concepts and engaging students.

In reference to course content, using the SMART Response systems did not seem practical. One participant described a course with content being driven by current events; therefore, it was not typical of a textbook-based course. It is conceivable that the participant believed that without a structured content outline the SMART Response system could not be used. Had this participant been shown a way to use the SMART Response system within courses that have multiple types of content, the participant may

have used the SMART Response system. For a variety of instructional strategies to be used, teachers often rely on other teachers' lessons as examples. If they do not have one to use as a model, they may not be inclined to use different instructional strategies.

Equipment was a factor in nonuse as well. Participants stated that equipment was the reason the koosh Ball activity was not utilized. In this activity, students throw a koosh Ball at the board to select an object, similar to throwing darts at balloons. In one instance, the SMART Board did not stay aligned correctly. If the activity was used, the correct objects on the board would not be selected, and the activity would not be beneficial. The other participant revealed that updates had been made to the technology structure of the SMART Boards preventing the activity from being utilized. This data support the need for properly functioning equipment for certain instructional strategies. Aside from the teacher's role of using the SMART Board in the classroom, the boards and integrated technology have to be operable. There will be instances when technology malfunctions, and the teacher will have to rely on an alternate method. However, when technology simply does not work or the design of technology changes, teachers will abandon the use of it. In the case of inoperable technology, measures have to be put into place to equip teachers with appropriate technology and technical support for the SMART Boards to be utilized. In reference to the change in technology structure, these changes may be outside of the teacher's or the support system's control.

The last reason for not using instructional strategies was time. Certain instructional strategies simply take more time to create. One participant believed that time is a hidden factor.

> Participant 1 . . . *You know a lot of people think "Oh, this is grand and wonderful," but they don't realize how many hours we're putting into creating*

> *that lesson. It's not instant. And most people don't want to give up the time to create those lessons . . . I think they don't see the benefit yet of using it, so they don't want to invest the time in creating it.*

People can be blind to the time it takes to create in-depth instructional strategies, and once they do realize the time factor, they do not want to invest the time to create them. Another participant understands the time factor involved for the instructional strategy and chooses not to use the erase-to-reveal for the very reason of time. Levy (2002) and Shenton and Pagett (2007) make note that the extensive amount of time required on the front-end can be offset because of the reusability of the lessons. It is evident neither of these participants have taken this into consideration.

SMART Board Tools and Features

Research Question 2: Which of the SMART Board tools and features shared during the workshop do participants most often use?

Theme 3: patterns of use for SMART Board tools and features. Participants' use of SMART Board tools and features were also inventoried in this study. The tools and features were divided into four use patterns: learned from training - used, learned from training - not used, learned by self - used, and visions for use. Interpretation of the participants' use was done by comparing the four use patterns within each group of tools and features.

As defined in this study, only two SMART Tools were mentioned, Notebook and Page Recorder. The lack of other tools being mentioned could be a result of the participants simply not using them, because they didn't include them in their responses to the questions used in the interview for this study, or because they may not view them as

tools. Tools and features not being used that were not mentioned in this study and the rationale for a lack of use could be addressed in future research.

Notebook consists of numerous features the participants discussed; and for this study, they were grouped by perceived uses. All participants described using or envisioned a use for a feature with the purpose of annotating. Because of the design of the SMART Board as a presentation device, it is believed that is why all participants indicated the use of an annotating feature. This could also be interpreted as the participants using the SMART Board for more than displaying information. The annotating features are used to point out information or contribute additional information to make the lesson more meaningful. The participant who had a vision for the use of annotating features also indicated the use of the creative pen as being learned outside of training. This participant is a media specialist and referred to these features as ones she would use if she was in the classroom. As indicated by Boyle (2002), the features accessible with IWBs make them more than a presentation tool. Because the features are used to attract the students' attention, there is a possibility of a greater impact on student learning.

Gallery features, in terms of activities, had mixed use types among the ones mentioned. One participant indicated that she used drag-and-drop, hide/move-and-reveal, and screen shade-and-reveal. This represented three of the four activities mentioned as learned from training-used. From her accounts of the lessons, these were used to introduce students to concepts. It is believed that since the lessons were based on teacher-centered instructional strategies, these activities allowed the teacher to guide instruction without directly telling students the concepts. The drag-and-drop activity was

noted by this participant and one other as being learned outside of training as well. It is thought that they learned methods of incorporating it into their instruction prior to training that differed from that demonstrated in training. Different activities were used to present instruction, and although they were used to support a teacher-centered instructional strategy, participants saw a need to use the SMART Board-based activities. According to Plair (2008), realizing a need for IWBs is a fundamental requirement for technology integration.

Of the gallery feature activities, three were not being used, erase-and-reveal, games, and koosh ball activities. Based on the participants' responses, they were not used because of time, preference, and malfunctioning equipment. There are many factors associated with adopting the use of features of the SMART Board. Glover et al. (2005) called this "developing a culture of use" (p. 28). As suggested from the findings in this study, a culture of use is contingent on a variety of factors, and teachers develop ways to work around any perceived hindrances. As the participants in this study indicated, if inconvenienced when trying to use an activity, they will opt for another one or simply not use the activity. Further discussion of these influential factors is discussed in this chapter in the section called Influential Factors.

