DOES INTERACTIVE WHITEBOARD UTILIZATION EFFECT HIGH SCHOOL CAREER AND TECHNICAL TEACHERS PERCEIVED ENGAGEMENT LEVELS OF THEIR STUDENTS?

by

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CERTIFICATION OF PROJECT WORK

We, the undersigned, certify that this project entitled Does interactive whiteboard utilization effect high school career and technical teachers perceived engagement levels of their students? by Sandy Przybyla Karpie, Candidate for the Degree of Master of Science in Education, Curriculum and Instruction, is acceptable in form and content and demonstrates a satisfactory knowledge of the field covered by this project.

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Abstract

The purpose of this study was to add to the growing research of interactive whiteboard (IWB) technology. Specifically looking at Career and Technical Education (CTE) teacher's perceptions of student engagement. For this study, six CTE teachers from an CTE school were asked to complete a 20 question questionnaire with both open and closed response questions. Participants were asks questions based on IWB use, tool, engagement, interactiveness, perceptions, and technical difficulties. Four CTE teachers completed the questionnaire. Results indicated IWB use in the classroom was frequent and the CTE teachers take advantage of the many tools and operations available on the IWB. Teacher perceptions of student engagement were very high across the board.

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Introduction

Teachers enter into the field of education for a variety of reasons, but their role as educators should always be to engage learners. The means by which they do this is up to the individual teacher and engagement can often be a subjective word. In New York State, teachers are now evaluated by an Annual Professional Performance Review (APPR) on how well they engage students and show academic progress. According to the Danielson Model Framework (danielsongroup.org, 2011) for Teaching domain 3c, teachers' scores reflect if their instruction is designed to engage students and advance them through the content. Additionally, demonstrating knowledge of resources, domain 1d, also plays a role in teacher evaluations (usny.nysed.gov, 2013).This need to not only engage students, but do it in a way using appropriate resources has led to a push for newer technology. The interactive whiteboard (IWB) has perhaps become one of the fastest growing technology resources in not only the United States, but countries such as England, Australia, Turkey, and South Africa (Wall, Higgens, & Smith, 2005; Slay & Hidgkinson-Williams,2008; Zevenburg & Lerman, 2008; Northcote, Mildenhall, Marshall, & Swan, 2010; Warwick, Mercer, Kershner, & Staarman, 2010; Türel, 2011; Türel & Johnson, 2012; Schmid, 2008). IWBs are touch-sensitive white boards that control a computer connected to a digital projector (Smith et al., 2008). Using some sort of stylus device, the boards can be manipulated similar to a mouse on a computer. Depending on the make and model, the IWB may come with supplemental software for additional tools and resources. More popular IWB brands include SMART Board, Promethean, and the e-Beam (Warwick et al., 2010). These IWBs claim to enhance great instruction (Smarttech.com, 2013) and create engaging and interactive learning experiences (prometheanworld.com). IWBs have the potential be a tool to help break down barriers between students and normal teacher space (Armstrong et al., 2005). While these glorified projectors appear to be the height of engagement in the classroom, there has yet to be sufficient evidence showing the

impact of IWBs to enhance the learning environment and engage students enough that significant academic growth is achieved (Smith et al., 2005). I believe there is more research to be found on IWB use and teachers perceived levels of student engagement.

Smith et al. (2005) points out that IWB use ultimately falls into two categories, a tool to enhance teaching, and a tool to support learning. The range of tools and resources allows for a variety of strategies and techniques to reach a multitude of learners. Beeland's (2002) results stated, “All of the teachers recognized the use of graphics, animation, and video as helping to meet the visual needs of students. They also recognized that allowing students to interact with the board themselves positively impacted the needs of tactile learners” (p.5). While not all teachers utilized sound when teaching with the whiteboard, all recognized that the auditory needs of students were also positively impacted either through software or the dialogue created between teachers and students when the whiteboard is used. Specific instructional strategies shown to have positive effects on learners include highlighting, coloring, and annotating important content, flipping back and forth to review previous content, using pictures for discussion and brainstorming, collaborative writing, shared reading, peer-teaching, collaborative problem solving, observing different media, capturing screen shots, correcting mistakes, and playing games (Türel & Johnson, 2012).

