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Understanding Elementary Teachers' Experiences and Views Using Interactive Whiteboards for Pedagogical Practices

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Abstract

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MA, Brooklyn College, 2009

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Dissertation Submitted in Partial Fulfillment

of the Requirements for the Degree of

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Abstract

Student learning for the 21st century requires innovative teaching techniques. Often, many teachers are unaware of how they can integrate innovative teaching, especially using interactive whiteboards (IWBs), to develop curricula and facilitate student learning in order to develop their advanced knowledge and skills needed in the future. The purpose of this qualitative case study was to examine how U.S. elementary public school teachers use and perceive IWBs. Rogers' theory of diffusion and innovation, Davis's technology acceptance model, and Ajzen's theory of planned behavior provided a conceptual framework for the study. The research questions focused on elementary teachers' experiences and perceptions of IWBs and integrating this technology in their classrooms. Nine teachers who used IWBs in their pedagogical practices for at least a year were selected as the criteria for this study. They were administered 2 interviews over Skype or phone and their lesson plan snapshots were collected. To identify patterns and themes, the data were examined and coded using the Dedoose software. Themes on teachers' experiences consisted of developing lessons with IWBs, teaching with IWBs, and assessing with IWBs. Themes on teachers' perceptions were a productive integration of IWBs, pedagogical practices, issues with IWBs, and school support. Overall, participants had positive attitudes towards IWBs and considered them beneficial, though they identified the need for professional development, additional planning time for developing new lessons, consistent technology support, and upgrades of the technology. The social change implications of this research encompass teachers productive practice for integrating advanced technologies to support 21st century learning.

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Chapter 1: Introduction to the Study

For U.S. schools to remain competitive and student achievement to be constantly improved, educators need to focus on what students need to learn and how they should be instructed in today's world. Vockley (2007) asserted that, in a digital world, no organization could achieve desired results without integrating technology into everyday practices. According to current research, the intensive use of technology is necessary for educational systems to prepare students to perform in the global economy, and it is the educator's task to blend techniques into lessons so that students might be successful in their future lives (Ertmer, Ottenbreit-Leftwich, Sadik, Sendurur, & Sendurur, 2012; Şad & Özhan, 2012). Twenty-first-century education requires the integration of technology to support innovative teaching and learning in order to develop advanced knowledge and skills needed in the future (Voogt, Erstad, Dede & Mishra, 2013).

An example of educational technology is the interactive whiteboard (IWB), which was developed in Turkey in the early 1990s (Şad & Özhan, 2012). According to Gursul & Tozmaz (2010), this technology has the potential to be a revolutionary teaching tool for the 21st century similar to the role the blackboard played in the 19th and 20th centuries. According to current research, use of IWB technology in classrooms may enable education to be more productive, creative, and efficient for all learners (Hur & Suh, 2012; Koh & Divaharan, 2013; Robertson & Green, 2012). By using IWBs, teachers can facilitate reflective practices in elementary schools and engage young students' attention for a longer time by enhancing the visual quality of teaching materials (Gursul & Tozmaz, 2010). Murcia (2014) found that, compared to secondary students, young

children have a higher level of learning response when they interact with media using an IWB. In addition, IWBs give students opportunities to absorb information in numerous formats, which helps enhance synthesis and the retention of information (Murcia, 2014). They also enable educators to plan and perform lessons in a more efficient and systematic way (Gursul & Tozmaz, 2010).

This chapter incorporates a discussion of existing research and the gaps in research about IWB technology. I follow with the problem statement, the purpose of the study, and an outline of the case study approach I used in conducting my investigation. Rogers's (2003) theory of diffusion and innovation (DoI), Davis's (1989) technology acceptance model (TAM), and Ajzen's (1991) theory of planned behavior (TPB) provided the conceptual framework for this study; the chapter includes an overview of these theories. Definitions and a discussion of the assumptions, delimitations, and limitations of the study are also provided to offer important contextual information about the study. The chapter ends with an analysis of the significance of this research.

Background

A large body of research exists exploring IWBs. Existing research illustrates numerous advantages of IWBs over traditional whiteboards (Alvarez et al., 2013; Berson et al., 2014; Lopez & Krockover, 2014; Murcia, 2014). IWBs enhance students' motivation and achievement, according to several researchers. When used as live presentation tools, to engage students in dialogs, as a just-in-time source of formative assessment and feedback, IWBs engage learners and result in improved learning (Begolli & Richland, 2015; Emeagwali &Naghdipour, 2013; Fraser &Garofalo, 2015). However,

many teachers who have adopted IWB technology are unaware of the positive changes that IWBs can make in their teaching because they have not received the appropriate training to apply IWB skills into their pedagogical practice (Bakadam & Asiri, 2012; Bidaki & Mobasheri, 2013; Hennessy & London, 2013; Türel & Johnson, 2012). In interviewing teachers, Korkmaz and Cakil (2013) found that the introduction of IWBs resulted in feelings of excitement, concern, and angst among teachers. Most educators possess little understanding of, and experience with, IWBs (Hockly, 2013).

Teachers are often unaware of the positive changes that use of IWBs can make in their teaching methods and techniques, according to researchers (Bakadam & Asiri, 2012; Hennessy & London, 2013). For this reason, technologies like IWBs are considered a disruptive innovation causing multiple changes in the classroom dynamics which challenge educators to develop new methods of teaching. Consequently, when new technologies are introduced into teaching practice without a consideration of pedagogy, learning and teaching do not change (Warwick et al., 2013).

Little is known about how elementary teachers develop new ways of integrating IWB technology with pedagogy and generate appropriate learning tasks (Beachamp & Kennewell, 2013). There is limited research on using IWB technology learning resources in lesson development and IWB teaching methods and procedures in elementary schools (Lopez & Krockover, 2014). In addition, knowledge is limited about assessing and evaluating students' learning using IWBs in elementary schools (Teck, 2013). To promote the IWB integration in elementary education and develop programs to support teachers' success in the 21st century technology integration process and its link to

pedagogy, an understanding of the experiences of elementary teachers in developing, delivering, and assessing lessons using IWBs is, therefore, needed.

Problem Statement

A large body of research exists on the advantages and disadvantages of using IWBs in teaching and learning (Camplani, Salgado & Camplani, 2012; Liang, Huang & Tsai, 2012). In addition, researchers studying IWBs have investigated their usage in particular subject areas focusing on pedagogical issues that are addressed when working with new technology (Albaaly & Higgin, 2012; Al-Qirim, 2012; Allsopp, 2012; Martin, Shaw, & Daughenbaugh, 2014) as well as teachers' and students' attitudes and views about IWBs as an innovative technology (Corbo 2014; Emeagwali & Naghdipour, 2013; Naghdipour, 2013; Şad & Özhan, 2012; Wong, Russo, & McDowall, 2012). Multiple studies have illustrated problems that are related to the integration of IWBs in K12 classrooms (Alvarez et al., 2013; De Koter,Volman, & Kuiper, 2013; Ertmer et al., 2012; Kilic et al., 2015).

However, there is a need for more research on elementary teachers' pedagogical practices regarding use of this technological. Specifically, knowledge is needed about how teachers integrate IWB technology in ways that are meaningful for developing curricula and the advanced problem-solving and critical thinking skills that are needed for the 21st century (Biacorosa & Griffiths, 2012; Gibson et al., 2014; Hwang & Hu, 2013; Linder, 2012; Jang & Tsai, 2012). How teachers perceive and experience the integration of new technology in the classroom represents a gap in the literature on teachers' experiences and views of technology in teaching. The knowledge gained from this

qualitative case study might yield new understandings of teachers' experiences adapting this new technology and potentially provide information that school administrators can use in their efforts to encourage the use of instructional technology by teachers.

Purpose of the Study

The purpose of this qualitative study was to understand the experiences and views of elementary teachers integrating IWB for pedagogical practices. This study was conducted using a case study approach because it is valuable in exploring, describing, interpreting, and explaining individuals' experiences (Stake, 1995). This type of approach allowed me to identify key themes and clarify educators' perspectives on the use of IWBs when analyzing data.

Research Questions

RQ1: What are the experiences and views of elementary teachers integrating interactive whiteboards in their classroom?

RQ2: How do elementary teachers integrating interactive whiteboards in their classrooms view the use of the IWB?

Conceptual Framework

For this study, three main conceptual theories were used to understand the issues inherent in participants' experiences: (a) Rogers's (2003) theory of diffusion and innovation; (b) Davis's (1989) TAM model, and (c) Ajzen's (1991) TPB. I used Rogers's theory to understand the acceptance level of innovation as a new technology, the IWBs, integrated into the teachers' classroom. I also interpreted the teachers' experiences with IWBs through Davis's theory. Ajzen's model was used to understand the participants'

beliefs toward IWB usage. A more detailed analysis of each theory can be found in Chapter 2.

Barriers to innovative technology integration exist at every level of the educational system (Çelik, 2015). Individuals vary in how they perceive, accept, and use innovative technology (Rogers, 2003). The ways in which teachers accepted and used new technology in their everyday teaching practice was central to this study. In conceptualizing and conducting the study, I was informed by Rogers's (2003) theory of the diffusion of innovations, primarily the concepts of *observability*, *compatibility*, *complexity,* and *relative advantage*. In addition, the Davis's (1989) definition of *perceived ease of use* (in my study, the level to which teachers expected the use of IWBs to be free of effort) directly informed my development of Research Question 1. Ajzen's definitions of *normative, behavioral,* and *control beliefs* were used to understand the beliefs of individuals toward a behavior (IWB integration) and informed my development of Research Question 2.

Nature of the Study

To explore elementary teachers' experiences in adopting IWBs into their classroom practices, I used the case study technique. Use of a qualitative case study approach allowed me to gather in-depth data to identify themes and patterns inherent in elementary teachers' experiences with IWBs (see Yin, 2009). The research questions were "What are the experiences and views of elementary teachers integrating interactive whiteboards in their classroom?" and "How do elementary teachers integrating interactive whiteboards in their classrooms view the use of the IWB?"

The study participants were nine Pre-K-5 full-time elementary school teachers from U.S. public schools who were integrating IWBs into their classrooms at the time of the study. Data consisted of two interviews with each participant and lesson plan snapshots, which were obtained from participants and which included activities related to IWBs. I used member checking to reduce the potential for bias and decrease the threat to validity (Harvey, 2015). Recorded interviews were transcribed and converted to text. I used Dedoose software to code and store two interviews and lesson plans from each participant. Yin's (2009) six-phase model was used for data structuring and analysis.

Definitions

Blogs: Regularly updated web pages or websites that are written in a conversational, informal style and run by a small group or an individual (Lou et al., 2013).

Digital portfolios: Electronic evidence collections gathered and managed by a user on the Web (Abrami et al., 2013).

Electronic tests and quizzes: The use of technology for assessment-related activities (McDaniel,2012).

Online surveys: Questionnaires that can be completed over the Internet by the target audience (McNeill & Kirk, 2014).

Podcasts: Internet digital audio files available for downloading to a computer (Kay, 2012).

Presentation software: Software used to develop a sequence of text, graphics, audio, and video to accompany a speech or presentation (White et al., 2013).

Small-group instruction: Teachers working with small groups of students on specific learning objectives (Sheffield, 2015).

Student learning objectives: Measurable instructional goals developed for a particular group of students (DuFour & Marzano, 2015).

Teacher-developed website: A website that is built, created, and maintained by a teacher; activities undertaken in creating and maintaining the website include web design, publishing, programming, and database management (Chandra & Watters, 2012).

Visual thinking software: Software that supports visual thinking as a learning style where the learners better understand and retain information when concepts are associated with images (Lupfer et al., 2016).

Web quests: Inquiry-oriented lesson formats in which the study material comes from the web (Yang, 2014).

Whole-group instruction: Teacher-led instruction, which is the same for the entire class regardless of where students are located (Lin et al., 2016).

Wikis: Websites that allow collaborative content and structure editing by users (Lee, 2012).

Assumptions

The assumptions for this qualitative case study included the following:

1. Elementary public school teachers apply unique techniques in their pedagogical practices using IWBs for teaching students.
2. A small study is needed to obtain the description of elementary public school teachers experiences and perceptions about IWBs.

3. The study participants will be honest and open answering interview questions.

Scope and Delimitations

The population of this research study was limited to Pre-K-5 school teachers working in public schools who had access to IWBs in their classrooms and consequently the study results can only be generalized to a narrow subgroup of educators. The qualitative case study methodology allowed me to gain in-depth insight and identify patterns and themes surrounding the experiences of these teachers. The case study method provided opportunities for the participants to describe their individual experiences. This study could add to the present literature by developing a better understanding of the experiences of these teachers as they integrate an innovative technology into their classrooms. Transferability of the research findings from this study may inform future research in technology integrating as well as educational policy.

Limitations

Limitations of this study involved the relatively small sample size, limited diversity of participants and geographical location, and the potential bias of the researcher as an elementary educator who supports the integration of new technologies. The main study limitation was the narrow parameters of the participant's selection. This study’s results might not be transferable to an analogous population; however, the findings might produce suggestions for further study. A second significant limitation of this study was that only elementary teachers were used to provide data. Analysis of other data sources (e.g., interviews with administrators and students) might yield a better understanding of the topic. In addition, my study was limited by a small sample size.

Significance

This study offers insights into teachers' perceptions of, and experiences with, the incorporation of new technology (specifically, IWBs) in teaching. Study participants shared their innovations. In describing their experiences, they also highlighted issues unique to their educational populations, thereby adding more knowledge about elementary teachers' instructional needs. Researchers have identified that IWBs help students to develop advanced critical thinking, communication, and collaboration skills when integrated into a constructivist learning environment (Lopez & Krockover, 2014). As the use of technology increases, the results of this study might provide elementary teachers additional support in creating learning environments for teaching students in the 21st century (Hennessy & London, 2013; Peled, Medvin, & Domanski, 2015). With a thorough understanding of the needs of elementary teachers, school administrators might be able to more effectively assist teachers in integrating educational technology in a productive manner through the offering of professional development courses (see Tertemiz et al., 2015; Yang & Teng, 2014). Study findings may also better enable educators to effectively prepare citizens for the complex knowledge society of the future.

Summary

The integration of IWB technology into all areas of the teaching and learning process in elementary public schools is difficult. Much of what is known about using IWBs as a strategic teaching tool in elementary education is that IWBs are mostly used as the display and presentation tools. A large knowledge gap exists in how elementary

teachers develop, deliver, and assess lessons for very young students while integrating IWBs into all aspects of the lesson development.

Chapter 2 offers a synthesis of existing research on IWBs from the past five years. To replicate the study in the other contexts, the literature search strategy explanation is provided. The research articles are organized by Roger's innovation and diffusion theory and their relevance to the IWB technology usage in education. An analysis of Roger's theory of the diffusion of innovations, Davis's technology acceptance model along with Ajzen's theory of planned behavior is completed. The research approach explained in Chapter 3 is organized based on the characteristics of the approach, the research design, and the way in which the study was conducted. Chapter 4 contains a broad analysis of the study participants' thoughts and the findings from the study are systematized around each research question. Chapter 5 concludes the research study with the study purpose and conclusions implications structured within the conceptual framework. Finally, the implications for social change and recommendations for further research are provided with a review of existing research related to IWBs.

Chapter 2: Literature Review

The purpose of this qualitative study was to discover the perceptions of elementary teachers regarding their responses to professional development on IWBs and how to develop, deliver, and assess lessons that engage young students and teach them academic content while integrating IWB technology into their classrooms. The following research was conducted using a case study methodology, which, according to Stake (1995) is valuable in exploring, describing, interpreting, and explaining individuals' experiences. A case study design was used to recognize occurring themes and clarify educators' perspectives on the use of new technology in teaching.

The following chapter includes an overview of the literature search strategy I used in conducting my investigation. I also examine the three main theories and models that constituted my conceptual framework. These included: (a) Rogers's (2003) theory of diffusion and innovation, (b) Davis's (1989) TAM, and (c) Ajzen's (1991) TPB. The next part of this chapter consists of the literature review with the focus on two main topics: the advantages and disadvantages of IWBs and pedagogical practices related to use of IWBs in classroom teaching. The chapter concludes with a summary and an explanation of the gap in the current research addressing pedagogical usage of IWBs.

Literature Search Strategy

To gain an understanding of how elementary teachers develop, deliver, and assess lessons while integrating IWB technology, I examined several existing studies. The primary keywords and their combinations in the search were *interactive whiteboards, elementary school teachers, lesson development, assessing with interactive whiteboards,*

lesson procedures, and *teaching methods*. However, only a few studies were found that were devoted to these topics.

As soon as I identified this gap in the current research, the search was expanded, and the following keywords and their combinations were used: *Smart Boards in teaching, advantages, disadvantages, teachers' and students' perceptions*, *attitudes, teacher preparation, teaching with technology, assessing with technology,* and *professional development*. I examined Rogers' (2003) DoI theory to understand innovative processes in elementary schools related to technology, with a particular emphasis on the manner in which IWBs have affected elementary teachers' pedagogical practices. I also explored Davis's (1989) TAM along with Ajzen's (1991) TPB as a theoretical explanation of the acceptance and usage of technology by elementary school teachers.

I used several databases in the literature review, including ERIC (EBSCO), ERIC (ProQuest), SAGE Premier, ScienceDirect (Elsevier), and JSTOR. Also, I used the free reference manager and PDF organizer Mendeley, as well as Google Scholar, for searching through books, articles, and academic websites and finding credible and relevant research sources. Sources for the literature review were chosen based upon the year of publication, i.e. from the past five years, and whether the journal was peer-reviewed.

Conceptual Framework

For this study, there were three main conceptual theories identified to understand the issues inherent in the teachers' experiences: (a) Rogers's (2003) DoI theory, (b)Davis's (1989) TAM, and (c) Ajzen's (1991) TPB.

Roger's Theory of the Diffusion of Innovations

According to Rogers (2003), every innovation follows a specific diffusion process as innovations or new ideas spread through the social structure that makes up a society. A diffusion refers to the spreading of new messages and information among individuals. The diffusion of innovation theory states that every innovation, over time, goes through five stages:

- *Knowledge,* when members of the social system are exposed to the existence of the innovation and try to understand its functions;
- *Persuasion,* when members form a positive attitude to the innovation;
- *Decision,* when members commit to adopting the innovation;
- *Implementation,* when members put the innovation into use; and
- *Confirmation,* when members support the innovation based on its constructive outcomes (Rogers, 2003).

DoI theory perceives a social system as being made up of different communication channels. Communication, in this case, is the means by which each individual reaches a mutual understanding about innovation or a new idea (Rogers, 2003). One type of communication channel is interpersonal communication, while another type is mass media (Rogers, 2003). In the diffusion process, first, the mass media channel introduces an innovation, providing an approach to creating awareness or knowledge about a new idea (Rogers, 2003). Next, interpersonal channels offer a framework in which individuals might form attitudes about this innovation during

discussions and comparing their experiences. The attitudes move individuals further to the decision process (Rogers, 2003).

According to diffusion of innovation theory, the probability that an idea will be received or accepted by individuals is dependent on a number of variables (Rogers, 2003). Ideas that are not well-matched with presented methods or ideas are not as well established as those that might tie in with a presented method or idea (Rogers, 2003). Methods or ideas that might be tried out for a period help to diminish the uncertainty experienced by many who happen upon a novel notion that works to enhance the possibility of the initiative being received (Rogers, 2003). Furthermore, the innovation complexity affects how speedily it is received, as some individuals can grasp the notion and some cannot (Rogers, 2003). Multifaceted ideas normally take longer to be received due to the time that individuals take to understand them (Rogers, 2003).

Adoption of innovations. For the innovation to be received by individuals, a definite amount of time is required for it to get in touch with every level of the social system, since this system is made up of different people: (a) innovators, (b) early adopters, (c) early majority, (d) late majority, and (e) laggards (Rogers, 2003). It takes time for information about a new idea to pass that influences how speedily it will be received. Each level needs a definite amount of time to learn about the innovation and develop the attitudes toward this innovation. As this process spreads out within each level, individuals from the following level enter into the same process until the innovation has reached every level of the social system.

The adoption of innovation is also dependent upon the characteristics of the innovation itself. According to Rogers, the key characteristics of innovation are:

- *Compatibility* (consistency with past experiences, existing values, and needs);
- *Trialability* (the degree to which individuals could experiment with the new notion on a limited basis, before making any decision about its adoption);
- *Complexity* (the difficulty of using and understanding the innovation);
- *Observability* (the visibility of the results of using the innovation); and
- *Relative advantage* (the point to which the perception of the new notion is better than it is superseded) (Rogers, 2003).

In this study, the theory of diffusion of innovations will be used to guide the design of interview questions and the review of curriculum artifacts to understand how the pedagogical beliefs of the teachers were influenced by the integration of new technology into their classroom.

Technology Acceptance Model (TAM)

Davis's model was used in this study to understand teachers' acceptance of IWBs and their integration of this new technology into their classrooms. I have created Figure 1 summarizing the main points of the Davis's (1989) theory. According to Davis (1989), the TAM's purpose is to evaluate the users' acceptance of "emerging information technology" (p. 34). The TAM attempts to predict and explain why a specific technology

might be unacceptable and follow suitable steps. The TAM is specific in its scope and appropriate to the computer use (usage behavior).

A significant factor in the TAM is to mark out the external factors' impacts on the users' inner attitudes, intentions, and beliefs (see Figure 1). Particularly customized for modeling users' information systems acceptance, the TAM is based on two main hypotheses. The first is *perceived usefulness* (*PU*), which is the subjective perception of the prospective users about the probable usefulness of a definite application system (Davis,1989). The second is p*erceived ease of use (PEOU)*, which is the level to which the potential user is expecting the definite application system to be free of effort (Davis,1989).