Two categories were created for presentation features. The first group included features that would be used during a lesson, and the second group involved features for organizing and saving a lesson. The group of features related to use during a presentation had all four participants indicate a use or an envisioned use, though two of the participants simply used features to select objects being displayed. The other two participants used features to guide students through instruction, present two copies of a

handout for the students to compare and contrast, or to reveal sections of information progressively during instruction. One participant gave a detailed account of using the Magic Pen. For all presentation features discussed here, it is suggested they were for the purpose of displaying information, calling students attention to aspects of the lesson, or for leading the students through the lesson. While these features do support engaging students with the content of the lesson, students were engaged as a whole-class or only one or two students worked at the board modeling a skill for the entire class. However, as Smith et al. (2005) suggests, these lessons were still interactive in the sense that the teacher and students were communicating in efforts to process information.

The second group of presentation features aimed at creating lessons was only discussed by two participants. One participant, from her view as a trainer, indicated that sorting pages and linking them to facilitate the flow of a lesson was not used. It was perceived that teachers do not value these features. Lessons are not so involved that they feel there is a benefit of sorting and grouping the pages in the lesson. In truth, it could be that the teachers have not been shown how these features can actually benefit them. The trainer participant also talked about the benefit of the feature to save lessons, while another participant had conflicting takes on using the save feature. As suggested by Royer and Richards (2011), Shenton and Pagett (2007) and Türel and Johnson (2012), the flow of instruction can be improved due to teachers being able to retrieve saved lessons and not having to create information. Organizing and saving lessons have not become valuable features to these participants based on the data in this study.

The specific features group included features that are available to help teachers draw shapes, teach math concepts, create tables, and insert additional resources into the

lesson. The only feature indicated not being used was the Math tools, which coincides with the fact that the participants in this study did not teaching math. For the other specific features, regardless of the type of use, they were used to create activities to present information, bring in external resources to supplement instruction, or to create objects to represent concepts. The drawing tools feature, which was used to create objects to represent concepts, was a part of the student-centered instructional strategy. The features were used in ways to facilitate the instructional strategy as described by the participants. Participant 3 did not mention the use of the screen capture feature of SMART. However, in his suggestions for integrating additional technology, it was the same premise as the screen capture, but the user was given more freedom due to not being directly connected to the SMART Board. Participant 1 described learning to use the 3D-360 tool outside of the SMART Board training, but the tool has not been purchased by the school, so other teachers cannot use it. Teachers can make information-rich lessons through the use of features available with the SMART Board, and Riddle (2010) promotes the inclusion of technology in the classroom to achieve more in-depth learning.

Tool properties addressed two areas: allowing users to change the features that are quickly accessible through a tool bar and changing object properties. One participant referenced using the tool bar and how being able to change the settings was beneficial. As pointed out by the participant, customizing the tool bar is not known by many and this could be the reason for the lack of use for this feature. Changing object properties was related to changing colors used to fill shapes or the colors of pens used in writing on the SMART Board. The ability to change colors of objects allows them to be more

distinguishable and aid in comparing and contrasting information. If a user does not know about a feature, obviously he or she will not use it. However, becoming more knowledgeable about the features can streamline the features' use. As more features are used, such as changing pen or shape colors, the presentation may have more of an impact (Boyle, 2002).

In the various features group, users spoke of animating objects, adding audio and sound, inserting pictures, linking to the Internet, and accessing video clips. From all the information provided, these features were used as supplemental elements to enhance the lesson. It is perceived that by using these features, concepts of the lessons can be displayed in multiple forms and connections between concepts will be more easily made. One participant commented on the lack of using video clips, and that was due to her feeling too intimidated to use them. Nevertheless, the importance of these features was underscored in studies by Gillen et al. (2007), Glover et al. (2005), and Haldane (2007). Findings in those studies reported that these features are being used to improve learning. Murcia's (2010) science lesson also exemplified the use of these features.

Integrating technology was the remaining group of features. Participants described ways of using document cameras, the SMART Response system, or other technology to interface with the SMART Board. The notion here is that connecting the SMART Board with other technology provides more ways to improve instruction. The perceived benefits of integrating technology can be in the form of bringing in extra visual aids or assessment tools that provide immediate feedback to the students. Participant 4 explained the benefits:

> Participant 4: *The student response is something they really like because they get to interact—they get to answer their questions instead of on a piece of paper with*

> *that clicker and then they actually get to right then see if they got it right or wrong.*

Plus, with the SMART Response system, it caters to those students prefer to learn with kinesthetically.

The Page Recorder was the second tool discussed by participants. One participant explained that she had not used the tool, but provided a detailed and beneficial use for it. The media specialist, referring to being in the classroom, envisioned a similar lesson. Potentially, the participants planned to use the Page Recorder to record their lessons and make them available to students who had been absent or needed them as a tutorial. This reinforces the benefits of this tool as described by Boyle (2002), SMART Technologies ULC (2009), and Wetzel (2009). Further discussion revealed that the lack of equipment kept the other participant from using the tool. Both participants had viable options for using the Page Recorder, but due to limitations of equipment and current job positions, the tool cannot be used.

It is also worth noting here that the use of SMART Board tools and features have the promise of differentiating instruction to address visual, auditory, and learning modalities. Discussion of these implications is in the learning modalities section of this chapter.

Theme 4: reasons for participants' use of SMART Board tools and features. Reasons for using and not using SMART Board tools and features were given by participants and were categorized by the purpose of the tools and features.

Participants discussed taking screen captures of other software or from the Web to incorporate into lessons and accessing the Internet to download up-to-date and various maps. This tool allows additional material to be made available to support the concepts

being taught. As reflected in findings of studies conducted by Gillen et al. (2007), by Smith as cited in BECTA (2003), by SMART Technologies, ULC (2008), and by Wall et al. (2005), the supplemental material can potentially help students make meaning of the information more quickly and easily.