While research on student achievement linked to IWB use is limited (Smith et al., 2005; Lancia, 2009), there is evidence that supports IWBs allow for greater student participation and perceived engagement (Murcia & Sheffield, 2010; Warwick at al., 2010; Beeland, 2002; Wall at al., 2005). In a case study presented by Murcia and Sheffield (2010), teachers that participated in IWB skill development were found using more open ended questions, greater wait time and requiring more reasoning and exploratory talk from students. Warwick et al. (2010) observed students that consistently sought ways to express their reasoning in talk and at times in writing on the IWB. Beeland's (2002) findings revealed a correlation between how highly the IWB was rated based on the type of media that

was being used. Diverse multimedia ultimately was perceived by students as highly engaging, even in classrooms where students did not interact with the IWB themselves. Wall's et al. (2005) study on student metacognition revealed most students have positive thoughts towards IWBs, and found them particularly helpful with how they facilitate and initiate learning. Not only did IWBs help students with better understanding and their own thinking process, they also found the IWB to be fun and highly motivating.

Not everyone agrees that IWBs are as effective and engaging as they claim to be. The appropriate use of pedagogy seems to far outweigh the actual technology of the IWB (Lancia, 2009; Zevenbergen & Lerman, 2008). Hall (2013) noted that even after teachers incorporated new features into their IWB based lessons, the majority of them continued with lecture based instruction. And even with advanced teachers, IWB technology is more conducive to teacher-based instruction. School districts considering purchasing IWBs should not have the false expectations that it is somehow a miracle fix for existing problems (Hall, 2013). Those teachers that have always provided multiple learning strategies and engaging hands-on learning will likely continue to do so with an IWB, and those that are more lecture-based aren't likely to stray too far from familiar teaching methods (Hall, 2013).

A reoccurring problem in the literature has been that the technology of the IWB is what is remembered, and sometimes along the way the lesson objectives are lost (Armstrong et al., 2005). A teacher from Armstrong's et al. (2005) study stated “I felt I was instructional and did not ask very many questions. Also I allowed the fun and gaming element of the lesson to become the main factor and lost the learning objectives. The science element became secondary” (p.463). Zevenberg and Lerman (2008) commented the the depth of questioning during an IWB based lesson remains at a relatively superficial level. What may be useful for English Language Learner (ELL) teachers is Schmid's (2008) study done with international students. Mixed findings showed students not only felt like there was an overwhelming amount of information, other felt they were being spoon fed because IWB deprive

students of using their imagination. Lancia (2009) touched on Moss's (2007) study in London where the impressive factor eventually wore off. Students became less engaged and showed no increase in academic achievement.

Troubleshooting was another problem that made its way into the research. Malfunctions and breakdowns on the IWB coupled with teachers' lack of skills can be a huge deterrent from an otherwise engaging lesson. More common concerns from teachers participating in Beeland's (2002) study include the need to frequently reorient the board if the cart holding the computer and projector, or the whiteboard itself, were moved. Also a slight glare from the projector, and that a shadow cast from your hand when you try to write makes the process of writing on the board more difficult. In Wall's et al. (2005) study, technical difficulties ranked the highest overall in negative comments made by students. Boards breaking down and constant need for recalibration were noted. Some students offered negative comments towards teachers' perceived lack of IWB abilities, “Sometimes the teacher forgets how to work the programmes [sic]” (Wall et al., 2005, p. 865). Students from Slay's et al. (2008) study show similar attitudes towards not only IWB troubles, but teacher abilities. They commented: “When asked why they preferred the former technology, learners pointed to calibration issues and unfamiliarity with the technology on the part of the teacher” (p. 1338). Technical glitches can pose as major set backs and interruptions in many classrooms. Time being spent calibrating IWBs is wasted classroom time for teachers and students.