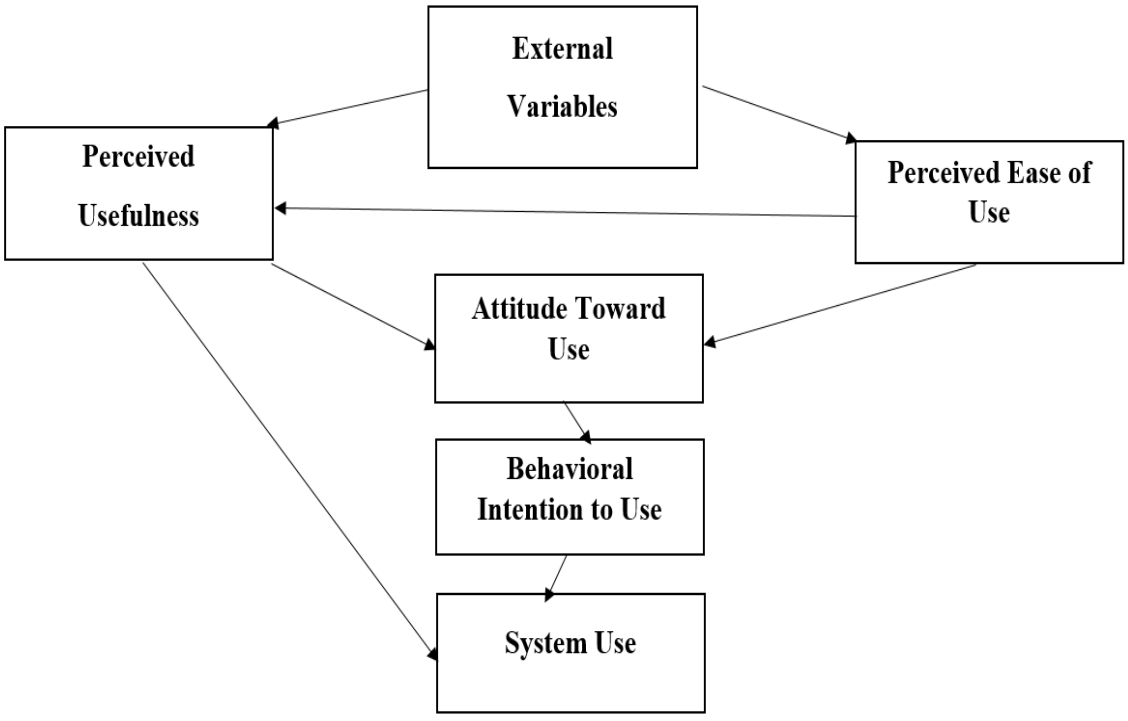

Figure 1. This figure is based on the TAM (Davis, 1989, pp.319-340).

Theory of Planned Behavior (TPB)

The TPB is a psychological model used to predict behavior. According to TPB, behavior comes with the positive attitudes toward this behavior, the expectations to achieve it and a sense of control these actions. The arrangement among three factors leads to an intent to act. An "attitude" in the framework reflects an individual's beliefs. The TPB theory (Ajzen, 1991) states that a person's behavior is directed by the following beliefs:

- *Normative beliefs* (about the expectations of others);
- *Behavioral beliefs* (about the likely cost of one's behavior); and
- *Control beliefs* (about aspects that might assist the performance of a given behavior).

Ajzen (1991) declared that behavior beliefs produced unfavorable or favorable attitudes toward the behavior; normative beliefs established subjective norms (which is any social force on a person to conduct a particular behavior; the behavior becomes more likely when such pressure is present); and finally, control beliefs increased the perceived behavioral control. In combination, all of these aspects lead to the development of a behavioral intention to perform the behavior (see Figure 2).

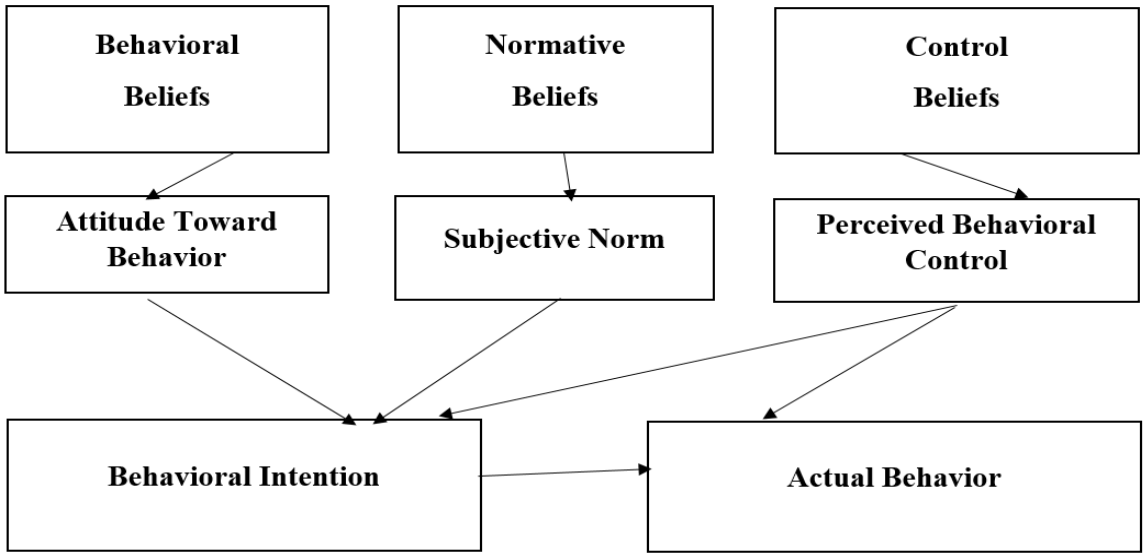

Figure 2. This figure is based on TPB (Ajzen, 1991, pp. 179-211)

In this study, the theory of planned behavior was used to design interview questions to understanding the beliefs of the teachers related to the pedagogical knowledge to understand the decisions concerning how they integrated this new technology.

Rationale for Conceptual Framework

To understand the experiences of teachers integrating innovation into their classrooms, I defined their perceptions of the technology, their level of adoption, and the type of integration process from the educational system. Each of these theories guided the literature review to understand the diffusion of innovative technologies in elementary public school, with the main emphasis being on learning and teaching using IWBs. In the following section, the process of integrating IWBs was examined through the lens of Rogers's DoI theory (2003). Each stage of this integration is aligned with Rogers's five

stages (2003). Davis's (1989) TAM and Ajzen's (1991) TPB was also analyzed, in support of the stages of Rogers's theory (2003).

According to Rogers's (2003) theory, the first stage of the innovative process is the knowledge stage, once people become familiar with innovation. During this stage, people become aware of innovation, either passively or actively. Individuals might passively see or hear about the innovation throughout communication channels, or they might dynamically seek out the innovation to fulfill their needs. Rogers (2003) confirmed that at this stage, three types of knowledge are included: "how-to knowledge, principles-knowledge, and awareness-knowledge" (p. 173). In the context of this study, elementary teachers were the primary individuals that identified the IWBS's potential as a pedagogical tool, so their reflections offered a clear understanding of how valuable this tool is.

The second stage of the Rogers (2003) innovation-decision process is the persuasion stage; during this stage, individuals actively seek information about the innovation and begin to interpret received information. In this stage, attitudes about the innovation start to form, and these attitudes are a significant part of the innovation-decision process. The individuals begin to overcome insecurity about innovation consequences. The individuals also usually seek out information from others to confirm their attitudes toward innovation. Finally, the outcomes of the persuasion stage are negative or positive attitudes about the innovation (Rogers, 2003). At this stage, TPB supports Rogers's theory stating that positive attitudes toward a behavior are one of the

factors leading to acting. I was interested in consideration of the elementary teacher's attitudes toward IWBs.

The third stage of the Rogers's (2003) innovation-decision process is "decision," when the members commit to adopting the innovation. The theory states that the attitude toward innovation leads to the rejection or adoption of the same, during this stage. Adoption means that the person decided to implement an innovation; rejection means that the person decided not to adopt the innovation. From my point of view, plenty of educators experienced the difficulties of using and understanding how IWBs work, which is a complexity of the innovation (Rogers, 2003), and they are required assistance, to make the final decision about the innovation adoption. In my study, I want to expect all these difficulties and complexities elementary teachers might have to adopt IWBs.

If the individual decides to use the innovation, the fourth stage is the implementation stage (Rogers, 2003), when the person is engaged in a behavior change to put this innovation into use. As a final point, the last step in the implementation decision process is the confirmation stage (Rogers, 2003). During this stage, the person seeks information to verify a decision made earlier. At the same time, as the person wants to find supporting information for the previously made decision, this does not occur at all times, and occasionally the results are a reversal of the decision that was made originally. The person would, therefore, try the innovation again or discontinue using it; in this situation, using TAM, I attempted to explain why IWBs might be unacceptable by elementary teachers.

At this stage, another innovation attribute plays a significant role in the adoption of the innovation – *Observability* (Rogers, 2003). *Observability* is the degree to which the innovation results are clear to others and are positively related to the innovation's adoption rate. It is possible for the educators' perceptions of the IWB attributes to be related to their use of IWBs in their pedagogical practice.

Creating a collection of readymade lessons for the IWBs might help integrate these attributes and probably increase the IWB use. The encouragement to have readymade lessons that require little preparation and planning addresses another one of Rogers's (2003) attributes - *Relative Advantage*. Lessons that are aligned to the school curriculum and are easy to navigate through boost the *Compatibility* and diminish the *Complexity* associated with IWBs. Readymade lessons might give educators the opportunity to use IWBs on a trial basis and examine their usage results in the classrooms. In the following section, the Literature Review includes the following topics: Description of the Interactive Whiteboard, Productive Integration of IWBs, Issues with Students Learning, and Research on Pedagogical Practices with IWBs.

Literature Review Related to Key Concepts

IWBs in classrooms have grown exponentially in recognition over the past few years. Schools have increasingly integrated IWBs as effective tools for improving learning, collaboration, and communication (Tertemiz et al., 2015; Türel & Johnson, 2012). However, they offer numerous advantages and disadvantages over traditional whiteboards, which have been used in classrooms for decades, to share ideas and information with students. The following section covers (1) research on teachers'

pedagogical beliefs about IWBs and experiences with IWBs that were positive and negative and (2) research on school support issues including professional development, technological training, and support for the development of new instructional materials needed to integrate the IWB technology.

Description of the Interactive Whiteboard

The interactive whiteboard technology includes a touch-sensitive, large electronic board connected to a data projector, a computer, and specialized software. The IWBs display the projected computer images and allow direct input via stylus or finger. Software equips IWBs with a range of functions, together with those that duplicate non-digital technologies such as dry-wipe boards, flipcharts, overhead and slide projectors, and video players (Hennessy & London, 2013). The IWB software package also includes tools for highlighting, annotating text, drawing, hide-and-reveal, zooming, and resizing. Images from other technologies might be displayed on the IWBs, and objects can be transformed or moved to generate interactive or enlarged images, text, and animation that might be directly manipulated by teachers and students to offer an interactive experience in lessons that is available to everybody (Moons & De Backer, 2013).

The students and the teacher can move forward and backward throughout the pages at an appropriate pace, which is valuable for representing and presenting work. Pens and highlighters allow the teachers and students to handwrite on the IWBs. A variety of pen colors is available, which might be used to enhance the learning and teaching process. This function might save teachers from writing passages by hand on a chalkboard, annotations can be easily erased, and teachers can begin with a fresh screen

for the next lesson. With IWBs, there are no magnets that fall off the board or Velcro to glue; virtual materials can be changed, manipulated, and adjusted for future use and last forever, rather than creating physical materials from scratch.

A major feature of the IWB is the ability to annotate over a website and save those notes. With digital ink, teachers can take notes over any program on the computer, such as Google Earth, PowerPoint, and more. IWBs support both printed and handwritten text. SMART Notebook and ActivInspire offer a convenient convert-to-text option that cleans up any writing on the IWB that is great for teachers or students with poor handwriting. In summary, the IWB is designed to be integrated to develop (1) presentation skills, (2) multimedia design skills, (3) research and inquiry skills, and (4) specific content area skills. In my literature review, I found that the level of student access and use of this technology varied greatly.

Productive Integration of IWBs

Research has shown that IWBs enhance the quality of interactions: the content interaction with math concepts and discussions among teachers and students, and, accordingly, advanced problem solving and conceptual math understanding (De Vita, Verschaffel, & Elen, 2014; Lopez & Krockover, 2014). Additionally, IWBs have the potential to support the teaching of abstract, difficult, and multifaceted math and physics ideas, to increase lessons' pace and improve students' motivation to learn, reinforcing conceptual learning with visual representation and animation (Begolli & Richland, 2015; Fraser & Garofalo, 2015).

Content knowledge. English teachers observed in the Kneen's (2015) study made much use of written texts on IWBs. It was the most frequent element of content used on the IWBs for the duration of the observed lessons. Accompanied by other types of content such as pictures, written text accounted for 86% of the observed IWB lesson content. However, the study indicated a strong preference for the printed text being used on IWBs over handwriting. Kneen (2015) stated that teachers in her study preferred to use handwritten text on the IWB for brief annotations and a spontaneous response, for example, to students' questions. The IWB software let educators create resources that students will find inspiring and fun. Being able to "drag and drop" images, sounds, and text on the screen allows for a selection of sequencing, sorting, and categorizing exercises. Revealing and hiding images, sounds, and text is possible as well, allowing learners to make suggestions and hypothesize, before reassessing or confirming their unique ideas (Kneen, 2015).

In similar research, Alvarez et al. (2013) studied IWBs as a collaborative knowledge construction space in a 7th-grade Swedish math class with 12 students. Findings from this experience provided an indication that digital pens and IWBs could be adequately integrated. Also, the authors pointed out that digital pens are intuitive and non-distractive for students. They are considerably easier to maintain and cheaper and do not need a wireless network to function. Alvarez et al. (2013) found that the individual answers generated with digital pens were appropriate for later collaborative work on the IWBs during the classroom discussions. Finally, the research authors underlined that integration of digital pens in the IWBs lessons supports the information flow across

paper-based and digital media for teachers and students, aligning them with the trans- and cross-media navigation concept that has been well-known as significant to 21st century education and as part of the new media illiteracies.

Berson et al. (2014) explored ways to use IWBs to enhance preschoolers' teaching, designing the "Panda" interactive activities. They have found interactive whiteboard activities to be teaching tools that support a classroom focusing on procedure over product, in which the value of young students' learning is interlinked with experiences and interactions with ideas and concepts. Berson et al. (2014) stated that the IWB technology expands the children's capacity to transform and revise through play-based investigations and experiences. Through interactive whiteboard activities, young learners become active participants and producers in varied digitally-enhanced environments. Also, they serve as instructional enrichments that facilitate active learning, engagement, social experiences, and creativity in a learner-centered environment (Berson et al. 2014; Fessakis, Gouli, & Mavroudi, 2013; McCrea, 2014; Yang & Teng, 2014).

Research has specified that activities within the IWB classrooms are diverse and include technical interactivities with a focus on using the IWB tools and physical interactivity focusing on learners' manipulation of objects on the IWB's surface (Murcia, 2014). Evaluating work in progress during discussions and peer review allows students to reflect on others' and their work in order to be able to make improvements. The Murcia's (2014) exploratory case study explored the types of interactivity that occur when IWBs are used during the science inquiry process. In this research, two Australian teachers were working with 25 11-year-old students developing and implementing interactive

pedagogies and notebooks. The video data and classroom observations allowed the researchers to classify the types of interactivities occurring in the classroom:(1) technical interactivity (when teachers used the IWB tools); (2) physical interactivity (when students manipulated objects on the IWB); and (3) conceptual interactivity (when students and teachers aligned their actions with the given IWB task and engaged in classroom dissociation). Both teachers used the IWB for different purposes. At times, students were passive in the IWB learning experience as they watched videos or listened to the teacher talk.

The Murcia's (2014) case study found that IWBs supported science teaching and learning experiences by:

- Engaging and eliciting learners' prior knowledge through conceptually appealing and visually multimodal interactive displays;
- Generating explanation and exploration opportunities;
- Providing opportunities through higher-level questioning for learners to transfer their knowledge to different and new contexts;
- Creating opportunities for students to generate their concept representations; and
- Reviewing learning by flexibly moving throughout interactive learning sequences.

Researching the IWB usage in math, Erbas, Ince, and Kaya (2015) explored the effect of IWB compared to a traditional environment on student achievement in math and attitudes toward technology. Sixty-Five Turkish high school students participated in this

study, and its results showed that IWB classroom positively affected learners' attitudes toward math and technology. The students in IWB classroom were actively involved in the math lessons, making connections between what they learned before and asked questions. Students in the traditional classroom became easily bored. However, interpretation and reasoning skills of IWB classroom students did not improve as much as those in the traditional classroom.

Similar findings were reported in the De Vita, Verschaffel, and Elen's (2014) literature review. Three large-scale mixed method research studies were retrieved, one in secondary education and two in primary education. All of them included interviews and surveys with students and teachers. In general, the interviewed teachers were positive about the impact of IWBs on their math teaching and thought that using the IWBs in lessons improved students' motivation. Most of the teachers believed that IWBs would lead to students' skill improvements. Students were tremendously positive about the IWBs use as well; most of them stressed that the IWBs helped them pay better attention during math lessons, due to the wide range of multimedia features and resources being used.

Summarizing everything stated above, it was clear that IWB technology is an effective way to encourage cooperation with multimedia and digital content. In the theoretical framework of his study, Al-Qirim (2012) listed the main findings on the benefits of using IWBs in the classroom:

- Can draw the attention of students by increasing the visual appeal of lessons;

- Provide the students with the opportunity for active participation;
- Support the retention of learning, enabling what is explained in a lesson to be recorded and to be continued in the next class;
- Make lessons enjoyable; and
- Make it easy to teach a lesson.

Higher education students in the Emeagwali and Naghdipour's (2013) study held the same positive attitudes toward using IWBs in learning. The researchers explored 350 higher education students and lecture perceptions about IWBs in Cyprus, and the majority of them perceived IWB usage as effective in the teaching and learning processes. Students stated that:

- Lessons on IWBs were more fun and attractive;
- IWBs should and would replace today's conventional classroom boards in the future;
- IWBs were instrumental to success and understanding in difficult courses; and
- It made abstract courses less difficult, and IWBs were needed for all lessons.

Motivation. The use of IWBs supports teachers by helping to enhance the students' motivation, participation, and concentration level as well as increases the frequency of interactions among students and teachers, and between the students within the classroom (Yang & Teng, 2014). For example, Erbas, Ince, and Kaya (2015) explored the effects of using the NuCalc graphing software and IWBs compared to the traditional

direct instruction-based environments on learners' achievements and attitudes toward technology and mathematics. Sixty-five high school graduates participated in this study. The research results revealed that the treatment had certainly affected learners' attitudes toward mathematics and technology. Furthermore, students' interpretation skills and reasoning regarding graphs were improved in the experimental group as compared to the control group. Students demonstrated better performance where they were instructed in the computer-supported environment and IWBs.

Erbas, Ince, and Kaya (2015) found that students were themselves motivated to learn materials and engaged with learning tasks when IWBs were used. Students described the computers and IWBs as interesting, enjoyable, and more fun, even though they were unsure if computers and IWBs had helped them to learn math before the treatment. They indicated that they were paying attention better in class when the IWBs were used. Interviewing primary students, Tertemiz et al. (2015) found that IWBs increased students' learning motivation by attracting their attention; students perceived IWBs as exciting, and the IWB's usage between or during classes increased the students' motivation to learn. In a similar study, Şad and Özhan (2012) reported that elementary students liked the following the most about IWBs: (a) visual presentation; (b) test-based; (c) time saving; (d) hygiene; (e) multi-media; and (f) better learning. Furthermore, interactivity was named the most significant property of the IWB.

In similar research, Ozerbas (2013) studied how the IWB usage affected the level of 50 sophomore university students' motivation for four weeks. Twenty-five students in the experimental group used IWBs and 25 students in the control group used only the

computer projector. The study results indicated a significant difference between the motivational levels of the control and experimental groups, and this difference was for the experimental group. Comparing the post-test motivation scores of those groups, the researchers observed a mean difference of 18.16. The students' report showed that increasing their grades with the IWBs usage was what contributed to the beliefs that IWBs attract students and encourage their active lesson participation. In addition, Ozerbas (2013) concluded that the communication and information technologies usage leads to the student's motivation increase and encourages their attention.

Student achievement. Erbas, Ince, and Kaya (2015) stated that IWBs might make a big difference in learners' achievement. Also, Yang and Teng (2014) added that the use of the IWB assisted teachers in providing more opportunities for students to practice listening, speaking, reading, and writing. For instance, Amiri and Sharifi (2014) were determining the influence of using IWBs in teaching writing to EFL students. The mixed-method research compared the traditional approaches versus using IWBs in teaching adverbs and using them in writing. Eighteen Iranian 12- to 16-year-old EFL male students were divided into two groups. During two phases, a traditional approach and IWBs were used for teaching adverbs and using them in writing. After that, the students were examined. The research findings indicated that students used the adverbs in their writing more correctly when IWBs were used for teaching. The researchers stated that it would be wrong to not use IWBs in classrooms since the study results demonstrated a positive effect of using IWBs. In the data gathered in the pre-tests and post-tests, the outcomes of using IWBs were clearly seen.