Findings also revealed that providing students with multiple representations of concepts is a reason the tools and features were used. They can make connections between information that has been shown numerically and pictorially. Presenting information in more than one form helps students in the learning process, which supports Beeland (2002) and Murcia (2010).

It is believed that through the use of SMART Board tools and features, students are more engaged in the lesson because of the interactive element that is added. Forms of student engagement are not limited to students participating and using tools at the SMART Board, but also through engaging them with the material of the lesson. Simply letting students come to the board does not mean they are learning. The students may simply be interacting with the technology and not paying attention to the lesson. One participant even talks of engagement as when students are more alert and participating in discussion because of the use of the SMART Board tools and features. In this instance, students are not necessarily at the board working; rather, it is interactivity in the sense that students are engaged in the lesson in some way whether it is visually, auditorily, or kinesthetically (Clark, 2011). As Sessoms (2008) suggests, students have the opportunity to interact with the lesson in a variety of methods. These findings also correlate with the descriptions of the teacher-centered and student-centered instructional strategies in the section instructional strategies presented in this chapter.

As part of student engagement, findings also revealed SMART Board tools and features are used because they help to differentiate instruction in the sense that multiple learning modalities can be addressed. SMART Technologies, ULC (2009) upholds the use of IWBs to address multiple learning styles within a lesson. Findings from this study also reflect those of Haldane (2007), which revealed tools and features used to make lessons interactive and appealing to students' learning styles.

Findings show participants were able to select tools and features to use as they searched for ones that would best benefit the goals of the lesson. If they had not known about the tools or had no working knowledge of them, they would be limited. More advanced users could be advanced because of the training they received or because they are more technology savvy. As Beauchamp (2004) and Glover et al. (2005) reveal there are different levels of users, ranging from those who use the SMART Board as a whiteboard to those teachers who seek ways of incorporating technology into instruction.

Glover and Miller (2003) maintain that the use of technology may be related to the user's skill level. Plair (2008) contributes the lack of technology use to a user's comfort level. Findings from this study support these ideas as participants indicated they did not use tools and features of the SMART Board because of feeling intimidated and discouraged. Although these participants are considered to possess a high ability level to use technology, they exhibited concerns related to their confidence in not using certain SMART Board tools and features.

Findings also related to lack of equipment access which was also supported by data related to the non-use of instructional strategies presented in Chapter 4. As Glover et al. (2005) points out, access to the right equipment is needed if technology is to be

used. Teachers are unmotivated to use the SMART Board if they perceive technical issues will occur or if access to the equipment is not convenient.

It is believed that certain tools and features are selected because of the user's preference. It is possible this preference may be a result of not valuing the tools and features equally or simply that the other tool suits the goals of the lesson or students' needs more appropriately. Mims et al. (2006) support the idea that the value of the use of technology in the classroom has not been modeled to pre-service teachers. This idea could actually extend to current teachers. Teachers cannot place value on the use of technology if they have not been provided the opportunity to use it, which reflects Mims et al. (2006).

A final factor contributing to the use of SMART Board tools and features not being used was course content. Certain tools are designed to meet teachers' and students' needs in a specific subject, like mathematics. As Participant 4 states:

Participant 4: *I don't use the math tools because I'm not a math teacher*.

By design, certain tools are not ones that would be beneficial to other content areas.

Learning Modalities

Research Question 3: In what ways are visual, auditory, and kinesthetic learning modalities embedded in lessons which utilize the SMART Board?

Theme 5: perceptions of integrating visual, auditory, and kinesthetic (VAK) learning modalities. All participants in this study described ways that visual, auditory, and kinesthetic learning modalities were embedded into lessons that used the SMART Board. Comparing the approaches used to incorporate all three modalities, visual methods were categorized based on their purpose. For example, images could be used to

realistically represent information or provide different views of the same concept. The third visual approach was to help students focus on information. Auditory and kinesthetic approaches enhanced students' understanding of concepts.

Drawing on the idea that participants' lessons were identified as teacher-centered and student-centered instructional strategies, visual approaches used to realistically depict information were used in both types of strategies. Real-time maps were used for sea level measurements, and pictures were used to symbolize the do's and don'ts of taking care of books. One participant accessed a Web site through the SMART Board providing students a virtual tour of where Anne Frank lived. This brings a historical event to life for these students and exposes them to something they may never physically see. This approach, embedding the visual learning mode, was aimed at helping students make the transfer from an abstract concept to a more concrete representation.

A second form of visual learning was multiple representations of concepts. This approach was used in a student-centered lesson. It is believed this was a result of students manipulating data for themselves in efforts to construct knowledge.

Visual learning was also embedded with intentions to focus students' attention. Teacher-centered strategies were discussed in relation to this approach. Students were guided through the instruction or directly presented information, and methods were used to help students concentrate on certain aspects. Colored pens, highlighters, handouts at student desks matching ones on the SMART Board, annotating, and the Magic Pen were used to help focus student attention. These methods echo methods given by Clark (2011), Promethean (n.d), and SMART Technology, Inc (2004) to address visual learners.

Auditory approaches used by participants were through the use of supplemental elements of the lesson to add meaning. Findings support the body of literature that discusses ways to address auditory learners (Beeland, 2002; Bell, 2002; Clark, 2011; Sen, 2011). Two participants referenced the use of Martin Luther King's speech. Rather than simply discussing it and telling the students what it was about, they could hear it for themselves. Similar to the Anne Frank video, students will never have the opportunity to hear Dr. King give this speech in person, but letting them listen to it makes a deeper impression on their learning.