While examining these articles, there were four take away lessons I was able to come up with. First and foremost, technology is only good when it works. Most teachers will be able to recall a time when technology was not so user friendly and there was a need to go ahead with plan B. It does seem that with proper training and wall mounted IWB's, the risk of malfunctions can be greatly reduced. Something else to remember is that interactiveness and engagement are subjective words. In a caption in Armstrong's et al. (2005) article, he describes the kids are engaged: “this is evident within the video,

through observation of gestural and whole or part body movement, pupils' verbal engagement with each other and the teacher, and their responses using other tools to the activities they observe around them." (p. 465). But the reality is engagement looks different depending on the student. This makes me think of when stand and lecture was the popular way to teach. People thought that if students were silent and staring at the teacher then they must be listening and therefore engaged, but this is definitely not the case. I also find it interesting that so many students found IWBs to be interactive, even when some did not have the chance to use it. Lastly, before school districts run out and order IWBs for every classroom and every teacher, they should take some time to consider if it's appropriate. The students in Wall's et al. (2005) study noted that the IWBs seemed to be the most useful in math, but was less necessary in English and reading classes. I think a conversation needs to happen between teacher and administrator before an IWB is automatically installed in a classroom. If it's not going to be used or utilized properly, perhaps the money could be better spent elsewhere.

The question that drove this project is: how does IWB utilization effect high school CTE teachers perceived engagement levels of their students? My reason for wanting to engage in the study is simply the fact I see IWBs as expensive projectors being used solely by teachers with far too many technical malfunctions. I also don't believe teachers know, or even want to know the full capabilities of IWBs. Students are hardly asked to come to the board, and only one child engaging with the board at a time does not seem interactive enough to balance the related costs associated with the IWBs. While IWB have shown some success in math classrooms, Career and Technical (CTE) classes were not mentioned in any of the research articles found and I am interested in how IWB are being used by teachers in vocational classes. CTE classes tend to be very hands on therefore and interactive white board might seem appropriate.

To gain additional information on this topic and add to the growing research, I developed a 20 question questionnaire revolving around the subject of IWB use and perception. Six CTE teachers from

a local Career and Technical School that currently have an IWB set up in his/her classroom were asked to complete the survey. Participating in the study was voluntary and subjects were asked to sign a consent form, informing them that there were no risks in participating and confidentiality was a priority. The questionnaire involved 18 scaled questions, ranging from 1 to 10 where participants were asked to circle their answer. The remaining two questions were open ended and participants were asked for a written response. Answers to the questionnaires were then coded based on likeness and major discrepancies. The scaled 1-10 questions were entered into a spreadsheet in order to find averages and analyze the data more efficiently.

Literature Review

Current educational research has shown a growing interest in classroom technology, with the Interactive Whiteboard (IWB) being a front runner. In an initial action research article, Beeland (2002) determined the effect of the use of interactive whiteboards as an instructional tool on student engagement. Ten middle school teachers and 197 students participated in the study to examines the effectiveness of IWBs on student engagement in his school in order to determine if the school should purchase more IWBs. The ten classes of each teacher participant presented a lesson to their students using an IWB. Following the lesson, students were asked to complete a survey and questionnaire based on a modified version of the Computer Attitude Questionnaire originally created by Dr. Rhonda Christensen and Dr. Gerald Knezek (Christensen & Knezek, 1997). The survey measured levels of engagement and general feelings towards the IWB. Results of the surveys and questionnaires determined that engagement increased, students preferred to use IWB lessons over non IWB lessons, and the more multimedia present in a IWB presentation, the more engaged students perceived themselves to be. Somewhat surprising, students engagement was not based on time spent at the IWB. “ Based on the results of the student survey, there was a correlation between how highly the whiteboard

was rated based on the type of media that was used, but not based on how much the students were allowed to interact with the whiteboard" (p.6).