Likewise, the goal of Katwibun's (2014) research was to explore the effects of using IWBs in vocabulary teaching. Fifty-one 11th grade students were investigated by using means, percentage, quality levels, and standard deviation. The study results showed that implementing IWBs demonstrated the students' achievements in academic performance, participation, and attitude. Most lesson plans exposed several audio and visual IWB tools that enhanced students' learning experiences. The Katwibun (2014) findings agreed with the findings of the IWBs impact learning and teaching. In addition, using IWBs as instructional tools had shown a considerable increase in student participation and students' attitudes were at a great level.

Classroom dialogue. Many of the research studies explored the use of IWBs in the classroom, focusing on teacher-to-student and student-to-student interactions. Yang and Teng (2014) stated that IWBs increased the interaction between teachers and students and among students in classroom activities. Supporting this statement**,** Mellingsaeter and Bungum (2015) studied how IWBs might facilitate the collective meaning-making process in-group work in engineering education.

First-year students used the IWBs in the group-work situation. Qualitative data identified four group-work processes: explanatory, exploratory, insertion, and clarifying. The research results showed that the IWBs might facilitate a shared workspace in which the learners' dialogues might take place. According to Mellingsaeter and Bungum (2015), IWBs support collaborative learning by providing an environment where the students develop and share their thoughts. For instance, the authors have revealed that IWBs make the physics problems, calculations, and arguments accessible to the whole group

supporting the cooperative meaning-making process. The IWBs contribute in creating a joint workspace, where this process occurs during the dialogue between what is written on the IWBs and learners. In other words, IWBs might support some important group work aspects and make them more efficient.

The Kerawalla, Petrou, and Scanlon (2013) study recognized the role of teachers in modeling this type of dialogue and guiding the students' engagement in the analysis. The comparative research evaluated teachers' use on IWBs of innovative software – *Talk Factory* –designed to form and characterize students' engagement with the ground rules in whole-class dialogue. Kerawalla, Petrou, and Scanlon found that the dialogue nature considerably changed: instead of dialogue characterized by unsupported students' responses, the educators used TF to mediate the learners' challenges and explorations of each other's thoughts.

In addition, Maher (2012), in his qualitative case study, undertook two Australian elementary classes where the IWB was used. The study results demonstrated that the use of the IWBs provided for whole-class learning with the students' interactions where the teacher played the facilitator's role by asking open-ended questions and making suggestions to the students. Interacting verbally around the IWBs, students were able to critically explore their ideas and collaborate in an in-depth way. Maher (2012) found that the IWBs engaged more student interactions, with the interactions being longer and more open-ended than in teacher-led lessons**.** Comparing traditional and innovative schools, De Koster, Volman, and Kuiper (2013) provided examples of the IWBs being used to support whole-class teaching with active students' role in controlling the classroom

dialog as well as the IWBs content. The authors agreed that the IWBs facilitated a transition to a more student-active role in the teaching-learning process.

Issues with Students Learning

Tertemiz et al. (2015) found that technical difficulties with IWBs affected students negatively and disrupted the order in the classroom. During the IWB's usage, maladjusted lighting made students experience eye strain. Students experienced sleep problems due to a lack of light sources. Advertisements that appeared during the Internet use on IWB negatively affected students, as well. In Bidaki and Mobasheri's study (2013), some of the teachers also reported that the light reflected from the IWB created problems for the special education students' eyes.

Lack of interactivity with the IWBs is the next issue. By integrating an interactive whiteboard into learning, teachers might support students' collaboration in a joint work area. This allows students to be a part of the process, rather than just prepared information recipients. Nevertheless, Türel and Johnson's findings (2012) indicated that teachers were not able to propose a social constructivist environment with students involved in collaborative and active learning. Bakadam and Asiri (2012) recommended decreasing the number of students in the classroom for more interactive learning. In addition, teachers were not able to find enough time for students IWBs usage collaborations. Because of the lack of interactivity with this tool, the students' positive perceptions of IWBs can diminish. In Corbo's study (2014), students in some classes were interactive; consequently, they stayed on the task and were more focused. However, in the other classes, where students were not given the opportunity to interact with IWBs,

they did not stay focused and looked disinterested. After interviewing students, it was found that their perceptions of how certain teachers' integrated technology were not encouraging. Also, Emeagwali and Naghdipour (2013) stated that IWBs were not effective for grade improvement because students did not use them in their individual study times.

Research on Pedagogical Practices with IWBs

In general, teachers and students are satisfied and have positive attitudes toward practical and powerful IWB technology that make a huge impact on teaching and learning, enhancing the pedagogical skills, increasing students' attention, and facilitating students' motivation. Teachers perceived IWBs as a user-friendly tool, and the use of IWBs in the classroom is making significant contributions to teaching practices, helping in curriculum contents delivery, for class preparation, and saving teaching time (Bakadam & Asiri, 2012; Tosuntaş, Karadağ, & Orhan, 2015). Alshawareb and Abu Jaber (2012) found that there were no significant differences between teachers' attitudes according to gender and specialization such as art and science fields. However, teachers with more than 15 years of experience hold higher positive attitudes than teachers with five years of experience. Teachers holding higher degrees such as MA or Ph.D. tend to have more positive thoughts toward IWBs and use them more frequently than teachers with lower education levels.

In Bidaki and Mobasheri's research (2013), primary teachers reported that IWB technology overcomes the one-hour lesson limit through its memory capacity, which gives teachers less stress and relieves them considerably. Generally, teachers prefer to use

them rather than other boards; the other boards do not offer this convenient option, and teachers are not able to save and retrieve the lesson's information in case they wish to use it again. In addition, the study's participants were happy with a special IWB feature that linked current lessons to the future or past lessons. This option allows the class to save time and helps students remember the preceding lessons quickly. The authors also emphasized that the most interesting IWB feature was its memory ability to connect pages through a computer.

Hadadi, Abbasi, and Goodarzi (2014**)** explored the pedagogical practice of 11 teachers from two different schools; the authors explored the EFL teachers' developmental paths and the pedagogical needs as they integrated IWBs into the curriculum. The research suggested that students' collaboration arrived through complex web interactions between the IWB affordances and that the teachers play the role of mediators and task designers. The authors underlined the IWBs importance in creating an appropriate environment for the shared understanding between students and teachers. However, the authors also stated that the IWB technology is most likely not the key for productive student collaboration.

Moreover, the researchers found that teachers believed that the IWB improves teaching performance. It is a convenient and effective way for learning content delivery that enhances learning experiences and enriches the process of instruction, enabling the use and reuse of the diverse teaching resources in lessons, developing educators professionally, and generating a degree of excitement (Alshawareb & Abu Jaber, 2012; Emeagwali & Naghdipour, 2013; Tosuntaş, Karadağ, & Orhan, 2015). Indeed, IWBs

stimulate attractive pedagogical approaches with the highest level of interactivity in the classroom (Bidaki & Mobasheri, 2013). Furthermore, Emeagwali and Naghdipour (2013) found that IWBs have a positive effect on the classroom atmosphere and increase student participation and concentration, contribute to student-centered teaching and create a proactive student environment, create a climate where students take responsibility for their learning, produce an environment that encourages and supports weaker students, and generate an environment that discourages absenteeism and truancy. Bidaki and Mobasheri (2013) also pointed out that IWBs might help to diminish the teachers' role in classrooms, improving some student skills: (a) discussion and (b) teamwork.

Likewise, lecturers who participated in Emeagwali and Naghdipour's study (2013) declared that the IWBs use combats traditional teaching methodologies, but improves them in situations where the use of such methods is anticipated. The majority of participants stated that IWBs allowed them to unite different teaching methods as suitable for learning objectives and individual lessons. They celebrated the IWBs flexibility that enabled lecturers to implement the syllabus as and when was appropriate.

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However, the authors also stated that the IWB technology is most likely not the key for productive student collaboration.

For example, the Teck (2013) qualitative study was looking at Australian elementary teachers' perspectives on using IWBs in science: the pedagogical practices, challenges, and benefits of using this type of technology. The research findings revealed that teachers used IWBs for interactive activities, supporting didactic and guided assessment. Consequently, the author summarized that IWBs are tools for improving the learning processes of a whole class of young learners, mainly in lesson introductions, teaching children's interactions (and promoting individual or group evaluation). Teck (2013) underlined that IWBs themselves do not improve teaching and learning, but they can be used to improve the pedagogy. In addition, the teachers showed their interest to incorporate assessments with the IWBs in many ways, believing that the IWB's affordances offer a proper channel to assess young learner children efficiently and easily.

Pedagogical issues. Uncovering negative IWB aspects, researchers found that school teachers experienced a lack of pedagogical knowledge, technical skills, and materials required for effective IWB use, and teachers often experienced technical issues with IWB software and hardware in the learning environment. Teachers who did not obtain appropriate training on how to use IWBs often found them troublesome and complicated (Bakadam &Asiri, 2012; Türel & Johnson, 2012). For example, a teacher might have difficulty connecting the computer to the projector or installing software. Bourbour, Vigmo, and Samuelsson (2015) found that IWBs were mostly used as the display or presentation tools, while at the same time its other features were not taken into

account. These findings supported the Ozerbas (2013) research study. In addition, in Katwibun's (2014) study, the notable students' participation was observed to drop to some extent at the end of the lessons if the IWBs accommodated the entire periods of teaching; as an alternative, it seemed that students liked IWBs better as facilitating tools and just a part of the lessons. Katwibun (2014) concluded that it is essential for the teachers to integrate the IWBs with the pedagogy and learning theory that cater to students' individual needs to guide the learners' academic achievement to meet unqualified success.

Bourbour, Vigmo, and Samuelsson (2015) explored the ways in which three preschool teachers in Sweden structured the mathematics learning activities using IWBs. Their use was reflected in three categories: (1) to engage young learners in problem-solving activities; (2) to use multisensory resources for engaging young students' reasoning; and (3) to take young learners' interest as a departure point. The authors found that the different teachers' pedagogical and technical skills were reflected in their ways of IWBs use. The research results indicated that teachers with excellent technical skills developed their design for the IWBs activities, despite the fact that the other teachers used available resources. Also, some teachers used IWBs learning activities that did not sustain the young children's interests in IWBs. Finally, Bourbour, Vigmo, and Samuelsson (2015) affirmed that it is essential to align enhancing the preschool teachers' pedagogical knowledge with their experience in IWBs use for learning purposes. Erbas, Ince, and Kaya (2015) supported this statement and underlined that IWBs are only good

in the hands of teachers who really know how to use technology that they had previously learned.

School support issues. In the current research, most of the teachers argued about an insufficient number of professional development classes and the need to train all teachers in general (Akkoyunlu & Baskan, 2015; Bakadam & Asiri, 2012; Bidaki & Mobasheri, 2013; Tosuntaş, Karadağ & Orhan, 2015). Schools could thus offer training seminars, troubleshooting guides, or whiteboard tutorials to help teachers get the most out of whiteboard technology. Korkmaz and Cakil (2013) stated that educational technologists that would supervise and support teachers' proficiency at all levels of the IWB usage are needed. Schools must offer training seminars, troubleshooting guides, or whiteboard tutorials to help teachers get the most out of whiteboard technology. The authors also noticed that there is a need for professional training in schools. Experts are required to offer a permanent teacher's consultancy or establish call centers, which might help in an immediate solution search for the IWB problems that were encountered (Korkmaz & Cakil, 2013). For instance, Rosetti (2012) found that most teachers in the study held positive attitudes about IWBs, demonstrating that they were willing to use IWBs, but might need more support and encouragement. In a similar study, Tertemiz et al. (2015) reported that the teacher participants argued about the significant efforts for the IWB use, stated that institutional support is needed, and mentioned the importance of immediate technical assistance.

Similarly, Türel and Johnson's study (2012) disclosed that teachers believed IWBs facilitate instructions and learning under the following conditions:

- collaboration with colleagues (IWB skills improved as teachers used the IWBs more often, and mainly they learned from their colleagues);
- every day teachers using IWB to advance IWB competency; and
- training in practical instructional approaches using IWBs.

Technical training. Training in how to use and maintain the software and equipment are required since whiteboard skills are essential (Hennessy & London, 2013). Technical issues can make teachers frustrated with whiteboards and then they would never utilize IWBs full potential. For instance, in the qualitative Korkmaz and Cakil's study (2013), 17 teachers' interviews displayed that the most important reason for not utilizing IWBs adequately was the fact that teachers did not know how to use IWBs and how to make a satisfactory preparation for the lessons on the IWB. Also, a lack of appropriate instructional materials and the teachers' inability to fix technical failures by themselves were among the other disadvantages.

Teachers need training in basic techniques, such as learning to organize files into folders and recognizing different types of files. These are necessary skills for using digital resources efficiently in classroom learning and teaching (Hennessy & London, 2013; Peled, Medvin, & Domanski, 2015). In addition, the teachers need time to become familiar with the IWB features and to start thinking about how their teaching strategies and methods would expand with the IWB (Peled, Medvin, & Domanski, 2015; Whyte et al., 2014). Even whole-school training needs to be planned into the schedule for the IWB integration with classroom practice (Hennessy, Haßler & Hofmann, 2015).

In addition, Bakadam and Asiri (2012) declared that most of the teachers use IWBs for Internet research and as overhead projectors, avoiding many other advantageous IWB features because of limited IWB technology knowledge. Supporting this fact, Bidaki and Mobasheri's (2013) study stated that there are connections between being a good ICT user and using IWB regularly in the classroom. Korkmaz and Cakil (2013) stated that in order to overcome this problem, teachers required special IWB training and a preparation of materials needed for the IWB usage; for example, videos, presentations, and visuals related to the state curriculum. These conclusions supported in a study by Rosetti (2012) where IWBs were used more often when offered with ready-made lessons. Consequently, the researcher suggested the development of resources such as ready-made lessons and websites where teachers could download and post lessons to support the integration of IWBs into classrooms.

Professional development. According to Ozerbas (2013), the teachers who are expected to successfully use IWBs as an instructional medium should be provided with face-to-face practice-oriented and interactive training on the use of the IWB. Such training must not essentially center on the hardware dimension of the IWB. In addition, Sweeney (2013) argued that the recognition and resolution of concerns and tensions in the teachers' practices are critical to maximizing the potential of IWBs in order to increase the learning interactions in a common dialogic space. Teachers are essential agents in mediating the integration of the IWB into their pedagogical subject knowledge, and it is crucial that the concerns and tensions within a teacher's activities are identified and resolved to smooth the progress of sustainable pedagogical change (Sweeney, 2013).

Exploring the dimensions of change as experienced as an Australian primary science teacher, Sweeney (2013) contended that technology does not do so in itself, and has no agency for a positive transformative effect on either classroom learning or teaching. Sweeney (2013) stated that if the teachers feel discouraged by technical difficulties, isolated from accommodating colleagues, anxious with managing the students' behavior, and embarrassed by strict timetabling, it is likely that their practice would not create a focus on the impact concerns about how IWBs may affect colleagues, students, and future work. Sweeney (2013) stated that maximizing the IWB potential requires supporting the teachers to obtain a considerable amount of consistent experience, which would be needed to apply their pedagogical and technical professional learning. Yang and Teng (2014) stated that the versatile and abundant teaching and learning resources provided to teachers integrating IWBs led to changes in pedagogy. The use of the IWB assisted teachers in making the lessons not only more vivid, lively, exciting, and fun but also more comprehensible to students (De Koster, Volman, & Kuiper, 2013; Yang &Teng, 2014). However, current research on using teaching and learning IWBs resources in elementary school is limited.

Time issues. IWBs support educators in concept explanation capturing students' attention; however, the lesson development process is very time-consuming. For instance, Corbo's findings (2014) revealed through questionnaires, interviews, and observations that the teachers appreciated all the convenience this technology offered and realized that they were not able to create lessons that students could benefit from during their classroom schedule. The IWB has access to an enormous amount of resources, and it is

critical to use the best resources and deliver in a short time. However, teachers stated that it sometimes took longer to find valuable resources on the Internet (Bidaki & Mobasheri, 2013). Teachers have difficulties in selecting helpful information from the Internet and incorporating them into the lesson plans within a limited time. They cannot spend lesson time on browsing the Internet for this purpose. Therefore, according to Türel and Johnson (2012), teachers mostly avoid the IWB's usage during their lessons.

For instance, Lopez and Krockover (2014) examined the correlations between the 134 elementary school teachers' perceptions related to their lesson planning skills, technical confidence, and the extent of IWB usage in math. The study found that years of teaching experience and teaching with the help of IWBs did not point to significant correlation among these factors. Therefore, the teachers' resource of technical confidence could be a factor in how educators expand the planning skills. Moreover, other findings indicated a moderate correlation among teachers' planning and its effects on students' behavior and engagement in the math classroom. In other words, teacher participants planning IWBs lessons considered how students would behave while engaged in the lesson. In contrast, there was a small correlation among the teachers' planning and student effects on students' accomplishment in math. At this point, the teachers' technical confidence was expressed in their abilities to display IWB features and functions to other colleagues. Yang and Teng (2014) added that teachers must master their IWB technical skills and professional knowledge of achieving teaching objectives by determining the efficient use of IWBs.

Synopsis of Current Literature

My review of research on the integration of IWB into the classroom found studies that underlined benefits and costs to this technology. My evaluation found that the main factors that influenced whether the technology was integrated productively to encourage advanced learning included: (1) type and quality of professional development, (2) the pedagogical beliefs of the teachers, and (3) the nature of the school's support for the teacher.

In terms of students' learning, the current research identified that IWBs could potentially enhance the quality of social and subject interactions between students and teachers advancing problem-solving and conceptual understanding (De Vita, Verschaffel, & Elen, 2014; Lopez & Krockover, 2014). IWBs can also improve students' motivation to learn, reinforcing conceptual learning with a visual representation (Begolli & Richland, 2015; Fraser & Garofalo, 2015). In addition, IWB can serve as instructional enrichments that facilitate active learning, engagement, and creativity in a learner-centered environment (Berson et al. 2014; Fessakis, Gouli, & Mavroudi, 2013; McCrea, 2014; Yang & Teng, 2014). Additionally, research found that teachers and students are satisfied and have positive attitudes toward practical and powerful IWB technology that make a tremendous impact on teaching and learning (Aytekin et al., 2012; Bakadam & Asiri, 2012; Emeagwali & Naghdipour, 2013; Şad & Özhan, 2012; Tertemiz et al., 2015; Tosuntaş, Karadağ, & Orhan, 2015). Teck's (2013) qualitative study found that IWBs are practical tools for improving the learning processes and the teachers showed their interest to incorporate assessments with the IWBs in many ways, believing that the IWB's'

affordances offer an excellent channel to assess young learner children efficiently and easily.

In terms of pedagogical practices with IWBs, the research results suggested that use of IWBs supports teachers by helping to enhance the students' motivation, participation, and concentration (Erbas, Ince, & Kaya, 2015; Ozerbas, 2013; Yang & Teng, 2014). In addition, IWBs might make a big difference in learners' achievement (Amiri & Sharifi, 2014; Erbas, Ince, & Kaya, 2015; Katwibun, 2014; Yang & Teng, 2014). Yang and Teng (2014) and Mellingsaeter and Bungum (2015) stated that IWBs increased the interaction between teachers and students and facilitated the collective meaning-making process in-group work, where teachers and sometimes students are modeling the dialogue and guiding the students' engagement in analysis (Hadadi, Abbasi, & Goodarzi,2014**;** Kerawalla, Petrou, & Scanlon, 2013; De Koster, Volman, & Kuiper, 2013; Maher,2012). The researchers found that teachers prefer to use IWBs rather than other boards and believed that the IWB improves teaching performance, stimulating attractive pedagogical approaches with the highest level of interactivity in the classroom (Alshawareb & Abu Jaber, 2012; Bidaki & Mobasheri, 2013; Emeagwali & Naghdipour, 2013; Tosuntaş, Karadağ, & Orhan, 2015). IWBs were found to support teachers in lesson development, offering teaching and learning resources, making the lessons interesting, fun, and comprehensible to students (De Koster, Volman, & Kuiper, 2013; Yang &Teng, 2014).

On the other hand, in Erbas, Ince, and Kaya's (2015) study, where researchers compared the IWB classroom to a traditional environment, students did not improve

interpretation and reasoning skills in the IWB classroom as much as those in the traditional classroom. In addition, technical difficulties with IWB affected students negatively and disrupted the order in the classroom (Bidaki &Mobasheri, 2013; Tertemiz et al., 2015). The next issue identified is the lack of interactivity with the IWBs and collaborations; decreasing the number of students in the classroom was recommended for more interactive learning (Bakadam &Asiri, 2012; Emeagwali & Naghdipour, 2013; Türel &Johnson, 2012). Researchers also found that teachers experienced problems related to a lack of pedagogical knowledge, issues with technical skills, and access to materials required for efficient IWB use (Bakadam &Asiri, 2012; Bidaki & Mobasheri, 2013; Corbo, 2014; Korkmaz & Cakil, 2013; Türel and Johnson, 2012).

According to Türel and Johnson (2012), teachers mostly avoid the IWB's usage during their lessons and, if integrated, most of the teachers use IWBs for Internet research and as overhead projectors. Teachers required special IWB training and training to prepare materials needed for the IWB usage (Bakadam & Asiri, 2012; Korkmaz & Cakil, 2013). Most of the teachers identified insufficient numbers of professional development classes and experts in schools for immediate technical assistance with IWB problems (Akkoyunlu & Baskan, 2015; Bakadam & Asiri, 2012; Bidaki & Mobasheri, 2013; Hennessy & London, 2013; Korkmaz & Cakil, 2013; Tosuntaş, Karadağ & Orhan, 2015; Türel & Johnson, 2012).