The use of songs and webinars can have the same connotation as the speech. Students can be taken back to different time periods and get a sense of what was taking place based on song lyrics and their meaning. The webinars allow students to attend conferences on current topics.

Each participant exhibited the use of valuable ways of addressing auditory learning. However, there was no evidence that the participants used sound clips like applause or buzzers to provide auditory feedback as described by Marzano (2009) and Wood and Ashfield (2008). The approaches used were to support the construction of knowledge and understanding of information.

When discussing the auditory components used in a SMART Board lesson, two of the participants suggested that auditory learning is always present in a lesson because of the teacher talking and the discourse among students.

Kinesthetic learning was in the literal and perceived form of contact with information displayed on the SMART Board, and the literal form was demonstrated the

least. It is perceived that the level of interactivity could be associated with the content being taught and the dynamics of the classroom.

Opportunities for students to be physically engaged in instruction were provided through the use of songs and through hand gestures. The Shurley Jingle engaged students in a grammar lesson by having students up out of their seats, singing, and watching the words on the SMART Board. This aligns with findings of Cuthell (2003) and Glover et al. (2005) which indicate that when teachers merge activities and the SMART Board, interactive teaching evolves. Additionally, according to Cuthell (2003), students are a part of the learning process as a result of this state of interactive teaching. Another approach to kinesthetic learning had the students working in groups manipulating data, solving problems, and constructing items to display their results at the SMART Board.

Approaches that promote the perception of physically being engaged in the lesson support the concept of ostensiveness as identified by Gillen et al. (2007), Virtual Learning (2003), and Wall et al. (2005). For example, the cell sort activity used in the figurative language lesson described in Chapter 4 had a student at the board sorting words. The other students remained at their desks performing the same task on their handout that match the one displayed on the board. This kinesthetic approach engages students within the lesson to give them the sense they are doing the same tasks as the ones being carried out at the SMART Board.

These findings reinforce those in Cuthell's (2003) study indicating that IWBs greatly support visual, auditory, and kinesthetic learning styles. In addition, the findings support the promotion of the SMART Board as a tool for delivering information in

multiple modalities as expressed by SMART Technologies, ULC (2009) and Smith et al. (2005).

Regarding the importance of addressing different modalities, two participants highlighted the fact that they do a student learning styles inventory at the beginning of each year. They value the need to identify students learning styles in order to develop instruction to meet the needs of the student in their class. This is contradictory to Carson's (2009) suggestion that teachers tend to rely on their personal learning style for instruction. Additionally, Clark (2012) claims a viable method for assessing student learning styles does not exist. Clark also believes that even if a student's preferred learning style is not used, he or she can still learn; it may just take the student longer to grasp the material. In line with this thought, Participant 2 said she feels the need to address all learning styles, even indicating if one is omitted she attempts to go back over the lesson to address that learning style. This implies the participant thinks learning has to include all learning modalities. There will be times that a learning style cannot be addressed, but students can still receive information and process it according to Clark. Carson (2009) even believes it benefits students who are exposed to instruction that does not cater to their preferred learning style, suggesting that in such instances, the non-dominant learning styles are strengthened (p. 100).

By embedding visual, auditory, and kinesthetic learning modalities into instruction, interactive teaching can surface. As the participants accounted for the ways visual, auditory, and kinesthetic styles were incorporated in lessons that used the SMART Board, a more information-rich lesson was presented with the intentions of engaging students in the learning process for a heightened level of learning. These findings reflect

the work of several other researchers (BECTA, 2003; Boyle, 2002; Haldane, 2007; and Wood & Ashfield, 2008).

Influential Factors

Research Question 4: What factors have influenced the instructional strategies, tools, and features that participants use most often?

Theme 6: enabling and hindering factors for use. When incorporating technology into instruction, multiple factors always influence its use. This is true with the integration of SMART Boards into the classroom. As a result of the SMART Board training the participants of this study attended, they are certified SMART Board trainers. From their experiences, they provided evidence of enabling and hindering factors associated with their use of instructional strategies and the tools and features that were presented in the SMART Board training.

Access to equipment was the first enabling factor associated with the use of the instructional strategies. Consistent with conclusions from Glover et al. (2005) and Levy (2002), having access to equipment promotes the use of instructional strategies. One participant, who detailed a student-centered instructional strategy in Chapter 4, linked the capability to use that strategy with the availability of the equipment. When preparing lessons, knowing the equipment is available can guide the teacher's choice to use an instructional strategy that requires equipment.

Earlier in this chapter, the discussion of learning modalities mentioned that participants supported identifying the students' learning styles to help create lessons that would cater to the students' preferred style. In addition to learning styles, it is also valuable to identify students' personalities and learning abilities. This is regarded as

knowledge of students in this study. Having this type of knowledge helps teachers design lessons that meet students' needs. For example, designing lessons that require students to be engaged at the SMART Board in front of their peers would not be beneficial to students who are hesitant to work in front of their classmates. Expecting students to participate in a way that makes them uncomfortable stifles the opportunity for learning. Furthermore, students' reluctance should not be considered as them not wanting to participate in the lesson; it could be they struggle with the concepts being taught and are afraid of making mistakes in public. In addition to knowing students' personalities and fears, it is helpful to recognize which students may require modifications due to learning disabilities. The instructional strategies used should include ways to address learners who have identified learning disabilities. Students may need modifications in instructional practices to help them recall information or to process large amounts of information. Dyslexia and attention deficit were two specific disabilities noted by participants. By knowing the students, teachers can select instructional strategies to address learners' personalities and abilities. It is possible that the strategies used would benefit other students as well.