The interactiveness of the board is a new concept to teachers used to traditional chalk boards or whiteboards. A research project involving three case studies was presented by Armstrong, Barnes, Sutherland, Curran, Mills and Thompson (2005) documenting the interactions between students, teachers, and technology, specifically interactive white boards (IWBs) in the classroom. Teachers and researchers used an innovative research design developed through the InterActive Education Project (Sutherland, Robertson, & John, 2003). Through multiple viewings of video recorded lessons and coding analysis, the common theme throughout was that training and ongoing support is vital for not only teacher's confidence, but learning how specific software tools and functions work. One teacher had good intentions by developing an interactive lesson, but she felt the way she presented it to the class focused too much on the interactiveness itself, and the actual learning objectives were pushed to the back burner. Another teacher commented that IWB's break down the barrier of students and normal teacher space by allowing kids to come up and manipulate the IWB. Armstrong et al. (2005) stated, "Teachers are critical agents in mediating the software; the integration of the software into the subject aims of the lesson and the appropriate use of the IWB to promote quality interactions and interactivity. Training and ongoing support is required for teachers to appropriately use IWBs and to support their selection of appropriate software" (p.468).

In some circumstances, technology can actually detract from lesson engagement. In a study presented by Schmid (2008) the pedagogical benefits, potential problems, and potential pedagogical implications of IWB use in the English classroom were determined. Classroom based investigation looked at international students from mostly China and Taiwan, with ages ranging from 20-36 years old. Two studies videoed 63 students through classes that taught English to international students. The perceived pedagogical benefits that emerged were engagement and enhancement, facilitation of

learning, catering for various learning styles, and seamless access to multimedia resources. Some of the potential problems with using IWBs were that students felt overwhelmed, but other felt like the overuse of multimedia was being spoonfed to them. It was reported there were too many hyperlinks and/or visuals on the board which sometimes took away from their ability to be creative and think for themselves. Schmid (2008) offers an interesting perceptive of students today, "Although it could be argued that multimodality or multimediality are not such a big issue nowadays, since the students are used to being bombarded with information via different modes or devices simultaneously, these research findings seem to indicate that becoming ''multimodally" competent remains a challenge, as several students in this investigation emphasized their difficulty in ''digesting" the amount of information that was presented to them (p.1566).

While new technology in the classroom can be fascinating and fun to experience, there is no guarantee of increased academic achievement. The next investigation examined how IWBs are being used in learning environments. Zevenbergen and Lerman (2008) studied five Australian schools over a three year period analyzing specifically ways the boards were being used in mathematics classrooms. Similar to Armstrong et al. (2005) lessons were video recorded and analyzed on multiple occasions using a productive pedagogy framework. It was concluded that while using the IWBs made lessons move at a faster pace, it sometimes came at the expense of deeper connections. It was noted that most teachers used the IWB for introductory material simply because they have the attention of the class. The authors also cautioned that using IWBs may actually inhibit learning, "by themselves tools will not transform pedagogy, no matter what their potential" (p.124). They concluded the richness of the material not being drawn out during lessons, the quality of mathematical learning opportunities greatly diminished, and there was fewer deeper connections being drawn by teachers.

When used appropriately, technology can have the ability to engage students, and active participation can become contagious in the classroom. In another case study, Murcia and Sheffield

(2010) depicted how interactive pedagogies in IWB classrooms are used to support whole class substantive discourse about science. Four primary school teachers with students ages ranging from 10-12 volunteered to be a part of this study by participating in IWB based discussions and skill development throughout the school year. Through video and interviews, seven principles of effective interactive pedagogy emerged: engaging and appealing interactive displays, accessing online information, linking media files, interacting with online activities, constructing a series of interactive activities to develop a science story, reviewing learning, and using IWB to increase wait time. What emerged through the use of the IWB intervention was an increase in the number of students participating in classroom discussion. Additionally, the quality of responses and wait time saw and increase. Murcia and Sheffield (2010) stated, "The increase in the quality of whole class science discourse during teaching and learning with the IWB should not only be attributed to the tools of the technology but also to the teachers' development of effective interactive pedagogy that focused on discourse" (p.430).