The Bourbour, Vigmo, and Samuelsson's (2015) study; Erbas, Ince, and Kaya's (2015) research; and Lopez and Krockover' (2014) study found that IWBs are most beneficial if the teachers know how to use technology. Türel and Johnson (2012) found

that collaboration with colleagues as IWB skills improved, as teachers used the IWBs more often, as teachers learned from each other. The research found that professional development in how to use the software, basic techniques, such as learning to organize files into folders, and recognizing different types of files and using digital resources efficiently in classroom supported the integration of this new technology (Hennessy & London, 2013; Hennessy, Haßler & Hofmann, 2015; Peled, Medvin, & Domanski, 2015; Whyte et al., 2014). In summary with many studies with mixed results, the main difference I identified in my review of research between efficient and non-effective integration of IWB into classrooms to support the advanced learning processes of students include professional development, teachers' pedagogical beliefs, and the school support for teachers such as time to develop materials and technology support.

Summary and Conclusions

The existing research highlighted that digital learning in the classroom promoted positive social norms and learner-centered pedagogy and emphasized the following advantages of IWBs: (a) enhances interaction in combination with remote devices; (b) supports collaborative learning; (c) facilitates learning; (d) saves the teacher’s time; and (e) enhances class preparation and management (Berson et al., 2014; Tertemiz et al., 2015; Yang &Teng, 2014). The research also mentioned numerous IWBs advantages over traditional whiteboards such us efficiency, interactivity, lesson participation, collaboration, idea sharing, and the ability to save and post drawings and writing (Alvarez et al., 2013; Berson et al., 2014; Lopez & Krockover, 2014; Murcia, 2014). The IWBs users, such as teachers, students, and school administration, offer a broad specter

of their opinions about this technology tool. They highlighted positive and negative sides of the IWBs usage (Corbo, 2014; Tertemiz et al., 2015; Turel & Johnson, 2012). The growing body of research indicated that IWBs enhance students' motivation and have a positive effect on students' achievement (Begolli & Richland, 2015; Emeagwali &Naghdipour, 2013; Fraser &Garofalo, 2015). However, research also identified issues with the integration of IWB including differing pedagogical beliefs of the teachers and the need for professional development for teachers in order to fully use the IWBs in the classroom (Akkoyunlu & Baskan, 2015; Bidaki & Mobasheri, 2013; Korkmaz & Cakil, 2013).

Based on the literature review, there is limited research on using the IWB technology learning resources in lesson development in elementary school. What is known about lesson development and using technology learning resources is the teacher's technical confidence in expanding these planning skills (Bourbour, Vigmo, & Samuelsson, 2015; Erbas, Ince, & Kaya, 2015; Ozerbas, 2013). There is limited research on the IWB teaching methods and procedures such as creating PowerPoint presentations, interactive activities, and whole-class discussions in elementary school (Lopez & Krockover, 2014). In addition, there is also insufficient research on assessing and evaluation of the students' learning using IWBs in elementary school (Teck, 2013). In the following chapter, the qualitative research approach and case study methodology will be explained.

Chapter 3: Research Method

The purpose of this qualitative study was to discover the perceptions and understand the experiences of elementary teachers regarding their integration of IWB into their classrooms. The participants were nine elementary public school teachers who were using IWBs in their classrooms at the time of the study. The following chapter is organized into several sections and includes information on the methodology I used in conducting my investigation. The first section explains the methodology, the research questions, and approach. The next section describes the data collection procedures and analysis context including ethical considerations and biases. The methodology section provides the data collection procedures used in the study, as well as details on the selection of participants and the process for analyzing data. Next, I consider issues of credibility, transferability, dependability, confirmability, and ethical procedures. Lastly, a chapter summary is provided.

Research Design and Rationale

The research questions were the following: What are the experiences and views of elementary teachers integrating interactive whiteboards in their classroom? and How do elementary teachers integrating interactive whiteboards in their classrooms view the use of IWBs? The central goal of this case study was to develop an understanding of the experiences and perceptions of these teachers as they integrate new technology into their classrooms. A case study approach was used to conduct an in-depth holistic investigation.

The study participants' experiences and perceptions were essential in understanding how elementary teachers perceive and use IWBs as a strategic teaching

tool. A qualitative method was the most suitable for the study because in-depth interviews with open-ended questions and the analysis of classroom documents were needed to develop a complete understanding of the integration of IWBs within U.S. elementary public schools (Bogdan & Biklen, 2003). In contrast, a quantitative method that requires standardized methods with the closed-ended questions (see Patton, 2002) might have limited participants in their responses. In addition, a quantitative process might leave important outcomes missed in case the research data will not fit into a pre-established category (Patton, 2002). For these reasons, I chose not to use a quantitative methodology.

A case study approach was a logical choice for this research. According to Yin (2009), when the central research question is explanatory, a case study is the most appropriate design. Case studies are useful for expanding the understanding and describing a phenomenon and often used to examine people predominantly in education (Stake, 1995). A case study provided an enhancement of understanding of the setting in which educators are using the IWBs as a teaching tool.

Stake (1995) highlighted that the case studies depends on the inquiry purpose. I used a case study in order to offer multiple perspectives on this topic. This approach allowed for the collection of multiple sources of data to recognize patterns and themes. Collecting data from multiple classrooms provided better authenticity to the findings (Yin, 2009).

Different qualitative methods could have been suitable for the current research -- for example, a phenomenological or narrative approach. However, I choose a case study

design instead of a phenomenological one because a phenomenology intends to present an understanding of the structure, meaning, and essence of the lived individual experience through reflection (Patton, 2002). In concentrating on a vibrant participant experience description, a phenomenological approach might miss important information about outcomes and consequences of this experience (Smith et al., 2009). A narrative approach was not chosen as well because the focus of the current research was not to retell teacher participants' stories and interpret them from my perspective (Creswell, 2007). In contrast, this case research study discovered how elementary public teachers perceive and use IWBs in their classrooms. I wanted to obtain participants' descriptions of their skill levels and professional development versus their subjective meanings.

Role of the Researcher

My role as the researcher was to gather the data on participants' experiences through the interview and collect artifacts demonstrating their integration of IWB into their classrooms. Before data collection began, I obtained special permission to conduct the research from Walden University Institutional Review Board (approval number 03-30-17-0359173). After that, I created a Facebook page with the recruitment letter (see Appendix A) that included an online survey link and the consent form. The consent form was used to inform participants of their right to withdraw and information on the study. I encouraged participants to print a copy of the consent form, including the study scope with my contact information.

I scheduled two semistructured interviews via Skype or phone. According to Britten (2007), including several key questions in semistructured interviews not only

helps researchers to define the explored areas but also allows the interviewee and interviewer to provide more details in their responses. Before the interviews took place, I informed the study participants about the study details and gave them a guarantee of confidentiality and anonymity. This provided them some ideas about my expectations and increased the likelihood of their providing honest responses (see Gill et al., 2008).

Before the interviews, I established a rapport with teacher participants as this could have positive effects on the continuous interview development (see Gill et al., 2008). In conducting the interviews, I consciously worked to create a calm, alert setting for the interviewees. Nevertheless, I ensured that the interviews were productive by listening attentively to the participants without unnecessary interruptions.

In addition, I requested that e-mail snapshots of their IWB lesson plans to me. Later, I created the interview transcripts and analyzed participants' responses. After I had conducted and transcribed interviews, I sent each participant an e-mail with my initial analysis of his or her interviews as part of my member checking procedure. I did not have any personal or professional relationships with the participants of my study.

Methodology

In this section, I explain the Yin's (2009) six-phase research model that served the primary purpose of the research question which includes: (1) planning a study, (2) designing a study, (3) preparing for the evidence collecting, (4) collecting the evidence, (5) analyzing the evidence and developing the study outcomes, and (6) reporting the study results. The participant's selection logic, the study instrumentation, and recruitment

techniques are included in the next section. In addition, the data coding and analyzing methods are discussed.

Participant Selection Logic

A purposeful sampling was used for the participants' recruitment; according to Creswell (2007), a purposeful sampling is a process of purposely selecting locations and individuals for providing the understanding of the research problem. I aimed to select a sample of a minimum of 8-10 teachers using the following criteria: (a) teachers identify themselves as full-time public school elementary educators, (b) teachers indicate that they have implemented the IWBs into their professional practice, and (c) teachers must have used the IWBs at least a full academic year. According to Patton (2002), using 1-10 participants will make the qualitative study saturation possible. I attempted, through sampling, to include diversity, e.g. male and female and multiple racial-ethnic groups. In addition, I tried to include teachers with different educational backgrounds including Bachelor, Master, and Doctoral degrees and varied years of experience working as elementary public school teachers to more deeply understand the data results.

Recruiting

The recruiting process is listed below:

1. For the study purpose, a special open Facebook page was created.
2. The recruiting letter with the study details was placed on this page:
    a. the recruiting letter included an online survey link;
    b. the teachers went to the online survey link where they responded to questions related to the inclusion criteria; and

   c. if they responded with **Yes** to the inclusion questions, the survey moved them forward.

3. If they answered **Yes** to the inclusion questions, the potential participants read the consent form, answered demographic questions, provided their emails, and selected the submit button if they agreed to participate in the study.
4. The participants provided their email address on the survey to schedule the phone conferences and for post interview member-checking.
5. I scheduled two semi-structured interviews, one hour each interview, with the participants over Skype or over the phone.
6. I requested the participants to email me a snapshot of a lesson plan they taught using the interactive whiteboard.
7. I also sent each participant a member-checking email with my initial analysis of their interviews to check for their understanding of the analysis.

Instrumentation

According to Yin (2009), there are three principles of data collection in a case study approach: (a) multiple sources of evidence usage, (b) creating a database, and (c) maintaining a chain of indication. Yin (2009) specified six sources of case study evidence: interviews, archival records, documents, participant observation, direct observation, and physical artifacts. This study used: (1) two semi-structured interviews and (2) review of lesson plan artifacts to understand the perceptions and experiences of

the teachers on the issues being addressed. In this qualitative case study, I explored a phenomenon using a variety of data sources ensuring that the topic explored through a variety of perspectives while multiple sides of the question were understood and revealed (Baxter & Jack, 2008). A case study hallmark is the multiple data sources use, an approach that enhances the credibility of the research data (Yin, 2009).

The research data were collected using a researcher-created interview protocol (Appendixes B and C) to ensure that each interview focused on the same content (Patton, 2002). The interview questions were open-ended and required more than yes or no answers. Designing an interview schedule, it was important to ask questions that would crop as much information about the research question as possible and address the research objectives and aims (Britten, 2007).

The IWBs usage was framed regarding: (a) instructional practice, (b) beliefs about learning, and (c) pedagogical skills. The first interview was scheduled in a one-week time frame. The second interview was scheduled within two weeks of the first. The transcripts were emailed within two weeks of the final interview for the participants' response.

1. During my first one-hour interview via Skype or phone, I introduced the purpose of the research and reviewed the participants’ rights and the study confidentiality.
2. The second interview phone or Skype schedule was discussed at the end of the first interview. The second interview was 45 minutes to one hour.
3. At the end of the second interview, I informed the participants that I would email them the transcripts of their interviews for the accuracy review.

4. Later on, they emailed me back with their responses to the transcripts. This strategy of member checking would reduce possible bias and gave the participants the opportunity to change or add responses in order to increase the study results validity.

I audio recorded and transcribed each interview. The interviews were analyzed to develop themes and review data (Patton, 2002). Additionally, the teachers were asked to voluntarily email a lesson plan snapshot for analysis. Data sources triangulation was a primary strategy that would support the principle in this case study that the topic was explored from several perspectives. In addition, the comparison of the data would enhance data quality based on the idea convergence principles and the findings confirmation (Knafl & Breitmayer, 1989).

Data Analysis Plan

The research data was categorized regarding themes and patterns and its results provided guidance regarding how to enhance the IWBs integration into elementary public school teachers' everyday professional life. The research data were analyzed using Yin's (2009) model of case study analysis. The first phase, the cross-case analysis procedures, consisted of eight steps, which are summarized below:

1. **Familiarization:** Once the data were collected via audio recorder and through the field notes I read and listened to recordings several times to become familiar with the data. Once the information was transcribed, I checked the information against the original audio for accuracy and as another means of familiarization.

2. **Creation of word tables:** Words that were relevant to the research question were placed on an initial list of ideas to create labels for other data in Dedoose. Information seen as irrelevant was located on a separate list and later discarded.
3. **Examination of word tables:** I reviewed information to identify patterns that exist in each case by coding units of meaning in each transcribed interview. A separate classification scheme was formed for each case.
4. **Write individual case reports***:* Based on the information from the coding categories and classification system a detailed individual report was constructed for each case before conducting the next case study.
5. **Create additional word tables:** Once each individual case report was created, I constructed other categories using data from all case studies to create an overall schematic of the information.
6. **Examination of additional word tables for cross-case patterns:** I reviewed each table and organized them in a classification system based on the frequency of related data to the label or base word. I also evaluated the data to identify the major differences amongst the data.
7. **Draw cross-case conclusions:** I made conclusions based on the major patterns as well as the rivalries within the collected data.
8. **Write the report***:* In this phase, I brought the results and findings of the study to closure (Yin, 2009). I used the linear analytic compositional structure to compose a report. The goal of the final report was to define

> the research study in a comprehensive way enabling the readers to feel like a research participant and apply the study findings to their own situations (Yin, 2009).

A database was created using a Dedoose software package to organize, manage, and code the case study data and maintain evidence based on the case study protocol. Yin (2009) recognized the significance of organizing research data effectively in a database. The database usage improved the case study reliability as it enabled me to organize and track data sources with my notes and interview transcripts. After I had completed initial coding, the research data were shared with the research participants to ensure data credibility. The participant's names and their characteristics were removed for confidentiality. Each participant was given a pseudonym.

Issues of Trustworthiness

This section includes the explanation on how I confirmed the credibility and trustworthiness of the current research study. Each part discusses elements for appropriate qualitative case study research. The section closes with ethical procedures and the study participants' rights.

Credibility

Trustworthiness concept of credibility relates to internal validity (Rolfe, 2006) that denotes to the rival, real, and reliable hypotheses measuring the right content (Straub et al., 2004). Credibility represents how much accurately collected data reflects the multiple realities of the phenomenon. Data from each interview and lesson plan were considered in order to create a clear picture of teacher experiences with IWBs that will

increase internal validity (Miles & Huberman, 1994). In addition, according to Carcary (2009), credibility might be established through data triangulation. Triangulation occurred by using three sources of data: two interviews and lesson plans. Triangulation also happened through the inclusion of different public schools into the study with male and female elementary teachers from Pre-K through fifth grade; furthermore, the participant words were used in the emerging themes to improve the research credibility (Cooney, 2011).

Transferability

Trustworthiness concept of transferability relates to external validity (Rolfe, 2006) that denotes how well an instrument is consistent across diverse populations (Straub et al., 2004). Transferability characterizes the applicability of the research findings to a different setting and can be enriched through the study participant's diverse experiences and perspectives, clear methodology, research description, and the results interpretation (Cooney, 2011). In addition, according to Morrow (2005), information about the researcher and his/her relationships with the study participants might enhance transferability. An audit trail will be exhaustive enough and provided to allow the repetition of the same inquiry by other researchers in a similar educational setting (Cooney, 2011).

Dependability

Trustworthiness concept of dependability matches reliability (Rolfe, 2006) that is the extent to which research variables are consistent across researchers, analysis techniques, and time (Morrow, 2005) with what needs to be measured when repeated

several times (Straub et al., 2004). Colleagues or peer researchers might examine the research process's detailed chronology to determine the findings reliability (Morrow, 2005). Consequently, detailed records of when and how the research data were collected would be preserved to allow probable duplication of this research study.

Confirmability

If another researcher will confirm this research finding as obtainable with the same data, this is what confirmability will refer to in grounded theory methodology (Sikolia et al., 2013). In other words, confirmability tests the research objectivity. I am confident that by using open-ended questions and not interacting with the study participants directly, and therefore not resulting in researcher's biases, would assure research confirmability.

Ethical Procedures

Before collecting data for this research study, I obtained Institutional Review Board approval from Walden University. The study participants were provided with a consent form and informed of their rights. Each study participant retained a copy of the study consent form, including the study scope with my contact information. The phone interviews were audio recorded, and the recordings were locked in a safe after transcription. The Skype interviews were recorded digitally, and the recordings were stored in a login-protected personal computer in my home. Data uploaded into Dedoose for data structuring were online in a login-protected Dedoose website maintained in secure data centers, located in the U.S. and monitored and secured 24 X 7.

All other data were digital and were stored in a login-protected personal computer in my home. The personal computer on which the data were stored was protected with a password and also kept in a locked location when not in use. Data will be stored for at least five years, as required by the university. After that time audio tapes will be destroyed. All digital data, including the Dedoose information, were downloaded to a flash drive, deleted from the computer, and the flash drive will be destroyed as well. The Dedoose site was canceled.

Summary

The purpose of this qualitative case study was to discover how elementary public teachers perceive and use IWBs in their classrooms identifying the self-reported methods and techniques that elementary teachers apply in their pedagogical practices while using IWBs as a strategic teaching tool. The study was conducted with elementary public school teachers who used the IWBs for their teaching practice. Nine elementary public school teachers from Pre-K to fifth grade participated in two open-ended, semi-structured interviews. The teachers also submitted their lesson plans snapshots to my email. I analyzed the data using Yin's (2009) model of case study analysis to understand the teachers' perceptions and experiences integrating IWBs into their classrooms.

Chapter 4: Results

The purpose of this qualitative study was to discover the experiences and views of elementary teachers regarding their responses to professional development on IWBs. For this study, there were three main conceptual theories identified to understand the issues inherent in the teachers' experiences: (a) Rogers's DoI (2003), (b) Davis's (1989) TAM, and (c) Ajzen's (1991) TPB. The research questions were the following:

RQ1: What are the experiences and views of elementary teachers integrating interactive whiteboards in their classroom?

RQ2: How do elementary teachers integrating interactive whiteboards in their classrooms view the use of the IWB?

In this chapter, I will describe the research setting, the demographics of the participants, and the process of data collection and analysis. Additionally, I will provide evidence of trustworthiness and my results organized by research question. I conclude with a summary of my findings.

Research Setting

Purposeful sampling was used in recruiting participants without regard to gender, teaching experience, or educational background. For this study, I selected elementary school teachers teaching Pre K-5th grades in U.S. public schools who had used IWBs in their classrooms for at least 1 year. During scheduling and conducting interviews, I addressed two issues: participants' personal time and differing time zone issues. The study participants were willing to participate; however, they also had other work and/or personal responsibilities that made the interview schedule problematic. In addition, all

participants lived in different states, and there was a problem with time zones. I did my best to overcome these obstacles and be flexible in scheduling Skype or phone interviews with the participants. When conducting interviews, I went to my home office where I could work online undisturbed. In this setting, my interviews would not be overheard. For interview purposes, I used a digital recorder and took notes on a copy of the interview questions. At the end of the interview with each participant, I checked the recording to make sure everything was captured and audible.

Demographics

There were nine study participants involved in my research process: eight were females, and one was a male, two were special education teachers, and seven were general education teachers. Two teachers had a bachelor's degree, and seven participants had a master's degree. The study participants had different levels of teaching experience: One was a new teacher, one had 3-5 years of experience, three teachers had 5-10 years of experience, two teachers had 10-15 years of experience, and two teachers had 15-20 years of experience. Table 2 includes an outline of the demographics of the participants.

Table 1

Participants Demographics

Name	Specialization	Grade	Gender	Years of experience	Education
1. Ms. B	Special Education	2nd	F	10-15	Master's
2. Mrs. E	Special Education	1st	F	5-10	Master's
3. Mrs. F	General Education	K	F	15-20	Master's
4. Mrs. H	General Education	2nd	F	5-10	Master's
5. Mrs. I	General Education	Pre-K	F	0-3	Bachelor's
6. Mrs. M	General Education	3rd	F	5-10	Master's
7. Ms. T	General Education	K	F	15-20	Master's
8. Ms. A	General Education	4th	F	10-15	Master's
9. Mr. H	General Education	5th	M	3-5	Bachelor's

Data Collection

I created a Facebook page with the recruitment letter and the study explanation (see Appendix A). The recruitment letter included an online survey link. The teachers went into the online link, and when they completed some demographic and instructional questions, they read the consent form and selected the submit button if they agreed to participate in the study. The consent form informed them of information about the study and their right to withdraw. Each study participant was encouraged to print a copy of the

online study consent form, including the study scope with the researcher contact information.

First Interview

After I obtained the consent from participants and received their e-mail addresses, I scheduled two semistructured interviews with each participant via Skype or phone for approximately one hour each. I scheduled the interviews within a few days of each other. For the first interview, I used the following interview questions:

1. How do IWBs affect your planning/preparation of lessons?
2. How do you use IWBs in your classroom?
3. What are the difficulties you experience developing and teaching lessons with IWBs and their features?
4. What are the benefits of using IWBs and their features for developing and teaching lessons?
5. How do you use IWBs for whole class teaching?
6. How do you use IWBs to ensure all children are motivated and engaged in learning?
7. How do you use IWBs for assessing your students' learning?
8. What types of additional resources do you use with your IWB?

After the interviews, I marked all my reflective thoughts. After interviewing each participant, I listened to the data recorded and made additional notes. Then I transferred the recorded files to the computer and backed-up the files on a flash drive, both of which were password protected. Once the files were transferred, I started transcriptions. Once I

was done with the transcripts, I reviewed each participant file against the recorded data ensuring the accuracy of the text files. I then loaded the files into the Dedoose software and began the initial coding.