The use of instructional strategies can be influenced by the knowledge of the SMART Board tools and features. Instructional strategies that use the SMART Board may rely on specific tools and features of the SMART Board. Teachers who know what tools and features are available can aid in the selection of a strategy, and knowing how to use the tools and features in conjunction with a lesson aids in the selection even more. When learning about the tools and features, it is important to learn them in the context they will be used (Ertmer, 1999). SMART Board tools and features also include

templates and ready-made lessons that teachers can access. Basically, teachers simply insert information into the template and the lesson is ready to use. Knowing about this aspect of the tools and features is a timesaving benefit that can influence the use of instructional strategies. Instructional strategies using the tools and features can surface from learning about them in training, or as one participant pointed out, they can be searched out to fit teachers' specific needs.

Participants believed that if students already know how to use the SMART Board tools and features used with an instructional strategy, the teacher is more inclined to use that strategy. In those cases, the teacher does not have to spend time demonstrating the use of the tools and features, which takes time away from the lesson. Participants also held that the students' knowledge of the tools and features was related to their exposure to the SMART Board. Using more lessons that provide students the opportunity to work with the SMART Board gives them these skills. One participant also equated the students' skill level with their association with advanced placement courses. It is speculated that this is due to the instructional strategies that are used in those courses.

According to Beauchamp (2004), Buckenmeyer (2010), DeSantis (2012), Levy, (2002), and Plair (2008), training should be based on the skills of the teacher. Designing training that groups teachers by their abilities allows for their exact needs to be met. The SMART Board training participants of this study attended was based on their advanced technology skills and their value of technology. It is perceived that training is also connected to the knowledge of tools and features. In relation to the instructional strategies used, it was posited that the instructional strategies used would be more

evolved because of the specialized SMART Board training. However, the majority of the ones presented symbolized a traditional teacher-led classroom.

Factors hindering instructional strategies that required additional resources included availability of equipment and malfunctioning equipment. Having access to resources entailed software add-ons and functioning equipment being available. Instructional strategies can require the use of additional software along with the SMART Board. These add-ons are not automatically included in the purchase of the SMART Boards. Some require an additional fee, while other add-ons are new and were not available when the boards were initially purchased. If a need for the software has not been established, purchasing it may not be justified.

In terms of functioning equipment, activities described could not be utilized because the SMART Boards did not work due to updated technology structures or problems with two or more components interfacing. These instructional strategies were not used because of issues with the equipment. When teachers plan activities, they do not want to deal with technology issues. If the issues are reoccurring, the teachers will abandon the use of those instructional strategies (Beeland, 2002; Buckenmeyer, 2010; Smith et al., 2005).

Classroom dynamics, which considers class structure and student characteristics, can affect the instructional strategies used. Teachers who like structured classroom environments do not typically use instructional strategies that allow students to move around the room or work at the board. The notion is that it is too much trouble to call them back together as a whole class. Even if teachers are more lax in their classroom structure, if the student characteristics do not support the use of an instructional strategy,

the teacher will opt for another one. The perception of one participant was that there were too many students in a class, and if an instructional strategy was selected that only involved a student or two at a time, the others would become disengaged. This thinking is aligned with Starr's (2010) findings that teachers can be locked into a teacher-centered style and do not transform to one that promotes interactivity.

Another reason teachers fail to use certain instructional strategies is that teachers develop favorite strategies. This preference for certain instructional strategies can be rooted in the teacher's value of those strategies or because of the efficiency afforded to the creation of the strategies that are used. Participant 1 made the following statement:

> Participant 1: *That was way more than what any of them wanted to do. They just want a basic 25 slides, . . . they don't want to group them and rename—you know, as far as organization . . . They're not interested in that . . .*

Participant 1, as a trainer, revealed that teachers do not want to organize the slides to help sequence their instructional strategies. They prefer to keep it simple. There was no evidence given that this participant leverages the use of certain instructional strategies to change teacher's mindsets toward more elaborate instructional strategies. It is possible that those instructional strategies do not meet the needs of those teachers.

The remaining factor hindering the use of instructional strategies is time. There is always a time factor associated with planning and creating instructional strategies. However, when this time factor exceeds what is available or what teachers are willing to devote, instructional strategies may not be utilized. These ideas reflect those presented by Levy (2002) and Shenton and Pagett (2007). They state that the initial investment of time to create lessons is substantial; but in the end, the time factor balances out because the lessons can be reused in the future. Regarding the time factor, Participant 2 said the

following: "*Just time. Time is the big one because to me those take longer to set up. It takes longer to create those lessons . . .*"

Another participant explained that some teachers do not know the amount of time it takes to create elaborate lessons, and when they do realize it, they are not willing to give up the time to create the lesson. Two participants discussed time as a hindrance from the viewpoint that there is a limited time available for them to create lessons. One participant's explanation is below:

> Participant 1: *Time for them. They just don't—they haven't figured out a way to use it that just flows in with their day. It's more time that they've got to spend preparing a lesson, because they've already done it, you know, the old way and turning it over to an interactive lesson is more work for them to have to create the lesson . . . you know, and they are saying they are so pushed for time . . .*

Time availability was both during the school day and on their personal time. In relation to the school day, time must be distributed between daily tasks and creating lessons. There is only so much time that can be used for creating lessons, and the ones that require a great amount of time are not ones the teachers tend to use. It was also suggested that an instructional strategy that required an extended amount of time to present was not feasible. This was based on the idea that classes are limited in time. Time had to be allotted for assessing students to see if they grasped the information and for making sure the required material is taught.