Similar to the pedagogy findings of Murcia and Sheffield (2010),Warwick, Mercer, Kershner, and Staarman (2010) researched how teachers vicarious presence is evident in the work of students at the IWB and how that presence influenced student behavior when engaging in science based activities. Three primary school teachers were the focus of individual case studies. These teachers were observed during one freestanding lesson and two research lessons. Through observations data, video, and student interviews, the vicarious presence became evident in the way rules and procedures were introduced, as well as teachers use of task structure to guide and mediate pupils actions. The teachers use of talk rules, page sorter, hyperlinks, prompts, and moving objects all helped provide an environment where shared dialogue was evident and co-constructed knowledge building took place. Warkick's et al. (2010) findings parallel Murcia and Sheffield (2010) "Finally, the ways in which the teacher employs their pedagogical knowledge in the pursuit of devising appropriate learning tasks, and how this links with

their use of IWB affordances, is of central importance. The teacher's vicarious presence in the technology is a clear factor in the success, or otherwise, of groups working at the IWB" (p.360).

When new technology finds its way into the classrooms, there is a learning curve for teachers and students alike. The final study by Türel and Johnson (2012) used prior research of valid and reliable surveys by evaluating teachers perceptions and use of IWBs. Five research questions emerged, what are the main sources of IWB training, what IWB training topics do teachers need, how much is each IWB feature being used, what are teachers perceptions about IWB use, and is there a relationship between teacher IWB frequencies and self reported competencies, discipline areas, and teacher perceptions. 174 Turkish teachers at various grade levels and content areas, all with a prior knowledge base of IWB were surveyed and questioned. During the analysis process, Cronbach's Alpha coefficients were calculated and interpreted for internal consistency and reliability. Türel and Johnson (2012) leave the success of IWBs in the classroom in the hands of the teachers. "If we are to expect students to improve their learning in the classroom, teachers need to develop their technology skills and positive attitudes though continued collaborative training and practice" (p.392). Results showed the main source of IWB training is fellow colleagues, a tie between technical IWB information and skills and effective teaching methods and techniques for training topic needs, the mouse, highlighting, and zoom were the three most frequently used IWB features, most teachers believe IWB to be motivating, engaging, and enjoyable for both teachers and students, and finally there was a moderate correlation in the relationships between both the frequency of IWB use and perceptions about IWBs.

In conclusion, this literature review suggests that IWBs do hold some merit when it comes to student engagement in the classroom. Many students prefer lessons that incorporate the IWB and it was noted the IWB has the potential in some classrooms to increase discussions and encourage an environment of dialogue. The research also indicated that some students and teachers feel too much attention is being given to the board itself instead of the lesson that accompanies it. Teachers felt a

hyper focus on the interactiveness of the board resulted in a lack of depth in material. One area that received little attention was IWB use in Career and Technical school settings, where the majority of learning is already done in a hands-on environment.

The purpose of this study was to research the interactive whiteboard (IWB) utilization of Career and Technical Education (CTE) teachers and gain insight on teachers perceived levels of their students engagement. The study is built around the research question: Does IWB utilization effect high school CTE teachers perceived engagement levels of their students?

The following chapter will detail the methods of this project. It involves questionnaire responses from current CTE teachers. The teachers are employed at a CTE school and all have IWBs mounted to the walls in their classrooms.