Lesson Plans

In addition, I asked the participants to e-mail me snapshots of their IWB lesson plans. I collected lesson plans data from the nine teacher participants for about two months in the form of IWB lessons snapshots and interviews. Once I received the lesson plan snapshots form each participant, I copied them into word processing documents and deleted the e-mails from the server. To store the lesson plan snapshots, I created separate files for each participant on my password-protected computer and flash drive.

Second Interview

I coded the initial interview to recognize areas for deeper discussions and clarifications prior to scheduling the second interview. Consequentially, I revised the second set of interview questions for each participant to add to the depth of my understanding. For the second interview, I used the following interview questions:

1. How do IWBs help you support your students' learning?
2. How do IWBs affect your expectations of what your students will learn?
3. Do you believe that using an IWB motivates and engages your students in learning?
4. How has the school supported your integration of IWBs?
5. What are ways the school could provide better support?
6. Are there other ideas or experiences you would like to discuss?

I began the second interview with each participant with a summary of my interpretations from the first interview, and the lesson plan snapshots. Each teacher participant provided feedback that helped me to improve my questions during the second set of the interview process. After I had completed all interviews, I sent the participants member-checking emails with my initial analysis of their interviews to check for their understanding of the analysis and to request their comments.

Data Analysis

I used Yin's (2009) six-phase model of thematic inductive analysis for data structuring and analysis to identify patterns and themes in the coded structures that included: (a) planning to conduct the case study, (b) designing the case study, (c) preparing to collect case study evidence, (d) collecting the case study evidence, (e) analyzing the case study evidence and developing the conclusions, and (f) reporting case study results or findings. The 18 documents were loaded into Dedoose software and grouped according to each participant. My process of analysis included the following steps:

1. I first read each document in Dedoose.
2. Next, I highlighted units of meaning, text in the document that had meaning in relationship to my study framework.
3. Next, I right-clicked in Dedoose and created codes for each unit of meaning to create a category related to the two research questions.
4. After I had gone through the first steps in the process and created these open codes, I went back through each document.

5. In my second reading, I identified the structure of patterns in the document.
6. In addition, after my second reading, I made notes within Dedoose and highlighted key phrase related the participants' experiences and views.
7. To reinforce the linking strategies from my notes, I made sure to pay attention to the participants' words from the digital recording while I was reading their transcripts.
8. Patterns of participant experience and views emerged after the second reading and careful analysis of the submitted lesson plan snapshots (see Figure 3 and Figure 4) that were organized by research questions in the Study Results section.

Below in Figure 3 are the coding structures that resulted from my analysis as they relate to the first research question, which was, "What are the experiences of elementary teachers integrating interactive whiteboards in their classrooms?" Figure 4 represents my initial coding structures as they relate to the second research question, which was, "How do elementary teachers integrating interactive whiteboards in their classrooms view the use of the IWB?"

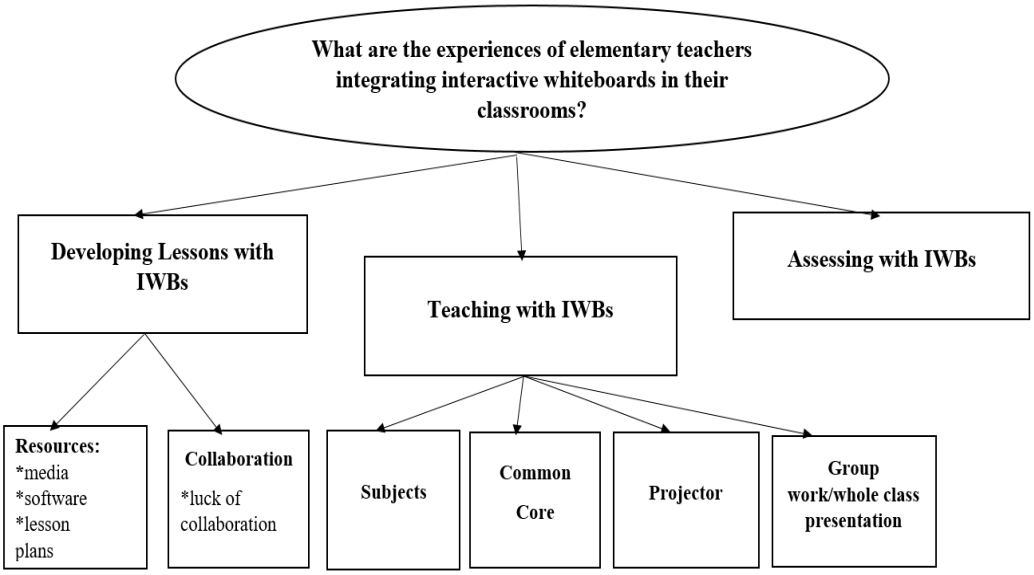

Figure 3. Coding concept map for Research Question 1

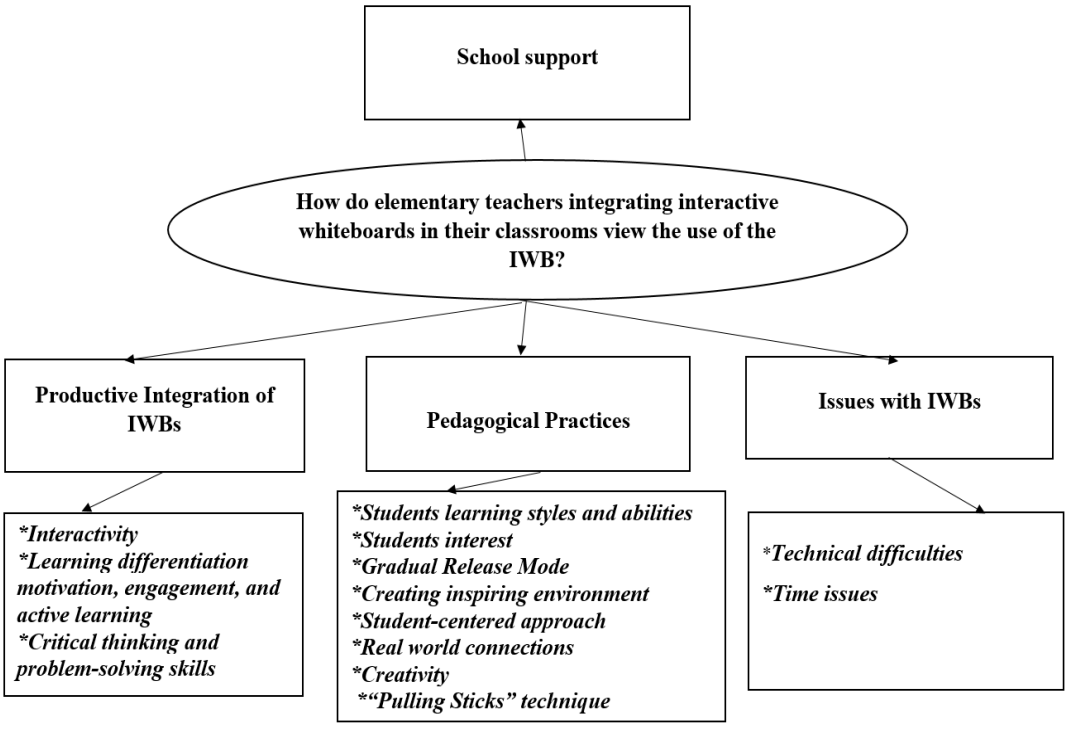

Figure 4. Coding concept map for Research Question 2

Evidence of Trustworthiness

Credibility

To ensure credibility, I explored the data from the lesson plan snapshots and interviews to discover the teacher participants' views and experiences with interactive whiteboards. Triangulation occurred by using three sources of data, including two interviews and lesson plans. My recruitment included as much diversity as possible through the inclusion in the study of different public schools, with male and female elementary teachers from Pre-K through fifth grade.

I included the process of member-checking to ensure that the participants reviewed my initial analysis. Before the second round of interviews, I reviewed transcripts and formed the follow-up questions, or updated the second interview protocol if participants had already covered the questions. I used probe questions to understand the participants' statements based on the two research questions. During the second round of interviews, I shared my interpretations of the participants' lessons plan snapshots and transcripts from the first interview. In addition, the time between interviews increased the data credibility and offered participants extra time to think and reflect on their first interview questions and add additional thoughts that may have occurred.

Transferability

To increase transferability, I identified in detail all the steps in the processes of recruitment, data structuring, data analysis, and reporting to allow the repetition of the same study by other researchers in a similar educational setting.

Dependability

To provide dependability, I identified detailed records of when and how the research data were collected and preserved to allow probable duplication of this research study.

Confirmability

For confirmability, I noted my thoughts and feelings in the interview note margins, and in Dedoose in the process of coding the data. Member-checking was used to ensure the interviewees agreed with the accuracy of the transcripts. By using open-ended questions and transcribing their words accurately, I reduced bias to increase confirmability.

Study Results

The research study results were organized by two research questions. The first research question focused on the participants' experiences with IWBs, and the second question analyzed the participants' views about IWBs. Data emerged from two interviews with each participant, and lesson plan snapshots were examined in order to identify relationships among the data sources and developed themes.

Research Question 1

The first research question was "What are the experiences of elementary teachers integrating interactive whiteboards in their classrooms?" Three primary key points emerged from the interviews and the lesson plan snapshots: *(1) developing lessons with IWBs, (2) teaching with IWBs, and (3) assessing with IWBs.*

Developing lessons with IWBs. A common agreement among the participants was that in most activities, the quality of lesson planning affects the quality of results. All the participants agreed that time and energy must be devoted to planning and preparing

each lesson with IWBs. The teachers stated that to ensure the greatest probability of learning, they must carefully select and arrange IWB activities that would produce the desired learning outcomes in students. The themes under this category were resources and collaboration.

Resources. Answering the question "How does IWB affect planning/preparation of lessons?" and the sub-question "What kind of resources do you use with IWBs?" all study participants agreed that interactive whiteboard usage facilitates the integration of useful and appropriate resources. Each of the teachers expressed that to be appropriate, the IWB lesson resources should relate to the lesson objectives in order to increase students' retention. To be useful, the resources should aid both the students and the teachers in the teaching-learning process. Each teacher agreed that students were able to grasp and recall facts and concepts in IWB lessons designed with interesting interactive materials and arranged in a way that enhanced learning.

Ms. A stated that "IWB makes planning preparation and instruction easier because it allows me an unlimited amount of resources that are grade appropriate and child-friendly." Ms. T's answer added that "any tool can be used to help promote student learning… there seem to be countless resources for enhancing education and making learning more fun and effective." Mr. H said, "I believe that interactive whiteboards should be given preference for resources; IWBs support the use of more resources to display and present to the children for them to learn the subject."

As a special education teacher, Mrs. E focused on differentiation, noticing that she "use [s] the IWB to plan for different learning styles, kinesthetic for interactive,

visual with lots of pictures, etc." Then the second special education teacher, Ms. B, agreed that "the IWB facilitates resources and materials for students with different learning modality." Besides, Ms. A's response was that all IWB tools could be used:

> Actually, all of the IWBs tools can be appropriate for the specific lessons. All of them have their place when you use it appropriately. You have to mix them up. You have to see what works best for your kids. Images, graphics, and videos are more appropriate for lower grades.

Media. I found from my interviews with teachers and my review of their lesson snapshots that for their IWB lessons teachers used videos, interactive games, educational websites, and software, graphics, and images. In her interview, Mrs. M noted, "Because of the IWBs, we are able to incorporate many more technology resources into our lessons, such as videos and games." Mrs. I said that she "mainly use[s] premade websites such as YouTube…and hoopla.com." Ms. T declared that she "found[s] that apps, organizational platforms, e-textbooks are tools that can help." In Ms. B's interview and lesson plan snapshot, she gave preference to reading resources:

> I usually use software and videos. My students rely on oral and visual cues to acquire new concepts. The material I choose most widely is reading resources, such as reading comprehension passages, phonics, and letter recognition.

Software. Three teachers, Mrs. F, Mrs. M, and Ms. A, mentioned Safari Montage software and BrainPOP animated educational website as the software they mainly used. Ms. A noticed that she "prefer[s] to use BrainPOP that gives explanations and

information directly to students in an informative way." Adding to this topic, Mrs. F listed her resources:

> I usually use Safari Montage and our IWBs for our math curriculum such as the HMH Curious George Videos as well as the interactive math games (Destination Math and Mega Math). My kindergarten students enjoy these games. When the technology is working, this makes for easy access to interactive games, videos, and websites such as www.havefunteaching.com. The IWBs is the only technology available to show videos in our classrooms. We are a new school and do not have televisions to show the Morning News or do the pledge together as a school. It is easy to adjust the volume and size of the item being projected. We also use the following websites: www.Readinga-z.com, www.abcmouse.com, and www.brainpopjr.com. Since the students are familiar with tablets at home, I explain that our IWBs is like a larger version of their tablet…I do have some books on CD that I've used on the IWBs, and then later I put it at the listening center for students to listen to if they'd like.

Underlining the importance of the school and county support, Mrs. M stated:

> Our school and county have purchased memberships to Brain POP and Safari Montage. Both of these programs are the most frequently used for video clips, website interactive, and lesson ideas. I think they are all appropriate depending on how the teacher uses them.

When I asked Mr. H about the resources he uses for his lessons with IWBs, he also said that he is **"**overly enthusiastic about the resources... [and he] use[s] a lot of PowerPoints, videos, and pictures." He also stated:

> I prefer to use the resources from the Discovery Channel and the Smithsonian website. The science software is too expensive and is only useful for a class or two. I also like Google Maps as a perfect companion for IWBs; it's free and easy to us. Having these stores helps me in the long term for already being prepared for later years.

However, he also added that "the teacher made resources are way more relevant and useful than cooperate made ones." When I asked Mr. H what those teacher-made resources were, his answer was, "PowerPoint presentations." I interpreted from my conversations with all participants and from their lesson plan snapshots that all the resources, they preferred the PowerPoint and Notebook software the most.

Lesson plans. All study participants mentioned the PowerPoint or Notebook as the main feature of the IWB lesson development. They stated that it provides a structure to a lesson presentation, aiding in the pacing and order of the lesson on the IWB. All participants agreed that PowerPoint or Notebook makes it easier to present the lesson objectives, rubrics, materials, and clear summaries. Ms. E said:

> I always prepare my lessons using PPT or notebooks as my guide. Each slide has the objective and activity. I prefer PowerPoint or Notebook documents with links to sound graphics or video links. I typically will search for the topic that I am

> teaching and then use an existing PPT or notebook format as a template to customize it to my lesson plan and students' needs.

Mrs. M stated that "[her school] also use[s] either MS PowerPoint or SMART Notebook software to create presentations for almost every lesson." Ms. B. said that "the use of PowerPoint is used when introducing topics that are complex in content and to understand unfamiliar vocabulary." Mr. H noticed that as a resource "PowerPoint is going obsolete, facilities can be done from a desktop, but the ability to use interactive software is only recreated appropriately from the IWB."

Both Ms. F and Ms. A specified that PPT or Notebook lessons created for the interactive whiteboard were easy to use. Ms. A said that she "like[s] it because it is very quick and it has the main parts of the lessons; it breaks the lesson down, and it shows specific steps." Ms. F's response about PowerPoint usage was:

> It's easy to "chunk" the lesson into manageable parts for students. And that it is easy to review previously taught skills or go back over information that I feel the students need more exposure to or time to learn using the IWBs.

Each participant viewed the interactive whiteboards as an excellent tool for planning and creating everyday lessons, one that offers numerous resources for general and special education students. Videos; interactive games; graphics; images; educational websites such as BrainPOP, Safari Montage, Discovery Channel and the Smithsonian; and PPT and Notebook software were given preference by all the participants. All teachers expressed that they prefer to create their everyday IWB lessons using PowerPoint or Notebook templates, including all the required lesson components: lesson

objectives, tasks steps or teaching points, instructional aids, handouts needed, visual and instructional aids or links for them, note taking space for teachers and students, and tests.

Collaboration. The opportunity to interact and share the IWB lesson plan ideas and resources with fellow peers was the next common code under this theme. Five teacher participants found value in the opportunity to collaborate and develop new ideas together; three of them reported that the IWB lesson collaboration was a school policy. Three participants regretted that there was no collaboration taking place in their schools. Only one participant found that working alone contributed to his integration of IWBs.

From my interviews with five of the participants and from their lesson snapshots, I interpreted that motivation and confidence increased from peer collaboration. As Mrs. I noted, "It makes it easier to connect with other teachers and with other ideas." Ms. T stated, "By working together over time, you can document practices that are the most effective both in content and in student engagement." Mrs. H emphasized that collaboration in the IWB lesson development saved a huge amount of teachers' time, and mentioned two educational websites that include thousands of questions sets and lesson plans for interactive whiteboards: SMART Exchange, and Teachers Pay Teachers (TPT). These websites offer the possibility to download lessons and open them in SMART Notebook software or to share lessons with other teachers. Mrs. H said:

> When I first started using my IWB, I used a lot of SMART Exchange lessons, but now I mostly use things from Teachers Pay Teachers (TPT). I can share any PowerPoint presentation or SMART Exchange lessons with my peers. If I am

making the presentation myself, it is more time consuming than using a premade one from TPT or Smart Exchange.

Three participants reported that collaboration in IWB lesson creation was school policy. The teachers stated that they did not create the IWB lesson plans on their own. In each grade level, there was a team and a team leader involved in the process of exchanging ideas, links, websites, and finally the IWB lessons with one another. Mrs. F said:

> I do not create my own lessons. My team and I share links to our lesson plans. Our grade level is divided into teams for lesson planning. One teacher creates the Science and Social Studies plans with some assistance from our CRT [curriculum team]. Two other teachers are responsible for the ELA [English language art] lesson plans. Being on a team with another teacher, I complete the math lesson plans. Then we have our Team Leader upload these to SharePoint, and we all use the same plans. I use the links that are in our team lesson plans, and then I supplement with some extra practice using websites such as ABC Mouse.com and Starfall.com.

However, exchanging the IWB lesson plans and resources did not mean that the teachers simply just used them. For instance, two participants agreed that they still needed to go over these shared IWB lessons and rearrange them for the specific needs of their students. Mrs. M stated:

> There are many pre-made lessons available for free. However, many schools like mine have very specific requirements for how our lessons need to be presented.

> Therefore, even if I can get a pre-made lesson, I still need to edit and re-work it to fit the needs of my school and my students.

Lack of collaboration. Through my interviews with Ms. T, Ms. A, and Ms. B, I realized that the lack of collaboration in the IWB lesson creation was a big issue for these elementary teachers. For example, Ms. A stated, "Administration should encourage teachers to share their past experiences with IWBs and share their knowledge and lessons with their colleagues." Ms. T also expressed the frustration of being isolated and not being able to learn from peers. She noticed, "I learned that as I began to design my lessons and activities, it would be good to share what I learned with peers." Only one participant found that working alone contributed to his integration of the IWB. Mr. H noted:

> Mostly I create my own PowerPoint presentations. Some teachers share their format to go over test questions. Personally, I have received many shared interactive resources by fellow teachers, but I have used very few of those resources received because they don't correlate to my lessons. However, I have copied those ideas to format it to my own questions.

Overall, the study participants seemed to enjoy and value the support and collaboration among colleagues. Working together and sharing the IWB lessons helped or would help the teacher participants to feel support and save a huge amount of time in the IWB lesson preparation.

Teaching with IWBs. All participants stated that according to their school policy they should use interactive whiteboards for teaching. Mrs. F stated that

"the IWBs is not mandatory, but it is strongly suggested that we use it." Ms. B supported this response, concluding that "it's recommended to be used as a supplement not as the main delivery of instruction." Nevertheless, each participant had different ways to use interactive whiteboards in their classroom. They all talked about using IWBs for reading, math, writing, social studies, and science; and for the whole group and small group settings. One of the teacher participants focused on the Projector functions of the interactive whiteboard. The topics of individual student needs and aligning lessons to the common core standards also arose during the interviews and lesson snapshots analysis. Ms. T said:

> I use IWBs primarily as an instructional tool within the teachers' control. Therefore, I think it is ok to experiment within the planned context and use the IWB in order to enrich existing pedagogy.

Subjects. Ms. A, Ms. E, and Mrs. H shared that they use the IWB in the classroom all the time. Ms. E said, "I use it for all subjects, all day…. the IWB helps me keep my lesson clear and concise…objectives are always visible to students." Mrs. H replied, "I use the IWB for my main group lessons in both ELA and Math so all my presentations must ready before hand … sometimes I use more than once for ELA, Math and either Science or Social Studies." Ms. A shared:

> I use it most of the time to introduce my lessons. In some subjects, it is easier to use the IWB; for example, if I am teaching Social Studies or Math. It is more visual and engaging. For example, for Writing lessons I can use it continuously,

> every day going back to the lesson and show the writing process. In Reading, we can read together and answer the questions written on the board.

Common Core. After careful analysis of the participants' interviews and their IWB lesson snapshots, I found that while planning and implementing lessons on the interactive whiteboards, teacher participants took into the consideration individual student needs and aligned all their lessons to the common core standards. Ms. B stated:

> The IWB is used to introduce a new content…The use of IWB is carefully chosen, by being aware of the common core standards and making sure that is designed to target the learning academic need of each individual student.

Supporting Ms. B's words, Mrs. F declared, "We are providing the curriculum in such a way that it isn't just "skill drill" anymore…the lessons are paired up with the standards we are teaching."

Projector. In his response on the IWB usage, Mr. H focused mainly on the function of the interactive whiteboard as a projector.