As participants described enabling factors for using SMART Board tools and features, their reasons overlapped with those enabling factors of instructional strategies. The SMART Board tools and features used were contingent upon the participants' knowledge of the tools and features, students' knowledge of tools and features, and training.

Knowledge of the SMART Board tools and features was an enabling factor from the participants' and students' perspective. When teachers know what tools and features are available and can use them, instructional strategies can be selected that include the use of the tools and features (Plair, 2008). Taking into consideration the students' level of knowledge for the tools and features can also influence their decision. Teachers are more likely to use instructional strategies that incorporate SMART Board tools and features if they do not have to spend instructional time teaching students how to use the tools and features. There is a possibility for this factor to relate to the value teachers place on the use of the SMART Board technology. They value the affordance of the technology as long as it does not interfere with the lesson. Furthermore, this could stem from the level of technology integration as defined by the teacher's pedagogical view (Sessoms, 2008).

One participant highlighted the point that knowing about the tools and features is not sufficient. Integration of the tools and features does not happen because a person knows about them. They have to be motivated and willing to use the tools and features. As teachers come to value the tools and features, they will be more likely to use them. These findings support the belief by Beuchamp (2004) and Glover and Miller (2003) that there are different phases of acceptance toward IWBs which are associated with the teachers' values and skills related to the IWBs. As Sessoms (2008) suggests, teachers do not have to have a thorough working knowledge of the tools and features in order to use them. Using the tools and features helps the teachers grow in their abilities.

Training was perceived to be an enabling factor for one participant. The opportunity to attend the SMART Board training gave her the fundamentals. Ertmer

(1999) and Levy (2002) believe when teachers are provided the opportunity to go to professional development to acquire new skills and to practice, the possibility they will use the tools and features increases. It was further perceived that in order to use the tools and features, a user cannot stop at training. They have to try out the tools and features, see what works, and talk with others to gain other methods of using them. Networking with others to share and seek advice influenced the use of SMART Board tools and features (DeSantis, 2012, Ertmer, 1999; Glover et al., 2005; Johnson, 2011; Levy, 2002; Mims et al., 2006).

The findings presented in Chapter 4 show hindering factors of SMART Board tools and features to be lack of access to equipment, classroom dynamics, and time. These factors parallel those associated with hindering instructional strategies as presented in this chapter.

Having access to the appropriate equipment to use with the SMART Board allows teachers to use it more ways. For example, the page recording tool could not be used by one participant because she did not have the headset that was needed to record sound. If equipment is not available or not conveniently accessible, teachers will not put forth the effort to use the tools and features of the SMART Board. Even if the equipment is available, if it doesn't work properly, the teachers will not use it.

Classroom dynamics related to the number of students in a class. A large number of students limited the use of tools and features. In most cases, the entire class cannot be physically involved at once. There is the opportunity for students to lose focus if they are not the ones participating. With this in mind, many teachers would rather maintain full

control of the class and not provide any student the opportunity to be physically engaged (Starr, 2010).

Time as discussed here refers to the limited amount of time during the school day. Planning periods are short, and teachers are restricted to the time they have during this period to create lessons. Even if in-depth interactive lessons are created, the class periods do not afford time for lengthy lessons. These findings reinforce those of Levy (2002) and Shenton and Pagett (2007).

Recommendations for Future Research

The purpose of this study was to explore the use of instructional strategies and SMART Board tools and features participants acquired from a series of SMART Board professional develop training; the ways visual, auditory, and kinesthetic learning modalities were embedded into lessons that utilize the SMART Board; and factors influencing the use of instructional strategies and tools and features. This study concentrated on a specific population, four teachers, and a specific training, indicating a narrow scope. From the relative findings in this study, there is the possibility that additional research needs to be conducted. Furthermore, there were results of this study that created additional questions prompting the need for further research. From the interpretations of the findings, recommendations for future research can be made and are presented here:

- Only the four participants who attended the SMART Board training were considered for this study. This research could be extended by expanding the participant pool to a more diverse teacher group with access to SMART Boards. The findings would further inform the use of instructional strategies,

use of SMART Board tools and features, incorporation of different learning modalities, and influential factors.

- Replicating this study using teachers who are SMART Board users but have not participated in the training would serve to examine the impact of specialized professional development. Data from this study and the recommended future study could be compared to explore commonalities and differences between the two participant groups.
- Additional research could be conducted, using teachers who are SMART Board users, to examine SMART Board use among additional grade levels and content areas. The participants of this study represented grade 6 through grade 12, and subject areas they taught were history, science, and media science.
- Further investigations could collect data about the type of interactivity that is afforded to the students through the use of the SMART Board and help in assessing interactivity as related to technology or pedagogy.
- Further investigations could collect data about the influence student learning preferences and course concepts have on the design and use of instructional strategies.
- Replication of this study could be conducted with the same four participants but with a revised interview protocol. Observations could also be used to collect additional data. Through the use of the revised interview protocol and observations, data collected has the potential to provide a more in-depth account of the participants' SMART Board practices.

Implications

The implications for this research are informative to teachers, professional development coordinators, school administrators, technology staff, and teacher educators. Instructional practices are changing because of technology and educational standards. To help support teachers during these transitions, it is important to provide insight into current teaching practices and the factors that influence the use of technology.