Methods

The study was based on the rise of interactive white boards (IWB) in classrooms across the United States (Türel, 2011). Career and technical teachers are often left out of the research, yet could stand to benefit from this technology as much as every other teacher. Popular IWB brands SMART Board, Promethean, and the eBeam (Warwick et al., 2010) claim to enhance great instruction (Smarttech.com, 2013) and create engaging and interactive learning experiences (promeatheanworld.com, 2013). This research design evolved out of the idea that there has yet to be sufficient evidence showing the impact of IWBs to enhance the learning environment and engage students enough that significant academic growth is achieved (Smith et al., 2005). Kotrlik and Redman (1999) have looked at technology adoption in CTE schools and noted that the speed and eagerness to adopt change is related to whether teachers value the new approach. Technology anxiety, gender, age, and experience all play a role in technology use, and ultimately, student engagement levels. This research study looked at Career and Technical teachers at a CTE center in the northeastern United States

to determine if IWB utilization effects high school CTE teachers perceived engagement levels of their students.

The desired research called for qualitative research methods. Johnson and Christensen (2012) described how qualitative research can be used in the field: “Qualitative research is used to describe what is seen locally and sometimes to come up with or generate new hypotheses and theories. Qualitative research is used when little is known about a topic or phenomenon and when one wants to discover or learn more about it. It is commonly used to understand people's experiences and to express their perspectives (p.33). IWB research is still something relatively new. It wasn't until 1988 that SMART technologies launched its first SMART Board (Smarttech.com, 2013). While the technology itself is impressive, the effects on student achievement is still up for debate. Ambert et al. (1995) suggests qualitative research is more about discovery and less about verification, which is more closely associated with quantitative research. This project looked at CTE teachers inner most thoughts about IWB, how they are utilized in their classroom, and perceptions they have about their students. This focused, more personal view aligns with Ambert's et al. (1995) notion that qualitative researchers seek to acquire in-depth and intimate information about a smaller group of persons. The findings from this qualitative research study provide information about a sample population that has yet to be observed in the area of IWBs.

Research Setting

This study focused on findings from a questionnaire from six CTE teachers from a small Career and Technical school in Western New York. This small sample aimed to represent the larger pool of CTE teachers in the United States. Questionnaires have shown to be appropriate sources of data collection in IWB literature. “Another critical issue for IWB research is the use of appropriate surveys and questionnaires that were developed based on existing research as well as sound instructional theories and strategies associated with the use of IWBs.” (Türel & Johnson, 2012, p. 383) The criteria

for participation in the study was:

1) subjects must currently be a CTE teacher.

2) subjects include male and female teachers

3) subjects must currently have their own classroom with a working IWB set up.

4) subjects must use their IWB in some way

Participants had to sign written consent forms before participating in the study. The participants in this study were purposely selected because they successfully matched the criteria for participation. Participants included six CTE teachers, include four male and two female. The ages of the participants ranged between 40-55. At this particular CTE school, there are no teachers under this range. The career and technical classes that were represented are Culinary, Criminal Justice, Small Animal Science, Heating and Air Conditioning, Cosmetology, and Information Technology.

Data Collection

A questionnaire was chosen as a way to maintain an even playing field with the questions, but allowed some teacher response with a few open ended questions. The questions were designed to find out how teachers use IWBs, and how engaged they perceive their students to be. The questions were created by researching other studies with similar interests. “In order to create a questionnaire consistent with the study’s purpose, we examined current studies looking at instructional theories and strategies, current practices, problems and perceptions of IWB users (Bell, 1998; Beeland, 2002; Cogill, 2002; Beauchamp, 2004; Wall, Higgins, & Smith, 2005; Moss et al., 2007). With the approval from our university’s Human Subjects Review Committee, hard copy questionnaires were distributed at the Career and Technical school to each individual teacher by hand delivery. Hard copy questionnaires were chosen as a way to be respectful of any teacher participants that might be unfamiliar or leery of online surveys. The questionnaire consisted of 18 questions in a Likert style scale response of 1-10, as well as two addition open ended questions. Participants then had two weeks to complete the questionnaire

before the researcher personally picked them up.