> In many cases, IWB allows me to share a dynamic lesson to the class. I use the whiteboard all the time but as a traditional feature (projecting questions and maps, highlighting and marking objects of interest, etc.). I also prefer to use IWB mainly for test prep. Using IWB as a projector, I can show the class the grades received, show a question and work out the problem with them and explain in a dynamic way. The children know that I will share these resources and they are expecting it. However, any pictures and software images are far from the reality.

Group work and whole class presentation. The teacher participants identified ways that they used IWBs to engage their students. Mrs. F mentioned the IWB projector functions as well, but she did not limit the interactive whiteboard usage only for the portraying the books and worksheets. She also specified the importance of using the IWB for the whole class teaching as well as small group work.

> We are using the IWB to enhance student learning in a whole group or small group setting…. We use the IWB in our classroom throughout the day; however, perhaps not in every lesson. In Writing, I use it for sentence starters. In Reading, we use it for the book we are reading aloud and also for singing songs like with www.havefunteaching.com. The entire Math lesson is done using the IWB. I portray the workbook page we are using, and it keeps students focused on what we are learning. Also during Intervention Time, the IWB is often used as a station. This way I can observe the station while working one on one with students at a nearby table. The students could be working on a worksheet that is being portrayed on the IWB.

Mrs. M also expressed that the IWB in her classroom was used for the entire classroom and small group rotations.

> We have IWBs in every classroom, and they are used during whole group instruction lessons. I also use it as an "IWB Center" during my small group Reading and Math rotations. I choose a particular activity or interactive website for a small group of students to use at a time.

Specifying what works better for preschoolers, Mrs. I noted that she did not use the IWB only for the academic work. She mentioned the Go Noodle website that she used for her students' movements inside the classroom.

> I mostly use an interactive whiteboard for Story Time, alphabet review and indoor recess. It helps me teach in whole group settings, which help reinforce what we are doing in small groups. I have several that are primarily Spanish speaking. Working with them in the whole group helps them hear from their peers and gives them another chance to hear the language.

The research participants used IWB in their classrooms in several different methods and tactics. However, most of the participants used the IWB for most elementary subjects and aligned their lessons to the Common Core standards, and to meet individual student needs.

Assessing with IWBs. Answering the interview question "How do you use IWB for assessing your students learning?" all teacher participants had a complex set of beliefs and practical examples about how to use the interactive whiteboard to create a clear picture of students' achievement and gaps. Through the interviews and lesson plans snapshots, I interpreted that all types of educational assessments were taking place in my participants' practices with IWBs, including (a) informal, (b) formative and (c) summative assessments. For instance, in her interview, Ms. A mentioned:

> You need to know what are the levels of the children you are teaching. Pre-assessments must be done prior creating lessons on the IWB. You need to know

the population you are teaching to make the lesson more powerful. Attention span needs to be considered.

Informal assessments. Analyzing the IWB lesson plans snapshots of all research participants, I noticed that the participants identified several informal assessment examples:

1) *Brainstorming techniques* (questions about what students may already know about a particular topic).

   For example, the Mrs. E's and Mrs. H's lesson snapshots had examples of using KWL charts, on which the K stands for what students already know, the W stands for what students want to know, and the L stands for what students will learn.

2) *Rubrics* (written guidelines by which student work will be assessed).

   Mrs. M's and Mrs. F's lesson snapshots with PowerPoint presentations had lesson rubrics that described what would be expected as the theme products and their grading criteria. The numbers on the tops of the rubrics indicated quality, from 4 or 3 being the best, to 0 being something students wanted to avoid.

3) *Exit cards* (written student responses to questions at the end of learning activity).

   The Mrs. M and Mr. H lessons had some examples of exit cards that required students to respond to prompts. Students would hand the

exit cards in before leaving the class, providing their understanding of the material being taught.

4) *Follow-up questions.*

   All participants' lesson plan snapshots contained examples of follow up questions for assessing what students had learned.

5) *Graphic organizers* (including Venn diagrams or T-charts).

   For instance, Mr. H, Ms. B, and Ms. T provided lesson plan snapshots with the graphic organizers being used to help students understand complex ideas covered in the lessons.

6) *Hand signals.*

   Most of the lesson plan snapshots mentioned the "thumbs up/down" technique to determine students' understanding.

7) *Journals or reflection.*

   Mr. H's PowerPoints offered the examples of using journals, in which students reflected on their learning, and quizzes (see below) with multiple-choice or open-ended questions.

8) *Short quizzes.*

9) *Turn-to-your-neighbor technique.*

   All lesson plan snapshots mentioned this technique being used to discuss the questions or problems, with students sitting around as a set-up for the all-class discussions.

10) *Games.*

> Ms. A's, Ms. B's, Mrs. H's, Mrs. I's and Mrs. E's lesson plans were full of educational game links.

Responding to the interview question, Ms. A stated that "informal assessment has to be done on a regular basis." Mrs. M underlined the importance of exit slips. She noted, "The exit slips allow me to check for understanding and identify which students need extra support or motivation." Mrs. I shared her experience informally assessing with IWBs as pleasurable. She mentioned:

> The IWB helps me see that they understand more than I thought. I can see the routine is coming together and that they are taking in the songs sung and the activities learned. I hear from the parents that they are singing the songs that are taught.

Mrs. E seemed to agree that interactive whiteboard lessons were beneficial in terms of immediate opportunity to assess the students' knowledge.

> Interactive features allow me to assess students informally during or after the lesson. With the I Do, We Do, You Do, the IWB allows you to assess students throughout the lessons. It presents the I Do, clearly assessing all styles of learners, and We Do can be used for share and guided practice, assessing students before sending them off to work independently.

Formative assessments. I also found that the teacher participants appeared to use formative assessments with their IWB lessons as part of the instructional process to assess learning while they were teaching a lesson. It seemed that the formative assessments informed both students and teachers about students' understanding so that

timely adjustments could be made in the lesson. Mrs. F offered the example of how she assesses her kindergarteners and then scaffolds her lessons during the IWB Writing lesson.

> I use the Ladybug to freeze worksheets or workbook pages we are using that day to have students write on the IWB. This way I can see their letter formation and correct any errors right at that moment. In Kindergarten, it stops poor habits, i.e. pushing up with their pencils vs. pulling down to make numbers or letters. It allows me to provide immediate feedback and I can model for the entire class how I'd like them to write at their seats.

Mrs. M mentioned videos as a formative assessment tool.

> Videos can be a really powerful teaching tool if they are used effectively. Instead of just playing a video and letting it run, I prepare or set the purpose for the video, including a graphic organizer/focus question/note taking, pause the video to check for understanding, and follow up with some type of formative assessment. I also use whiteboards or other types of formative assessment on paper to ensure that all students are staying on task even while someone else is using the IWB.

Summative assessments. The lesson plan snapshots and interview data gathered showed evidence of the use of summative assessments with the IWB lessons. For example, Mr. H mentioned he used the animation feature for summative assessments. He stated that "interactive whiteboards give the opportunity to plan questions for chapter tests using fun animation for the children." Ms. A underlined the importance of creating

summative assessments for the IWB lessons for future lesson differentiation and for making cumulative assessments. She said:

> I can put the assessment on the board and check the students' understanding. For example, create a summative assessment. As the result of this assessment, I will be creating differentiation instructions. So, for the long term will be the access of the information and building data around it and make a cumulative assessment.

The data gathered during the research process identified that the teacher participants used the IWBs for informal and formal assessments as part of the IWBs lessons. All the participants underlined the importance of identifying the lesson objectives, teaching according to these objectives, and assessing these objectives, using IWBs for informal assessments, used to inform instruction; and formal assessments used to compare the students' performance or identify their overall achievement.

Summary of Teachers' Experiences with IWBs

The themes I have identified from the teacher participants in relation to their experiences integrating interactive whiteboards in their classrooms were *developing lessons with IWBs, teaching with IWBs, and assessing with IWBs.* It was a common agreement among the teacher participants that IWB resources such as videos; interactive games; graphics; images; educational websites such as BrainPOP, Safari Montage, Discovery Channel, and the Smithsonian; and PPT and Notebook software were used in the classrooms. All participants stated that the IWB was an excellent tool for planning and creating lessons, and they used IWBs to create their everyday lessons using

PowerPoint or Notebook templates. Eight out of nine participants noted the importance of collaboration in the creation of IWB lessons.

All teacher participants had different ways to use IWBs in their classrooms; however, all of them mentioned using IWBs for reading, math, writing, social studies, and science lessons for the whole group and small group teaching. Only Mr. H focused mainly on the teacher-led projector functions of the interactive whiteboard. All participants talked about aligning their lessons to the Common Core standards and individual student needs. According to the participants, the IWB supported creating a variety of interactional methods and addressing diverse learning interests and needs of individual students and groups of students. Finally, the data showed that the teacher participants used IWBs for informal and formal assessments. Each participant described the importance of assessing with the interactive whiteboards.

Research Question 2

The second research question was "How do elementary teachers integrating interactive whiteboards in their classrooms view the use of the IWB?" Four major key themes emerged from the participants' interviews and my review of their lesson plan snapshots, including *(1) productive integration of IWBs, (2) pedagogical practices, (3) issues with IWBs, and (4) school support.*

Productive integration of IWBs. The teacher participants' views were that integrating IWBs into everyday classroom practice creates new possibilities for teaching and learning. According to the participants' points of view, the advantages of the IWBs include the possibilities for educators to differentiate

their lessons, create dynamic lessons, engage their students, and foster students' problem-solving and critical-thinking skills. The themes discovered under this category were (a) interactivity, (b) learning differentiation, (c) motivation, engagement, and active learning, (d) and critical thinking and problem-solving skills.

Interactivity. Interpreting the research data, I found that the study participants perceived that use of the interactive whiteboard and its features were very beneficial. Ms. B emphasized that "the use of IWB helps the teacher to cover a variety of topics and includes more concrete and relevant information related to the topic." The common agreement among the participants was that IWBs help to create a more dynamic learning experience. Mrs. M stated that "the IWB advantage is being able to use virtual manipulatives instead of having to make sure everyone has enough supplies for hands-on activities." Mrs. H added that "anything hands-on or interactive enhances understanding and learning." In addition, Mrs. H concluded that using interactive IWBs enriches students' achievement and increases tests results.

> I think that when using interactive technology, the students are more engaged and retain more information, so they score better on tests and are able to show a better understanding.

Ms. A added:

> Test results should increase because students will have deeper knowledge and deeper understanding. For example, when you make your PowerPoint, you can break down these skills for better student understanding.

Learning differentiation. As I interpreted from my conversations with teachers, the participants' common agreement was that students who naturally had varying interests, abilities, and learning needs were more successful when they were taught in ways that were receptive to their interests, readiness levels, and learning profiles. According to the teacher participants' responses, the interactive whiteboards helped them differentiate their instruction. For example, Mrs. M declared that she "[tried] to include as many different modalities as possible into a lesson to appeal to a wide variety of students and student abilities; using the IWB, [she] can include audio, video, images, kinesthetic activities, text, graphics etc. to reach the maximum number of students." From her special education perspective, Ms. B perceived the IWB as a main tool for the instruction differentiation.

> The use of IWB is highly beneficial, especially for students with severe cognitive delays. This population benefits from repetition and drill, so the use of adequate videos and PowerPoint presentations enhance their language and processing skills. Students always have the opportunity to repeat a lesson that they may have difficulties with, by re-reading unknown vocabulary or finding key details in a text.

Special education teacher Mrs. E also noted that IWBs and software made it possible to ensure that every student learned the content at a pace that was catered to their different learning levels. She underlined that the interactive whiteboard provided the teacher with the variety of ways to look at the students' needs and adjusted or modified instructions to fit those needs.

> The IWB makes it suitable to differentiate for students who can't note take or copy from the board easily. You can print the presentation, and the students can keep them in a notebook or folder for reference.

In her response, Ms. A underlined the importance of using the interactive whiteboard for the ESL students. She stated:

> Kids who need to be entertained, who needs visual, audio, and kinesthetic impute will learn better. ESL children need these pictures and videos. The IWB will help them to learn faster and quicker.

Motivation, engagement, and active learning. Each teacher participant emphasized that engagement and motivation were important in education and perceived IWBs as a way to boost engagement and motivation in their classrooms. According to Ms. B, "the interactive whiteboards affects the student's engagement and a high level of participation." Mrs. I agreed that "things [she is] able to do with [IWBs] have excited the children and helped them feel a part of the lessons." She also noted that "children are so technology based in their environment that expanding it in the school setting has been helpful." Then Mrs. F. expressed satisfaction that IWB could increase students' engagement and help to stay on task stating, "I like the level of engagement that the IWB resources provide; I enjoy using the IWB to teach the whole group because it helps students to focus and offers not only visual images but also songs and sounds to make learning livelier." In addition, Mrs. H highlighted:

> Students these days are easily bored. By integrating technology, we can keep it fresh exciting and extremely interactive. I love technology! I honestly think it

> keeps our tech savvy kids engaged more because they are used to technology being in many aspects of their lives. Each year I am excited to present the materials to the students and each year they are eager to see what we are doing.

I interpreted from the interviews with participants that the interactive whiteboard was seen as a tool that supports the increase in motivation for students, and also a tool that makes learning more accessible and active by integrating multiple technologies and engaging students through interactive lessons. Mr. H highlighted that "using science and social studies software and projections are the strong points of IWBs mostly geared to highly engage students." According to Ms. A, "IWB support[s] by making learning fun and engaging; keeping kids' attention can reach any type of learning abilities." Ms. T stated:

> IWBs serve as motivational tools for students and their desire to remain on-task. You can highlight resources that will help you and your students collaborate, share ideas, and stay organized to get the most out of learning.

The hands-on and tactile features of the interactive whiteboards were perceived as student-engaging factors. Mrs. M said:

> I believe the benefits of using IWBs are two-fold: they engage students, and they help teachers. The large format of the IWBs allows teachers to present material (books, games, images, etc.) to an entire class of students instead of just a small group at a time. The ability to animate and manipulate objects on the screen increases student engagement and enthusiasm for learning. The IWBs are still a relatively new feature to many students at our school, and the "newness" of them

> still creates excitement from the students. I often wonder if/when this excitement will wear off once the IWBs become so commonplace that they are "old news." When it comes to teachers, using lessons on the IWB help the teachers stay on track with activities and focus on the learning goals. We map out each portion of the lesson on a presentation shown over the IWB. The teacher navigates through the presentation, which removes having to constantly refer to a printed-out lesson plan or TE.

Mrs. E also stated that she found the interactive whiteboard with its features a very helpful tool for the teachers.

> I enjoy using IWB because it helps guide me through my lessons and engage my students at the same time. I do not have to memorize questions or my stopping points for turn and talks; it's built into the "presentation." I believe it affects my expectations of what children will learn because it can make things tangible.

Focusing on the active learning aspect of IWBs when students actively engage in the learning process through writing, reading, analysis, discussion, evaluation, and synthesis, rather than passively absorbing instruction, Mrs. E added:

> When using an interactive document, students are physically manipulating objects to problem solve, or have a visual to always reference. Students love to show what they are learning. They are motivated by wanting to do well. When they get a chance to do so in front of their peers, it helps them reach their potential. Standing up and coming to the board isn't a scary task like it was prior. It is seen

> as a tool to help them learn. They don't need to come to the board with the answer. They use it to help them get the answer.

Critical thinking and problem-solving skills. During the interviews, the teacher participants were asked about the specific learning support IWBs provided in developing of 21st century skills such as critical thinking. Four teacher participants stated that IWBs could contribute to the development of higher order thinking skills such as critical thinking and problem-solving. Ms. B concluded that "the IWB is highly beneficial to understand difficult tasks; it also increases critical thinking skills." Mrs. F detailed the need to increasingly put technology into the students' hands and trust them with progressive technology use.

> The problem-solving skills are apparent in real lifetime experiences vs. worksheets being graded and later returned. You can observe exactly how the student derived at their answer and can have them provide evidence by having them underline or "Show you their thinking."

Ms. T specified that for students to develop advanced thinking skills, they need access to a continuously growing array of technological activities and tools to encourage decision-making, problem-solving, cooperation, and communication skills.

> Learning with IWBs can contribute to the development of skills such as information, higher order thinking, communication and cooperation, use of technology, and independent learning skills. Most likely the long-term effect of IWBs is their use to develop thinking and learning skills such as higher order thinking. When this technology is integrated into the curriculum, it can provide

> support in attaining instructional goals. I believe that IWBs can, therefore, enhance existing teaching skills. Schools must prepare younger students for the future. Using this IWB technology in the classroom can prepare students for a future deeply embedded in technology.

Ms. A detailed the support that IWBs offered for inclusive classrooms by offering students a variety of ways to learn, express the ideas, demonstrate understanding, and master 21st century skills.

> For those kids coming to the classroom with different needs, IWB is the good tool for teaching children's thinking questioning skills and problem-solving skills. When I put the objective and high order thinking questions on the IWB they are getting into a routine on questioning and problem-solving.

Pedagogical practices. According to the interview data results, I found that each participant shared his or her own pedagogical techniques that would be useful in implementing IWBs into practice. One of them, *"*Pulling Sticks" technique, was a common technique used by three of the participants. The themes in this category were: (a) students' learning styles and abilities, (b) students' interests, (c) Gradual Release Mode, (d) creating the inspiring environment, (e) student-centered approach, (f) real-world connections, (g) creativity, and (h) the "Pulling Sticks" technique.

Students learning styles and abilities. Several participants described the importance of using every available resource, strategy, and tool to meet every student learning style and ability teaching with the interactive whiteboard. For instance, Mr. T

said: “Teachers will have to learn new skills to change instruction that places identical learning tasks for all students.” Ms. B talked about meeting every student need in implementing the IWB lesson.

> Teachers must be aware of the learning style of the students; some students may find the use of IWB over-stimulating or the distracting. Teachers should use different techniques and approaches to make sure students learned the objective of the lesson. For instance, instruction should be implemented in the small segment, a lot of repetition is highly recommended to make sure that all students accomplished the desired goal or outcome.

Students' interests. Mrs. I emphasized that resources and activities on the interactive whiteboards must be developmentally appropriate, both challenging enough and engaging for the children. She stated that it was imperative to “refocus students when distracted and giving them age-appropriate activities are needed when the IWBs are in use.” Ms. A’s beliefs were similar to Mrs. I’s beliefs. She declared, “[Teachers] have to know the students’ interests and preferences earlier in the year, keep the track on them and incorporate their interests into the interactive lessons.”

Gradual Release Model. Mrs. M shared that the Gradual Release Model for scaffolding instruction was the best pedagogical approach for her IWB lesson instructions. That model is structured as (I do), prompt (We do), and practice (You do), and moves instructions from teacher-centered to student-centered. However, using this technique was not enough; Mrs. M emphasized that teachers must select an appropriate tool to track student progress with the IWB lessons.

> I think using the IWBs really facilitates the gradual release model for teaching. Using the IWB, teachers can first model a concept (I do), then guide students through the practice of a concept (We do), and finally, post problems for students to practice independently (You do). Having a presentation or activities pre-planned and posted on the IWB helps teachers stay focused on the learning targets, but also allows for flexibility as needed. Teachers need to have very good monitoring skills and "witness" to effectively use the IWBs.

Mrs. F specified that creating an inspiring teaching and learning environment in the classroom was linked to levels of student success. She emphasized that keeping students motivated and interested were challenges.

> For me, it's no different than ensuring that all children are engaged in learning with or without the use of technology. Teachers must pay close attention to their students' level of engagement and that students are on task. I tell my students to "listen with their eyes." Teachers are doing a disservice to their students if they allow students to "zone out" during the day. Time is very precious, and learning should be occurring throughout the lessons. Well with five-year-old, motivation is rarely an issue.

Mrs. H agreed with Mrs. F on the importance of the degree of curiosity, attention, and passion that students display, which spreads to the motivation level when they were being taught with the interactive whiteboards. Nevertheless, Mrs. H suggested focusing on behavior and time management, attention spans, and question differentiation as well.

> I think IWBs overly enthuse teaching always keep young learners more engaged. You need to be excited about the material and present it in such a way. If the teacher is excited, they will be excited. You also need time management and behavior management paired with an interesting lesson. You need to be aware of the time that it takes to share the mini-lesson and the ability of the attention spans in your classroom. You need to challenge all students at their levels by providing different levels of questioning; this way all students can be successful. When a student feels more confident, they are more inclined to try something new, volunteer an answer, and ask questions.

Student-centered approach. Ms. T believed that when teaching lessons with IWBs, teachers should move from a teacher-centered to a student-centered approach, and should focus more on inquiry, meaning making, and authentic activities. She stated that the main instructional goal for the IWB lesson must be creating a learning environment where knowledge is built by students and teachers, rather than coming directly from the teacher.

> The skill most effective when using IWBs in whole class learning is for the teachers to learn to alter instruction to be more dynamic and interactive. The skills needed are to alter learning away from being teacher-centered to a more interactive designer of instruction using technology. Most likely, instruction methods are most meaningful and produce the best results when knowledge is skillfully taught in an interactive manner. It is contingent on teachers professionalism to use fewer teacher-centered instruction. Teachers must create

> skills that stimulate instruction using the IWBs as a presentation tool to make teaching more interactive with all students.

Mrs. F and Mrs. H agreed with Ms. T, asserting that IWBs foster student independence. For instance, Mrs. H said, “The more they use the IWB, the more independent activities can become. Mrs. F concluded, “As a teacher, I enjoy seeing the ‘light bulb’ go off and also having students teach a skill to their classmate using the IWB.”

Real-world connections. Mrs. E described the value of real-world connections that involves authentic experiences similar to ones students would likely encounter in life. In addition, she emphasized that teachers should link new information being taught in the lesson to the students’ prior knowledge. Mrs. E declared that “relating learning to real world situations and problems, building on prior knowledge and understanding skills needed for success in the current lesson on the IWB” were essential in teaching with IWBs.