- Findings of this study suggest that instructional strategies used were predominately teacher-centered strategies. With the adoption and implementation of Common Core State Standards, instructional practices will have to transform to ones that are student-centered strategies.
- The results also suggest that participants' use of the SMART Board was influenced by the professional development training. When developing and scheduling technology related professional development, consideration should be given to the varying levels of technology skills and the content area represented. Not only should the technology skills be taught, but examples and practice for incorporating the technology within teaching should be included.
- It is also worth noting that participants found time to be an influential factor in choosing instructional strategies, both from the perspective of the time that it takes to create technology-rich lessons and for the time that is available to teachers to dedicate to creating these lessons. Providing teachers opportunities to develop these lessons would convey to them that the school values the use of technology for instructional use, and could serve as

motivation to the teachers to incorporate technology or increase the use of technology in the classroom.

Conclusions

Knowing this research study revolved around a specialized, in-depth SMART Board training with four participants considered being knowledgeable of technology and who value the use of technology within the classroom, conclusions gleaned from this study could be considered unfavorable. However, these conclusions could also be considered instrumental in designing future professional development and in forming user support systems.

As for the instructional strategies presented during the SMART Board professional development workshop, results from this study revealed teacher-centered and student-centered instructional strategies were used by the participants. Since teacher-centered instructional strategies were reported more often, the results could be an indicator that teacher-centered instruction is still commonly used in the classroom. Although the participants of this study were known to place value on technology for instructional use, their participation in the SMART Board professional development did not seem to shift their instructional practices to student-centered strategies that place the students at the center of learning. Results of this research also suggest that regardless of the type of instructional strategy used, the lessons were based on an interactive approach. Based on reasons provided by the participants, lessons were purposefully designed that engaged students with the content being taught. It is also important to call attention to the idea that certain instructional strategies were not used due to factors out of the participants' control. For teachers to expand their use of instructional strategies,

designing and providing professional development opportunities that demonstrate additional strategies using the SMART Board is needed. In addition, resources need to be provided to teachers to offset technology and time factors that inhibit their use of instructional strategies they desire to use in the classroom. Resources could be in the form of technology support, newer equipment, or time release from work to use for creating instructional strategies.

The SMART Board tools and features the participants described were ones that engaged students with the lesson content to optimize the learning opportunities for the students. They were used mainly to support presentation of the content through teacher-centered instructional strategies. Simply having technology in the classroom does not automatically change the instructional strategies used by the teacher. It was thought that because the teachers possessed an advanced level of technology skills, their use of the SMART Board tools and features would be used for more than supporting the presentation of concepts. The participants did exhibit knowledge of tools and features, but their actual use of the tools and features was limited. Additional training that focuses on integrating the tools and features with specific content areas may help them move beyond a presentational type of use. It is also important to consider teachers' reasons for using and for not using tools and features when designing professional development. Participants, as SMART Board trainers, knowing these reasons can address them when training others.

According to all participants in this study, visual, auditory, and kinesthetic learning modalities were embedded in lessons that utilize the SMART Board. The researcher believes that visual learning was the most accommodated mode, with

kinesthetic being the least addressed. The high level of visual elements could be a result of the SMART Board tools and features being used mainly as presentation tools. When teachers adopt a more diverse set of instructional strategies and use the tools and feature for purposes other than presenting information, more ways of embedding the visual, auditory, and kinesthetic learning modalities will likely follow.

Results of this study suggest there are enabling and hindering factors associated with the use of instructional strategies and SMART Board tools and features. From these results, teachers, school administrators, and technology staff are encouraged to develop user-support systems to aid other teachers in their use of instructional strategies and tools and features. Technology is becoming an integral part of instruction, and acknowledging these factors may benefit teachers. Teachers will be at various stages of use, and these support systems can be a positive influence. Designing technology-related professional development catering to users' skill level can be beneficial. Training that consists of multiple levels of users can be discouraging to those who are basic users and frustrating to those advanced users. Furthermore, when teachers do learn how to use technology-laden teaching practices and they are motivated to use it in the classroom, schools need to ensure technology is available for teachers. Technology that is conveniently available and works properly will be more likely to be used in the classroom.

Although the training in this study was specific to SMART Board technology, the conclusions could be applied to any technology type training.

Chapter Summary

Integration of technology into the classroom is going to expand. To meet teachers' needs of merging technology with instructional practices, professional

development opportunities will have to be adapted and structured so that varying levels of technology use and content areas are considered. Also, schools will have to make technology available to the teachers. As more research is conducted, the importance teachers place on the use of technology in the classroom can be instrumental in designing future professional development.

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Appendix A

Email Script

Hello, my name is Danita Gibson, a graduate student at the University of Memphis. Currently I am working on my Doctorate of Education with emphasis on Instructional Design and Technology. My research examines instructional practices intertwined with the use of SMART Board technology as learned from the SMART Board training. The most commonly used SMART Board tools and features along with factors influencing the integration of this specific technology will be explored.

Your participation in this research would be greatly appreciated. The requirements of your participation include one interview lasting approximately 45 minutes. A follow up session may be needed after the interview notes have been transcribed and evaluated. Interviews will be conducted at your place of employment. The information you supply will be completely confidential, and in the final product no reference to you which would identify you will be used. Participation in this study is completely voluntary, and should you volunteer and later change your mind, there are no consequences. There are no risks associated with participating in this research study as well.

The potential benefits to science and humankind that may result from this study are contributions to the collection of research on technology professional development and how educators are impacted by it. The potential benefits to the participants from this study are not directly connected to the participants. The potential benefits come from future professional development customized for other educators to facilitate the integration of SMART Board technology in the classroom.

Should you have further questions, contact me at dcgibson@memphis.edu or call 870-240-5927.

Sincerely,

Danita Gibson
297 Greene 626 Road
Paragould, AR 72450
Phone: 870.240.5927
Email: dcgibson@memphis.edu

Appendix B

Participant Informed Consent Form

How is the SMART Board being Used?
Informed Consent Form

The following information is provided to inform you about the research project and your participation in it. Please read this form carefully and feel free to ask any questions you may have about this study and the information given below.