Data Analysis

Once the questionnaires were collected, the analysis portion of the research involved open coding of responses. Tan (2010) describes the coding process as a fundamental analytical process, which plays a vital role in analyzing, organizing and making sense of textual data. During the coding process, data was analyzed by naming responses and categorically organizing that information into groups. (Johnson & Christensen, 2012). In the analysis portion of the research, trends and outliers would present themselves. Seidel and Kelle (1995) stated, "coding is heuristic devices for discovery" (p.58). While the research study is primarily qualitative, the use of a scaled Likert questionnaire allowed for responses to be quantified.

Limitations

The present study focused solely on CTE teachers and their perspectives. The study did not ask about the students own perceived engagement levels or thoughts on IWB use in the classroom. Without further research from the students, the results are purely subjective feelings about a piece of technology. The study also did not look at grades or test scores to see if engagement affects academic achievement.

The following sections will provide the results of this study. The results from the 20 question questionnaires will be displayed through tables and figures.

Results

After analyzing the questionnaire responses from the CTE teacher participants, the following section will present the data. The present findings showed CTE teachers not only use the IWB and its features frequently, their perception of student engagement is high. Results for the study are presented in four parts: 1) results of teachers' IWB use 2) results of IWB engagement and perception questions, 3) results focused on individual differences between CTE teachers and IWB operation use and 4)

emerging themes from open response questions. Of the six eligible CTE participants for this study, four of them completed the survey. The following information is based on four CTE teacher responses to the questionnaire.

Results of Teachers' IWB Use

In the first section of the IWB questionnaire, teachers were asked three questions about their use of IWBs in their CTE classroom (see Table 1).

Table 1. Teacher IWB Use

		Frequency	Percent %
How long have you been using an IWB?	Less than 1 year	0	0
	1-2 years	0	0
	3 years or more	4	100
Approximately how many hours a week do you use the IWB?	0-2 hours	0	0
	3-5 hours	0	0
	6-8 hours	2	50
	9-11 hours	1	25
	12+ hours	1	25
Approximately how many hours per week do your students touch (use) the IWB?	0-2 hours	1	25
	3-5 hours	2	50
	6-8 hours	1	25
	9-11 hours	0	0
	12+ hours	0	0

All participants have a wall mounted SMART Board IWB set up in their classroom. 100% of the CTE teachers reported experience with the IWB for 3 years or more. Two CTE teachers reported 6-8 hours of use per week, as the other two teachers reported 9-11 hours and 12+ hours respectively. While IBW use is strong in the classroom, student use is far less. One teacher reported students use his/her SMART Board 0-2 hours per week, 50% of the teachers allow their students to use the IWB 3-5 hours, and the final teacher in the study allows his/her students the most time with the IWB, somewhere between 6-8 hours per week.

Results of IWB Engagement and Perception Questions

For this section of the questionnaire, teachers were asked 13 questions based on interactiveness and perceived levels of student engagement. Participants circled a response based on a 1-10 Likert scale system with 1 being "strongly disagree", 5 being "neutral", and 10 representing "strongly agree". The average rating from the four CTE teacher participants can be seen in Table 2.