Creativity. Mr. H highlighted that that creativity and content knowledge were two skills needed to teach lessons with IWBs. He stated:

> I believe two important skills, knowing the material being taught well and using IWBs to present follow-ups or demonstrate the lesson through an alternative, the creative way through the use of pictures, write-ups, charts, etc. are needed with IWBs as well as having a different follow-up for the same lesson. Demonstrating through a graph, showing dynamic pictures and seeing the recorded work and the child’s face if they are following up and if the resources are being effective….

> Although I have heard of teachers throwing plush balls to the screen to select a question from the software, I don't have the creativity to develop programs such as those.

"Pulling Sticks" technique. Three teacher participants described the effective use of classroom management techniques for decreasing class disruptions while teaching with the IWBs. Mrs. M said, "[IWB] helps with monitoring student behavior because your head is up instead of looking down at a paper or book." The participants emphasized that effective management techniques raised the students' achievement and made it possible for the teacher to conduct instruction with the interactive whiteboards more productively. Mrs. H, Mrs. M, and Mrs. F mentioned the "pulling sticks" technique as one they used more frequently with IWBs. Mrs. H said:

> I like to "pull sticks," write each student's name on a Popsicle stick and pull them out at random. This way the students are excited to see who goes next and this makes all students accountable for the learning, not just the hand raisers which are a more traditional way to volunteer information.

Mrs. M acknowledged:

> The teachers cannot stay planted at the front of the class on the board; they need to circulate. The teacher needs to allow various students to interact with the board instead of always using it as a teacher-only tool. Pulling Popsicle sticks or a planned rotation strategy can help with this.

Finally, Mrs. F added:

> I try my best to instill fairness when using the IWB. For the students to take turns, I often have them pull sticks out of a cup with their classmates' names on them. This ensures that everyone gets their turn. This in Kindergarten is a BIG deal.

Issues with IWBs. My analysis showed that these teacher participants had overall positive perceptions about using interactive whiteboards in their everyday teaching practice and felt comfortable using them. According to Mr. H, "IWBs are mostly technical - knowing how to operate the screen … many colleges nowadays are teaching students how to create dynamic software to use with the IWBs… and almost anyone could use the resource of an IWB into effect." However, some participants acknowledged that they experienced some difficulties. They described the need for more technical support and additional time for planning lessons with interactive whiteboards. Two codes emerged in the data analysis about problems integrating IWBs: technical difficulties and time issues.

Technical difficulties. As I interpreted the interview data, six participants described technical difficulties with IWBs. For instance, Mrs. E stated that "technology fails; it interrupts lessons when things aren't working, and you need to have materials in place in case it does." Mrs. I noticed that "[their] IWB has been inactive as far as being able to use as a touchscreen for a while; I have not been able to do more with it than show videos, online books or PowerPoint presentations." Mrs. M alleged, "There are technical issues many times – a loose wire, recalibrating, burnt out bulbs, etc...." Ms. A determined, "Sometimes the Internet is not working; there are lots of surprises from the technology; you have to be tech savvy."

Mrs. B stated:

> The access to the Internet and technical support can pose a problem. For example, when all teachers logged on the same website it's impossible to obtain access, thus delaying the lesson or losing the students.

Mrs. F. added:

> I tend to lose my pen a lot by laying it down in the classroom. One other incident I've encountered is having the bulb go out on the projector and then you're left dead in the water until it's replaced. Then as a teacher, you resort to "old school" methods, and you realize how dependent we are on utilizing the IWB on a daily basis. At times, the IWB isn't kid-friendly so instead of using the touch mode we use the mouse. Sometimes it's difficult to switch from the touch tool being the "select" button and using it as an eraser.

Time issues. Some participants expressed that IWBs, and technology in general, save them time. For example, Ms. A underlined that now she was able to simply save her lesson plans on a flash drive, and reuse and enhance previously created lessons and resources on the IWBs.

> When I planned my lesson earlier, I spent time writing them on the piece of paper or printing them out on the computer. Now I can cut and paste the objectives, examples that drive my instructions and all parts of the lesson and use them on the IWB. Technology overall gives me easy and quick access to the info. In addition, I can keep information on the flash drive.

However, five teacher participants voiced that limited planning time was a big issue. Mr. H emphasized, “I have to spend more time looking for software or thinking of interactive resources.” For instance, Ms. T stated that this time was doubled because she did not have enough technical knowledge.

> For some, including myself, it can seem overwhelming to adopt technology into the classroom. Time is needed to learn how to use something new…. Many teachers feel that they need to invest a lot of work in planning and preparing of lessons. Good applications of IWB technology exist, but they are also time-consuming. Teachers do not have extra time…. It can be frustrating and time-consuming to learn new ways of teaching and learning.

Mrs. M seemed dissatisfied about the planning time and determined that she was limited with the time needed for creating useful resources for the IWBs lessons as well. She had to use her personal time:

> The most difficult thing is time. It can take a lot of time to create an effective IWB lesson. There is not enough planning time provided for us to make that happen, so I spend a lot of my “free time” creating these IWB products.

Supporting Mrs. M ideas about the planning time limitations, Ms. A determined that the time issue was not only the problem. It appeared that she was also worried about the lesson effectiveness after the time-consuming planning process.

> Sometimes there is too much information, and it is time-consuming to choose the right one and create any resource. There are no guarantees that your lesson will work perfectly.

Finally, Mr. H's apprehensions about the planning time limitations were similar to other participants' concerns. He stated that in planning lessons for IWBs, he spent time looking for the appropriate lesson resources even if somebody had already created them and posted them on the Internet.

> Developing a lesson, however, can sometimes be challenging – finding a just right picture, sound or font can be time-consuming. Looking for other people's premade resources can also be time-consuming.

In conclusion, the results of the study indicated that districts and school administrators should take into consideration issues such as technical difficulties and time issues that affected technology integration.

School support. The last theme that emerged from the interview coding analysis was the topic of school support. Two interview questions: "How has the school supported your integration of IWB?" and "What are ways the school could provide better support?" focused on this topic. Six participants noted positive school administration support and three stated that there was no support. For instance, Mrs. B stated that "school is supported by the use of IWB…." However, Mrs. A said that "they just give us a list of websites and program that school purchased." In addition, all teacher participants offered suggestions that were mainly related to their needs in implementing IWBs in their classrooms, such as additional technological and curriculum training, purchasing new software and updating the existing software, teacher collaboration, and more technical support at school.

The participants recognized their schools' support in incorporating new software strategies into their curricula and help in troubleshooting if necessary. Mrs. E said, "They have purchased software if needed; they are available to troubleshoot; they provide extra bulbs, clean dirt out of the vents, and help maintain." Mr. H specified, "Our school paid teachers to be trained with IWBs and supports an IT department in case there are technical issues with the projector or the board." Mrs. H was eager to share the names of software her district purchased for IWBs implementation: "Yes, my district loves technology; they have purchased licenses for I-Ready, I Read, BrainPOP, Reflex Math, Safari Montague." Mrs. M mentioned multiple ways her school supported her, such as instructional support and help with monitoring student behavior.

> Our school has implemented IWBs in all of the classrooms. Our instructional coaches help develop lessons and resources to utilize these in the classroom. Our behavior team has chosen to use Class Dojo along with the IWBs to help manage and monitor student behavior.

In contrast, Mrs. F and Ms. T described less support from the school administration for implementing interactive whiteboards for teaching. Mrs. F stated that the technology person was not available as often as she needed and professional development training was not current.

> Well, we are assigned a technology person who works not only at our school but on another campus as well. Other than that, as a teacher, they provided a brief tutorial at the beginning of school 4-5 years ago. So basically, no support has been

> provided to teachers to help in integration of the IWB. It is just expected that we are using them on a daily basis.

Ms. T added the notion about the need for instructional support and technology training for teachers.

> No support. Schools need to contribute more training and guidance so that teachers will be able to use this technology in ways that support instruction. I did a lot of experimenting with little training.

Professional development, purchase of IWB materials including new software and boards, updating software and technical support of IWBs, and providing teacher collaboration were the support needs were recognized by the teacher participants. The participant's suggestions for future IWB training related to the technical part of the IWB usage. For example, Ms. B mentioned that "the way schools can provide better support is by providing adequate training for teachers all staff." They also mentioned curriculum-based professional development. For instance, Ms. A said that "school administration should talk about how to integrate … not just provide you with the board, and you are on your own finding your own recourses." Supporting these thoughts, Ms. T added:

> Teachers must request specific professional development that includes both skills to integrate into the IWB and the curriculum as well as technological training. Also, help teachers with ways to actively involve the students in instruction using this technology.

Mrs. M's concern was that school just supported with the IWB training once the interactive whiteboards were installed and that there was no follow-up support given for

teachers. In addition, Mrs. M mentioned that "old school" teachers had no training in the basics of technology integration.

> Training on the IWBs was provided to the school when they were first purchased and installed, but there has been no follow-up training. Because of a high overturn of teachers, many new teachers are not familiar with the IWB features. In addition, many of the older teachers who are not technically literate still struggle with using the IWBs because there has been little follow-up support.

Mrs. I's main concern was that her IWB was not working correctly since the school year started and she mentioned, "If we could get the touchscreen to function correctly that would be wonderful." Mrs. H and Mrs. E stated that school must provide upkeep for interactive whiteboards, and their features should be updated. In addition, Ms. B emphasized the importance of buying new software, stating that "[schools] can also purchase more IWB materials that are accessible to teachers and students." Mr. H agreed with Ms. B and concluded that schools should "share in the PDs useful age level software for the children."

Finally, the teacher collaboration in the IWB usage was the main theme in Mrs. F response. She stated that as a teacher who has been working in the public school system for a long time, she would benefit in more support from the youngest teachers who were more technically trained.

> I wish they'd provide time during the day for teachers to observe another teacher using the IWB to its fullest capacity. That would be very beneficial to a tenured

teacher like me to see how much more I could be using it for and HOW TO use it better.

According to the data gathered from the interview responses, six participants mentioned the positive and productive support from the school administration in terms of buying new software and providing professional development for teachers. Two participants said there was no support. All participants stated that they needed additional training, new software, teacher collaboration, and more troubleshooting support at school.

Summary of Teachers' Views about IWBs.

All participants perceived IWBs as a tool for lesson interactivity, learning differentiation and addressing different students' needs, students' motivation and lesson engagement, and fostering critical thinking and problem-solving skills. Sharing their specific pedagogical practices and beliefs, the participants named the capability to respond to their students' learning styles, abilities, and interests by creating inspiring classroom environments that motivated and engaged students as the most useful techniques for IWB usage. The Gradual Release Model was named by Mrs. M as the best fit for the IWB instructional format. Other participants named creating a student-centered environment and making real-world connections as the most effective tools. Finally, the "Pulling Sticks" technique was called the best behavior management technique for the IWB lessons.

I found that while all the participants had positive perceptions about IWBs, some participants recognized that they experienced some difficulties using IWBs, including a need for technical support and extra time for planning lessons with IWBs. Six

participants stated they had their schools' support, while three recognized that there was no school support. All participants suggested that additional technological and curriculum training, the purchase of new and updating the existing software, teacher collaboration, and more technical support at school were needed.

Participants agreed that IWBs usage facilitated the integration of useful resources such as videos, interactive games, graphics, images, and educational websites, and stated that the IWB was an excellent tool for planning and creating lessons. All teacher participants described different ways to use IWBs in their classroom, including using IWBs for informal and formal assessments. These teachers perceived IWBs as a tool for lesson interactivity, learning differentiation and addressing different students' needs, increasing students' motivation and lesson engagement, and fostering critical thinking and problem-solving skills.

The purpose of this research study and the implications of the findings are organized in Chapter 5 within the conceptual framework. The implications for social change and recommendations for further research are provided.

Chapter 5: Discussion, Conclusion, and Recommendations

Introduction

The purpose of this qualitative study was to discover the experiences and views of elementary teachers regarding IWBs. The population of this research study was limited to PreK-5 school teachers working in public schools who had access to IWBs in their classrooms. Use of a qualitative case study methodology provided me with in-depth insight and enabled me to identify patterns and themes regarding the experiences of participants. A case study method offered opportunities for the participants to describe their individual experiences (see Merriam, 1998).

This study has contributed to the existing literature on IWBs by developing a better understanding of teacher experiences as they integrate an innovative technology into their classrooms. As the use of technology increases, the results of this study might provide elementary teachers additional support in creating lessons for teaching students in the 21st century (Hennessy & London, 2013; Peled, Medvin & Domanski, 2015). With more understanding of the needs of elementary teachers, school administrators might be able to more effectively assist teachers in productively integrating technology in their instruction through the offering of professional development courses (Tertemiz et al., 2015; Yang & Teng, 2014).

Interpretation of the Findings

Data results helped to determine the public school elementary teachers' experiences with IWBs and their views about implementing IWBs in the classrooms. The

conclusions from this research study confirmed the literature review findings. They extended knowledge on the school technology integration process as well.

Overall, the results showed that teachers perceived and used IWBs as an effective instructional tool. For the first research question (What are the experiences of elementary teachers integrating interactive whiteboards in their classrooms?), analysis of data showed that the participants saw IWBs as an excellent tool for planning and creating lessons incorporating videos, interactive games, graphics, images, and educational websites into the lesson content. They shared their experiences on the collaboration process during the lesson development at schools. The participants also cited several ways of using IWBs for different subjects and as an assessment tool.

For the second research question (How do elementary teachers integrating interactive whiteboards in their classrooms view the use of the IWB?), the teacher participants perceived the IWB as a tool that fosters lessons interactivity, learning differentiations, students' motivation, engagement, critical thinking, and problem-solving skills. In addition, some teacher participants recognized difficulties in using IWB for teaching. They suggested that administrators provide teachers with additional technical support and extra time for planning lessons with IWBs. Six teachers participants displayed positive attitudes toward school support in implementing IWBs; however, three participants recognized that there was no support. All research participants recommended technological and curriculum training, purchasing of new and updating the existing software, teacher collaboration, and more technical support at school. My conclusions are based on my data findings from the two research questions.

What are the Experiences of Elementary Teachers in Integrating Interactive Whiteboards in their Classrooms?

Research Question 1 centered on the participant's experiences with IWBs. The topics identified in Question 1 were *developing lessons with IWBs*, *teaching with IWBs*, and *assessing with IWBs*. The research data found that all participants used IWBs as a powerful teaching tool that provided resources for lesson planning, enhanced their lesson demonstration, improved the quality of their interactions with students and assessments through effective questioning, and increased the depth and the pace of learning. Therefore, the data results showed that participants' experiences with IWBs did correlate with some researched-based practices found in Chapter 2 and filled some gaps in the current research.

Developing lessons with IWBs. The results showed that IWBs enhanced the overall teaching experience. This finding is consistent with other researchers' results (see Alshawareb & Abu Jaber, 2012; Emeagwali & Naghdipour, 2013; Tosuntaş, Karadağ, & Orhan, 2015). Teachers indicated that having access to IWBs increased their understanding of technology and they were comfortable using IWBs as an instruction tool (Amiri & Sharifi, 2014; De Vita, Verschaffel, & Elen, 2014; Emeagwali & Naghdipour, 2013). The whiteboard software allowed participants to create resources which students would find fun and motivating (Begolli & Richland, 2015; Emeagwali & Naghdipour, 2013; Fraser & Garofalo, 2015; Rosetti 2012; Şad & Özhan, 2012).

I interpreted the participants' experiences with IWBs through Davis's (1989) TAM and informed by current research. The participants stated that use of IWBs

enhanced their lesson preparation by reducing start-up time for lessons integration because they (IWBs) are easy to use for students and teachers that covered the TAM definition of *Perceived Ease of Use* - the level to which teachers were expecting IWBs to be free of effort (Berson et al., 2014; Kilic et al., 2015; Tertemiz et al., 2015; Yang &Teng, 2014). As found through the study, use of IWBs motivated participants to develop and incorporate more digital resources in their lessons. In addition, use of IWBs enabled teachers to save notes for use in the following year and made it easier to create a collection of learning materials that could be constantly updated, thus keeping lessons interactive and fresh (Alvarez et al., 2013; Berson et al., 2014; Lopez & Krockover, 2014; Murcia, 2014).

Currently, there is an extensive range of digital resources that teachers may use to enhance learning and teaching such as computers, iPad, and tablets. The participants stated that they had access to a variety of resources for different topics which might be explored on the IWB. They also said that they did not have to waste time creating their own resources. However, now teachers said they were concerned that plenty of time was spent finding these resources, adapting them to the lessons, and developing teaching tactics to exploit them. This result is similar to Bidaki and Mobasheri's (2013) finding that it is complicated for educators to select useful information from the Internet.

Media resources, such as videos, games, educational websites and graphics, and educational software were cited as tools that provided diverse teaching methods for learning (De Vita, Verschaffel, and Elen, 2014). The participants believed that media resources could be used to simplify and clarify problems and let students access the

learning material as often as they want. According to data results, a range of educational software is now available for any school subject and schools are purchasing high-quality curriculum-specific resources for teachers, as well. Confirming Erbas, Ince, and Kaya (2015), the study results emphasized that better IWB integration with proper software would support whole-class demonstrations, discussions, and students' investigations.

PowerPoint and Notebook presentations were given an absolute preference for structuring and presenting the IWB lessons. Each participant mentioned that for a moderately short-term investment of time at the start creating these presentations, they received long-term benefits in both the quality of the presentations and in the ease of updating and maintaining their teaching. Using Notebook and PowerPoint were perceived as very positive activities (Kneen, 2015). The Yee et al. (2017) findings confirmed the study results. Studying Engineering undergraduates' perceptions about IWBs and PowerPoint lecturing, the authors concluded that IWBs and PowerPoint tools complemented each other.

There was enough evidence from the research data that the IWB lessons could be reused and adapted by teachers according to the students' needs and shared with colleagues at the same or different schools through saving the lessons as web pages. The collaboration could happen over the Internet, the local school network, or email (Türel & Johnson, 2012). The Karsenti's (2016) study found that planning lessons with the IWB took too much time and suggested teacher collaboration as a support.

Three study participants mentioned that such collaboration was school policy. Nevertheless, there were some participants who were lacking collaboration in their

schools and cited that the teacher collaboration in the IWB lessons development and usage would be beneficial for them. There are always hitches, predominantly among the older and less technology-orientated teachers, to adopt new technologies (Bakadam & Asiri, 2012; Korkmaz & Cakil, 2013). They often need extra support from colleagues and school administration.

Teaching with IWBs. All teacher participants mentioned that they used IWBs for teaching most of the elementary subjects and aligned their lessons to the common core standards. In their responses, they specified that planning lessons that use the IWBs to increase students' achievement, the teachers' focus should be on the content substance and not on the feature's flashiness. National, state, and local education standards need to be considered as well as long-term goals, and short-term objectives should be identified (Katwibun, 2014; Mata et al., 2013).

One of the teacher participants considered only projector functions of the IWB with traditional features as an advantage (Bakadam & Asiri, 2012). Karsenti (2016) supported this finding, mentioning that the teachers in his study used IWBs as a digital projector and ignored the interactive features of the IWB, which set technical difficulties. The author proposed using a simple electronic projector that would cost less and be more appropriate for educational purposes. Having the IWB in the classroom alone will not make lessons perfect or increase student achievement, but paired with a skilled, highly competent teacher, it will very likely increase the lessons outcomes and students' achievement (Bourbour, Vigmo, & Samuelsson, 2015). For instance, the format of using

IWBs in a small or whole group creates a dynamic of shared learning (Mellingsaeter & Bungum, 2015).

Teachers identified that students collaborating and communicating were necessary because by design the interactive whiteboard is not a one-person tool (Hadadi, Abbasi, & Goodarzi, 2014**)**. Most of the participants mentioned that the students not only became involved with IWBs and learning, they also became involved with one another. They suggested that reasoning, discussing, and explaining solutions are critical to deep understanding; learning process becomes reciprocal and verbal (Yang &Teng, 2014). Alvarez et al. (2013) and Maher (2012) also emphasized that many programs in the elementary grades are now highlighting the explanation of how to find out answers; if students are able to show how they are resulting in an answer by explaining the process to fellow students or teachers, it establishes a deep knowledge level. When young students become involved with one another, these types of conversations could help extend their level of content understanding (Mellingsaeter & Bungum, 2015).

Rogers's theory (2003) of the diffusion of innovations specifically identified that creating a collection of ready-made lessons for the IWBs helped integrate the *Observability* attribute and increased the IWB use. The teachers' encouragement to have ready-made lessons that require little preparation and planning addresses another attribute - *Relative Advantage* covered in this study. Lessons that were aligned to the school curriculum and were easy to navigate through boosted the *Compatibility* and diminished the *Complexity* associated with IWBs.

Assessing with IWBs. The research data results indicated that different types of assessments such as informal, formative, and summative were taking place in the research participants instructional practices with IWBs. The IWB encouraged intervention and questioning at a range of levels, including closed, open, and interest questions along with evaluative responses and probing as part of the general flow of the lesson (Teck, 2013). It also enabled the teachers to easily assess students, refer to resources, and previous learning. According to the participants' responses, students used the dynamic representation of systems, texts, and images to explain their thinking, to demonstrate their understanding, to support their reasoning, and to teach other students. Reviewing work in progress through discussion allowed students to reflect on their own and others' work in order to make improvements. Confirming the study results, Kyriakou and Higgins (2016) stated IWBs impacted on summative assessments and classroom talk and suggested enhancing the theoretical framework. They also added the notion that the summative assessments offer considerable insights into students' learning.