Purpose of the study: The purpose of this study is to capture what participants who attended a series of SMART Board professional development workshops consider to be the most commonly used instructional strategies acquired from the training; what they` perceive to be the most beneficial tools of the SMART Board; and what factors influence how they use the SMART Board tools

Procedures: As a qualitative study, the method for collecting data is personal interviews. The analysis of the data will entail the identification of commonly used instructional strategies, tools, and features related to the SMART Board along with factors influencing the integration of it. The results will be compiled in a write-up detailing the findings.

Risk of Being in the Study: There are no identifiable risks associated with participation in this study.

Compensation for participation: There is no compensation for your participation in this study.

Voluntary Nature of the Study: Your participation in this research study is voluntary. Your decision whether or not to participate will not result in penalty or loss of benefits to which you are otherwise entitled. Data collected for this study will be kept confidential within the limits allowed by law. No identifiable information will be included in any published reports that will identify the research participant. Your name or the school's name will not be included in any publications. Only approved researchers will have access to the securely, stored data.

After volunteering to participate in this study, but change your mind in the future, you may withdraw from the study at anytime. Should you withdraw from the study after it commences, your information will not be used in any reports.

Audio Recording of Study Activities: To assist with accurate recording of participant interviews, an audio recording device will be used. Participants have the right to refuse to allow such taping without penalty. All recordings will be destroyed one year from the completion date of the study.

Contacts and Questions: If you should have any questions about this research study please feel free to contact the research or the researcher's advisor.

Researcher
Danita Gibson
dcgibson@memphis.edu
870-240-5927

Researcher's Advisory
Dr. Clif Mims
clifmims@memphis.edu.

Questions regarding your rights as a research participant can be directed to The University of Memphis the Institutional Review Board, Administration Building 315, Memphis, TN 38152, 901-678-2533 or irb@memphis.edu. **You may request a copy of this information for your records.**

Statement of Consent: I have read this informed consent document. I have had the opportunity to ask questions, and they have been answered. I freely and voluntarily choose to participate in this study.

_____ _____

Signature of Research Participant Date

Appendix C

Interview Protocol

How is the SMART Board Being Used?
Interview Protocol

Participant: _____ **Date**: _____

1. Welcome participant and thank for willingness to participate
2. Restate purpose of project
3. Restate purpose of conducting interview
4. Allow the participant time to review and reflect on the workshop agenda.
5. Emphasize importance of open, honest discussion

Interview Questions

Before starting the interview, take up to five minutes to review the agenda of the SMART Board training (Appendix C) to stimulate your memories and thoughts from that experience.

The following questions will be used to initiate a discussion about instructional strategies, tools, and features of the SMART Board. Other questions may surface during the interview from the information you provide. The discussion will be recorded for accuracy.

1. What instructional strategies presented during the SMART Board professional development workshop do participants use most often?
    - Describe a lesson that you taught utilizing one or more of the instructional strategies presented during the workshop.
    - Why does this lesson standout?
    - How were the instructional strategies selected?
    - What factors have enabled your use of these instructional strategies?
    - Think back to the instructional strategies presented during the workshop. Are there instructional strategies that you are not using? Why not?
    - What factors have hindered your use of the instructional strategies?
    - How do you see yourself using the additional instructional strategies? – Describe a time in which you used instructional strategies with the SMART Board that you didn't learn in the workshop.
    - What do you see as potential benefits for integrating current or additional instructional strategies?

2. Which of the SMART Board tools and features shared during the workshops do participants most often use?
    - Describe a lesson that you taught that utilizes tools and features presented during the workshop.
    - Why does this lesson standout?
    - How were the tools and features selected?
    - What factors have enabled your use of these SMART Board tools and features?
    - Are there tools and features presented during the workshop that you are not using? Why not?
    - What factors have hindered your use of these SMART Board tools and features?
    - How do you see yourself using these SMART Board tools and features? – Describe a time in which you used SMART Board tools and features that you didn't learn in the workshop.
    - What do you see as potential benefits for integrating current or additional tools and features?

3. In what ways is instruction presented using the SMART Board that incorporates visual, auditory, and kinesthetic learning modalities?
    - Do you incorporate different learning modalities in your instruction? Why or why not?
    - If you do, describe a lesson that uses the interactive whiteboard to incorporate different learning modalities.
    - If you do not incorporate different learning modalities in your instruction, why not?
    - Earlier you described the lesson(s) in which you {USED INSTRUCTIONAL STRATEGIES FROM THE WORKSHOP}. Were there any VAK connections in this lesson?
    - Earlier you described the lesson(s) in which you {USED TOOLS AND FEATURES FROM THE WORKSHOP}. Were there any VAK connections in this lesson?

Appendix D

SMART Board Training Agenda*
June 5, 2011 – June 8, 2011

Day 1

- Introduction to SMART Notebook Software Training
- Getting started
- Basics for SMART Notebook software
- Objects in SMART Notebook software
- Creating interactive lessons activities
- Working with Ink Aware applications
- Care and maintenance

Day 2

- Review of SMART Notebook software basics
- Best practices and tools
- Structuring and organizing lessons
- Adding style to lesson activities

Day 3

- Building interactive lessons
- Integrating rich media into lesson activities
- Lesson development in SMART Notebook software
- Delivering lessons and leveraging interactive tools
- Wrap-up

*Information compiled from resources provided to participating Greene County Tech teachers by SMART Technologies during the 2011 SMART Notebook Software Training.