Some participants mentioned that IWBs were extremely good for scaffolding - teaching through assessing with guidance from the teacher, students gain skills to build on prior knowledge and corrected mistakes. Mrs. F and Ms. A cited scaffolding using the IWB for mastering writing skills and learning hard concepts in Language Art. The support provided by the IWB tools allowed students to learn these concepts faster and let teachers modernize and reach students in ways never before conceivable. The De Vita, Verschaffel, and Elen's (2014) literacy review supported these findings underlining that IWBs sustain the lessons progression in achievement and learning offering structures for

assessments, activities, and immediate feedback. The authors noticed that using IWBs, teachers could prompt discussions and explanations in the lessons by getting students to illustrate, direct, and explain from IWBs.

How do Elementary Teachers Integrating Interactive Whiteboards in Their Classrooms View the Use of the IWB?

Research Question 2 positioned the participants teaching beliefs about the IWBs. The themes that emerged in Question 2 were: *productive integration of IWBs, pedagogical practices, issues with IWBs, and school support.* The research data found that all participants viewed IWBs as a beneficial instructional tool that is correlating with the research findings described in Chapter 2.

In my study, I found that teachers believed that IWBs provide students with the opportunity for active participation, make lessons enjoyable, and make it easy to teach a lesson (Al-Qirim, 2012; Emeagwali & Naghdipour, 2013). Additionally, the teachers expressed beliefs that IWBs increase student's motivation and encourage their attention (Erbas, Ince, & Kaya, 2015; Ozerbas, 2013; Tertemiz et al., 2015). The teachers stated that IWBs increase student achievement in their classrooms (Erbas, Ince, & Kaya, 2015; Katwibun, 2014; Yang & Teng, 2014). They also identified that IWBs enhance the quality of interactions among students and teachers, and between the students within the classroom (De Vita, Verschaffel, & Elen, 2014; Lopez & Krockover, 2014; Yang & Teng, 2014). Overall, the teachers believed that IWBs improve teaching performance (Alshawareb & Abu Jaber, 2012; Emeagwali & Naghdipour, 2013; Tosuntaş, Karadağ, &

Orhan, 2015). Though, this research offered some unexpected findings that could fill gaps in the current research.

Productive integration of IWBs. Theory of planned behavior (Ajzen,1991) supported this study identifying that positive beliefs about IWBs produced favorable attitudes toward the IWB usage and normative (administration or colleagues) beliefs established subjective norms toward the IWB usage. Teachers agreed there are benefits to using IWBs in the classroom. According to the data found, the IWBs promoted increased interaction between the teacher, students, the subjects, and the technology itself (Bidaki & Mobasheri, 2013;). It allowed all students to be engaged with the same central point in the classroom which was not easy to achieve with another type of technology (Şad & Özhan, 2012).

The results of the current study clearly showed that by manipulating the images and texts on the screen, i.e., physically interacting with the software, stimulated "on-task talk." In Murcia's (2014) research, students talked much longer than otherwise in their answers and used rich vocabulary in their explanations; being able to "drag and drop" text, images, and sounds on screen allowed for a variety of sorting, categorizing, and sequencing exercises. Hiding and revealing text, images, and sound is also possible, allowing students to hypothesize and make suggestions (Murcia, 2014).

Most of the participants felt that IWBs enhanced better practices in inclusive education. Planning for differentiated learning within lessons helped meet the needs of all learners with diverse learning needs. Many of these learning styles can be addressed when lesson delivery and learning activities incorporate the use of IWBs (Mead,2012).

Cabus, Haelermans, and Franken (2015) displayed similar notions about learning differentiation and IWBs. They studied the effects of using IWBs on math proficiency and found that the IWB allowed educators to differentiate among secondary education Dutch students. Students in their study helped each other and the extra time was spent with low performers while higher achieving students received additional tasks.

The research participants mentioned that IWBs offered interactive learning experiences with topic discussions, concept demonstrations, and opportunities to touch IWBs motivated students to learn. Higher motivation led to greater participation (Begolli & Richland, 2015; Emeagwali & Naghdipour, 2013; Fraser & Garofalo, 2015). An engaged and active learning style matched the needs of a current generation of students who are comfortable as active participants, which supported Fraser and Garofalo (2015) and their findings. In Fraser and Garofalo's (2015) research the teachers used IWB programs, PowerPoint files, powerful software packages, and student response systems because they felt that IWBs' features offered students valuable activities and opportunities to provide timely feedback to students and educators. The researchers stated the IWBs' advantages could inform educators about the students' achievements and made the learning process fun and encouraged student engagement.

The current study participants agreed that the adaptation to the students' means of learning was needed so they could enjoy learning. IWBs could be the incentive to get them involved (Begolli & Richland, 2015; Fraser & Garofalo, 2015). They believed that students were more engaged in learning when the IWB technology was integrated into instructional activities. Student engagement, well defined as student investment in

learning, was identified as the most substantial factor in the learning process (Erbas, Ince, & Kaya, 2015; Tertemiz et al., 2015).

In the study, the participants cited that involving students in the process was vital to attentive learning; students have to be active participants in their education and take ownership in the learning process. Using an IWB's ability to display collected information helps students meet the critical thinking and problem-solving educational standards by letting them shape the information in diverse ways and by helping them process what was exposed (Ozerbas, 2013). These findings were consistent with the Boubour, Vigmo, and Samuelsson's (2015) study where the IWB was used to engage young students' reasoning and engagement in problem-solving activities. The authors found that some IWB features, such as its colors, touch-sensitive board, and visual nature, could enhance young children's reasoning skills and learning in general.

Pedagogical practices. The research participants came into agreement that the IWB technology use with effective teaching techniques could certainly increase learning opportunities. De Vita, Verschaffel, and Elen (2014) suggested that there is a need to deeply investigate what kind of learning goals and activities IWBs might promote. Are they different from those in a traditional learning environment? An experimental study is needed in this regard.

The results of current study displayed that seven learner styles named by Gardner could be addressed by the IWB usage, including visual, kinesthetic, musical, interpersonal, intrapersonal, linguistic, and logical-mathematical (Alonso Suárez, 2013). Teaching students with IWBs, the participants revealed the importance of knowing

students' unique perspectives on the world and appreciating the students' interests. Katwibun (2014) specified that it is crucial for the educators to integrate the IWBs with the learning theory and pedagogy that cater to students' individual needs. Teachers must take the time to know the students individually by asking about their interests and using this knowledge in creating lessons on IWBs.

Gradual Release Mode instructional framework for moving from teachers' knowledge to students' application and understanding was named by participants as an efficient technique for implementing the IWB lesson. This model includes focus lessons when teachers model their understanding of content, establishing the purpose and cluing students into the learning standards. Next step is guided instruction when teachers question and lead students through the lesson content, increasing their understanding. Collaborative learning follows, and students work with their peers using the clues displaying on the IWBs. Then, the last step is independent work, when students transform their ideas and apply them in new ways. There is no research on using this technique in teaching with IWBs so further investigation would be helpful.

Creating an inspiring classroom environment was the next effective pedagogical practice cited by the participants. The teacher participants stated that teaching lessons with IWBs, teachers have to ensure that a learning environment is valued, respected, and safe for students for them to achieve and establish full potential. The learning environment includes adequate materials and classroom management and ensuring that all students are treated equally in the classroom and feel supported in the content, discussion, physical/structural aspects, and class meeting times.

According to the study participants, to meet 21st century expectations, educators have to depart from yesterday's pedagogies and become advocates of new educational standards and techniques. It has been found that a student-centered approach, where teachers become resource persons and facilitators, was determined by the participants as one more tactic for teaching lessons with IWBs. They stated that students must have full responsibility for their learning, be involved, and participate. The participant's views were supported by Herreid and Schiller's (2013) research. Their findings specified that the student-centered learning strategies usage led to the point when students had to take responsibility for learning and, consequently, became more liable. Skill development, active learning, retention, and information collection was reported by researchers as well. In addition, quiz scores in the student-centered classroom were significantly higher compared to the traditional method.

Creating real world connections were cited by participants as a technique that encourages students to engage more deeply in lesson materials that are related to real life. The participants mentioned that through IWBs students are shown concrete examples - the real world in the classroom. The outcomes of the current study presented that streaming videos on IWBs or using YouTube are much easier to gain students' interest and bring the material to life. There is no sufficient research, and this topic requires further investigation.

IWBs provide opportunities to meet the standards for skills needed to succeed in a digital age and creativity is one of them. The participants stated that creativity is especially important for creating lessons and teaching with the IWB. The IWB

exploration, generation of the new ideas, creative behavior directed toward the IWB usage, and applying new knowledge were cited as essential practices in teaching.

Finally, according to the research participants, all methods listed above would be unsuccessful in teaching with IWBs without behavior management systems in place. The "pulling sticks" technique, when teachers were managing the students turns in the IWB use, was cited as most effective for teaching with IWBs. In addition, two participants mentioned that the IWB itself could be a powerful tool for classroom management. Active students would be much less disruptive interacting with the IWB, and special software could enhance classroom management and be used as a behavioral management tool (i.e., Class Dojo).

In confirming the study results, Van Laer, Beauchamp, and Colpaert (2014) aimed to map the amount of IWB usage in secondary schools to find how IWBs are used and to measure the teachers' progress in developing the IWB skills in the classrooms. As a result, the majority of teachers did allow the students to use IWBs, structuring this usage before allowing students to take greater control. The authors suggested further research in developing higher levels of pedagogical IWBs usage.

Issues with IWBs. There were problems identified in the integration of IWBs into their classrooms. The research participants mentioned technical problems when working with IWBs and considered technical support as a substantial factor for IWBs integration into the teaching and learning process (Bakadam &Asiri, 2012; Türel & Johson, 2012; Tertemiz et al., 2015). Time issues and lack of school support were named as additional problems that appeared through the technology implementation process

(Tertemiz et al., 2015). The participants were more concerned that they do not have enough time for the IWB lesson development and collaboration with the colleagues or there is no teacher collaboration at school at all (Corbo, 2014).

School support. An unexpected finding was that some schools had teacher collaboration time for mandatory IWB lesson preparation as a school policy. Professional development, purchase of IWB materials including new software and boards, updating software and technical support of existing smartboards, and supporting teacher collaboration were named as needed support. Once teachers have established professional development and an education technology installation is operational, IWB integration would mesh effortlessly with the rest of the curriculum and help reorganize lesson preparation and, in that way, grow teacher productivity (Lopez & Krockover, 2014; Yang &Teng, 2014). Confirming these findings, Karsenti (2016) stated that IWBs had better not be mounted in classrooms until tutors are fully ready for it. The author underlined that teachers need special pedagogical days so they could take group or individual training sessions for learning how the IWB functions, particularly in the fostering student engagement interactive aspects.

Summary

Rogers's (2003) DoI, Davis's (1989) TAM, and Ajzen's (1991) TPB were the conceptual frameworks used in the understanding of this study. Ajzen's model found that by understanding the beliefs of people toward a behavior, you could anticipate their behavior. In this study, the teachers described that positive beliefs about IWBs produced favorable attitudes toward the IWB usage. They felt that it was an aid to them in the

design of lessons, their instructional model, the assessment of learning, and the creation of an engaging and motivating classroom for their learners. Despite expressing the need for increased time for lesson design and the lack in some cases of professional development and support services, all teachers used the technology to develop engaging classrooms. All participants were integrating IWB's almost daily into their classrooms.

Rogers's theory has been used to understand the acceptance level of innovation as a new technology. IWBs have been used in classrooms for several years; however, these teachers described innovative ways to use this technology to support their learning goals. According to Davis's theory, the IWBs motivated the participants to develop and incorporate lessons on a daily basis. The teacher participants perceived the IWBs as easy to use instructional tool for teaching and learning. Ready-made lessons gave educators the opportunity to use IWBs on a trial basis and examine their usage results in the classrooms.

Limitations of the Study

The teachers who participated in this study were selected because they were elementary and public school teachers. Middle, high school, and higher education teachers were excluded from the research, as well as charter and private school teachers. Another limitation of the study was the elimination of school administration and students from the analysis. The inclusion of these members would add more understanding of IWBs' benefits and usage. In addition, the small number of participants limited the transferability to other educational contexts.

The methodology limitations were related to the data collection procedures as well. Composing the interview questions, I might have missed some important questions and topics. Thus, collecting the limited amount of the IWB lesson snapshots, I might have missed some lessons aspects. In addition, the interviews were conducted through the phone or Skype. During six Skype interviews, I was able to note facial expressions of my participnats. However, during three phone interviews, I was not able to see and respond to their facial expressions.

Recommendations for Further Research

This case study found that some schools had teacher collaboration time for IWB lesson preparation as a school policy. A grounded theory study for future research would be important to define the role of school administration in supporting the integration of the IWBs. Grounded theory studies can provide a unifying theory on the most effective strategies for integrating technologies into schools. School districts could be involved in future research to ensure its transferability and to support the establishment of school policy requirements from state to state.

Different types of assessments were used by these teachers. A mixed methods design would be recommended for future research to understand the use of IWBs for assessing and scaffolding students. The quantitative data collected will be used to validate which assessment techniques might be more appropriate to address students' educational needs. Qualitative data will be used to understand the instructional methods used to scaffold students using the IWB.

There is limited research on using the IWB technology learning resources in lesson development and using the IWB teaching methods and procedures in elementary school (Lopez & Krockover, 2014). The study participants cited PowerPoint and Notebook presentations as mostly used for structuring and presenting the IWB lessons. Recommendations for further research would be a case study on how teachers develop these presentations, including all of the resources used.

A case study approach on how to use Gradual Release Mode, real world connection techniques, student-centered approaches, and behavior management practices cited as most effective for teaching with IWBs will support the creation of future lessons with IWBs as well. A recommendation for future research would be a phenomenological study of strategies teachers use with their special education students for planning and developing lessons with IWBs. The future research should contain specific tactics for meeting students' various exceptions such as cognitive, behavioral, and physical.

Implications of the Study

The diffusion of new technology into all aspects of education is an ongoing process. IWB integration, started years ago, is not an exception. Promoting IWB incorporation in elementary education and developing programs to support the teachers' success in the 21st century technology integration process and its link to pedagogy is needed to support educators as they integrate new technologies in new ways. Research can provide teachers and administrators with new information to integrate IWB technology with current pedagogical methods and support the implementation of new instructional models.

There is limited research on using the IWB-based learning resources in lesson development and using the IWB teaching methods and procedures in elementary schools. There is also little known about assessing and evaluating the students' learning using IWBs in elementary school. Research on the evaluation of learning has immediate implications for schools that could incorporate IWBs into their assessment model.

In response to my study findings, district personnel could develop additional professional development classes to reinforce the lesson and assessment development for IWBs. They can support teachers by purchasing IWB materials including new software, boards and updating current software. School administration can provide technical assistance of existing smartboards and revise their policy for professional development by providing additional planning time for teachers to create IWB lessons. My study found that teachers who believed they were supported by the district administrators were more likely to develop innovative new models for integrating IWBs to advance higher level learning outcome. More sustained and proactive professional development for teachers integrating new technologies would result in effective instructions (Beach & Willows, 2014; De Santis, 2012; Zygaitiene, Vainoryte, & Barkauskaite, 2015).

Social Change and Recommendations for Practice

The teachers' shared experiences and views on IWBs integration covered in this study might offer other educators examples and suggestions on how to implement technology in teaching and learning. Participants of this study reported that time for the lesson development was a significant concern and they needed more premade lessons available for immediate use with IWB lesson templates. A practical recommendation

would be the creation of a database with IWB lessons templates (PowerPoint or Notebooks) for different subjects that are taught in elementary school. In addition, special teachers' IWB blogs,wikis, and electronic portfolios can be created that allow the teacher to collaborate and share IWB lesson and assessments ideas as well as helpful web links.

Considering various ideas on how to use IWBs in the classroom, educators can learn from the real-world teaching experiences of the teachers in this study employing the IWB technology. Teachers implementing the IWB technology need to be aware of the different types of lessons and assessments for IWBs as well as pedagogical practices. Districts might use the research data to revise old or create a new curriculum that will consider IWB usage at classrooms.

Conclusion

Technologies like IWBs are a disrupting innovation and challenge educators to develop new methods of teaching. Consequently, the introduction of new technologies into teaching when it does not concentrate on linking it to pedagogy and practice does not change learning and teaching (Warwick et al., 2013). To promote IWB integration in elementary education and develop programs to support the teachers' success in the technology integration process overall, an understanding of the experiences of elementary teachers in developing, delivering, and assessing lessons using IWBs is needed.

This study used a qualitative case study methodology to identify the real-world experiences and responses of teachers integrating new technology into their daily classroom experiences. As a result, this research defined practical issues relevant to the use of new technology into classrooms and found that teacher participants had positive

attitudes toward IWBs and considered them very beneficial. In addition, this study found that IWBs enhanced practices in innovative classrooms by providing differentiated learning models thus meeting the needs of diverse learners with a more personalized learning environment (Yakubova & Taber-Doughty, 2013).

Integrating new technology into all aspects of education is an ongoing process, and IWBs' integration is not an exception. What is largely unknown is how elementary teachers make the day-to-day decisions to develop new ways of integrating IWB technology by linking it with pedagogy to generate appropriate learning tasks (Sundberg, Spante, & Stenlund, 2012; Varol, 2013). There is limited research on using the IWB learning resources in lesson development and using the IWB teaching methods and procedures in elementary school (Lopez & Krockover, 2014). In addition, there is little known about assessing and evaluating students' learning using IWBs in elementary school (Struyven, Blieck, & De Roeck, 2014; Teck, 2013). Research, such as this study, provides educators with new concepts about the positive changes that IWBs can make in teaching methods and techniques and can create acceptance for new technologies in elementary classrooms (Bakadam & Asiri, 2012; Hennessy & London, 2013).

Vockley (2007) believed that in a digital world, no organization could accomplish the desired results without integrating technology into everyday practices. Current research has shown that the educational system might not be able to prepare today's diverse students to perform in the global economy without the intensive use of technology, and it is the educator's task to blend innovative techniques and technologies into their daily lessons so that students might be successful in their future lives (Ertmer,

Ottenbreit-Leftwich, Sadik, Sendurur, & Sendurur, 2012; Şad & Özhan, 2012; Partnership for 21st century Skills, 2011). Promoting innovative technology incorporation in elementary education by developing programs to support the teachers' success in the technology integration process is needed for educators to provide learners with the potential to develop 21st century skills and knowledge.

This study participants stated that the IWB is an excellent tool for planning and creating lessons using PowerPoint or Notebook templates and collaboration in the creation of IWB lessons is very important. Each participant described the importance of assessing with the IWB and used it for informal and formal assessments. Sharing their pedagogical practices and beliefs, the participants named the ability to respond to their students' learning styles, abilities, and interests. New knowledge about the teachers' preferences in the form of IWB lesson plans format, pedagogical practices, assessments, and support required for further technology integration may help educators integrate the IWB technology, and other technologies, into their classrooms.

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Appendix A: Recruitment Letter Posted on Facebook

My name is Olga Samsonova, and I am writing to tell you about a study that I am conducting at Walden University. I am in the dissertation phase of my doctoral program at Walden University.

My research topic is ***Interactive Whiteboards Usage in U.S. Public Elementary Schools***.

My research questions are: What are the experiences of elementary teachers integrating interactive whiteboards in their classrooms?" and "How do elementary teachers integrating interactive whiteboards into their classrooms view the use of the IWB?".

What I really would like to hear is *you* elaborate about *your* perceptions and feelings. I would love to hear your stories about your educational experiences, and your experiences using interactive whiteboards. I am asking for volunteers for this study who are elementary teachers (pk-5th grade) who have used an interactive whiteboard in their classrooms for at least one year.

If you are interested in participating in my study, your commitment would be about 2 hours and 30 minutes. You would participate in 2 interviews on the phone or use Skype. Each interview is about 1 hour. You will also be asked to submit a lesson plan to a closed website. I will be recording the interviews. Only I will have access to the recordings.

Your name will not be attached to any information you provide to me, or to the interviews. All participants will be given an identifying code, and the list of names and codes will only be seen by me and will be kept in a secure location.

You will be asked to sign a *Consent to Participate Form* at the end of an online survey. The link is below. After you read the consent form, you will be asked to Submit. This means you voluntarily agree to participate in the study.

If at any time during the interviews you decide that you are not comfortable, and would like to end the interview and not participate in the study, you are very free to do so. I do not want you to feel obligated at any time to continue if you decide that you do not want to participate or continue. I have planned that the interviews will take about one hour, but I don't want you to feel pressured that we will run out of time. I have plenty of time to extend that time limit if our conversation takes more time than that.

If you are interested in learning more about this study, please contact me via email [e-mail address redacted] or by phone at [telephone number redacted]

Thank you for your consideration.

Olga Samsonova

Appendix B: Interview Questions # 1

1. How do IWBs affect your planning/preparation of lessons?
2. How do you use IWBs in your classroom?
3. What are the difficulties you experience developing and teaching lessons with IWBs and their features?
4. What are the benefits of using IWBs and their features for developing and teaching lessons?
5. How do you use IWBs for whole class teaching?
6. How do you use IWBs to ensure all children are motivated and engaged in learning?
7. How do you use IWBs for assessing your students' learning?
8. What types of additional resources do you use with your IWB?

Appendix C: Interview Questions # 2

1. How do IWBs help you support your students' learning?
2. How do IWBs affect your expectations of what your students will learn?
3. Do you believe that using an IWB motivates and engages your students in learning?
4. How has the school supported your integration of IWBs?
5. What are ways the school could provide better support?
6. Are there other ideas or experiences you would like to discuss?