Table 2. Engagement and Perception

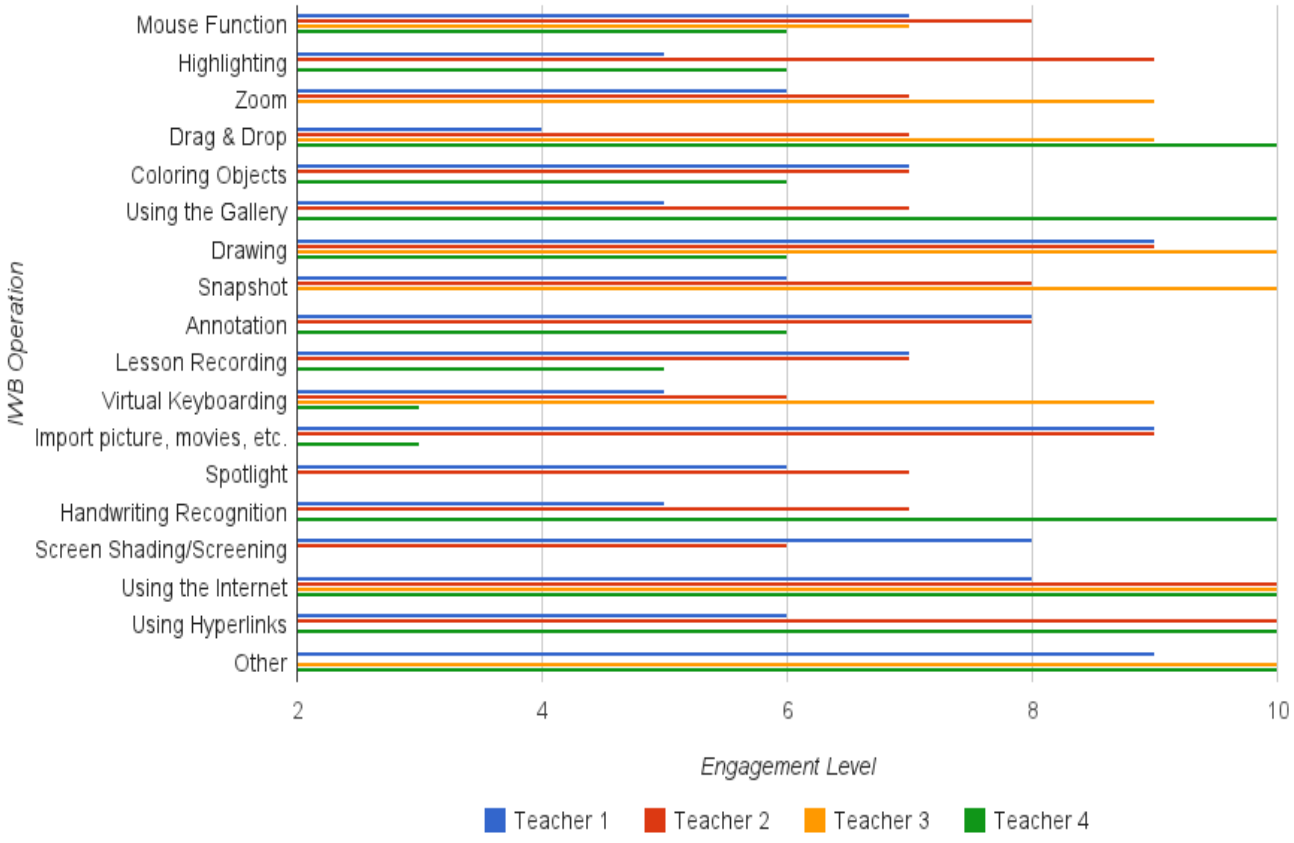
Questions	Average Rating	Standard Deviation
How confident would you rate your IWB abilities?	8.75	0.83
IWB are conducive for CTE programs.	9.25	0.83
What are your perceived levels of students engagement when the IWB is being used?	8.25	0.43
IWBs help my lesson be more interactive.	8.75	0.83
I believe using an IWB helps my students' learning.	9	0.71
My students learn faster when I teach with an IWB.	9	0.71
IWBs help my students learn in groups.	8.5	1.12
Using IWBs help my students learn concepts easier.	9	0.71
Using IWBs increases my students interest in the classroom.	8.75	0.83
My students look forward to using an IWB in class.	9	0.71
My students focus on my lesson more when I use an IWB.	8.75	0.83
IWBs increases my students motivation towards the course.	9	0.71
Technical difficulties negatively affect student engagement with the IWB.	4.5	1.5

The highest average rating was generated by the statement "IWB are conducive for CTE programs," averaging 9.25 out of 10. The majority of the questions received an average rating between 8.25 and 9.25. The questions with the lowest standard deviation indicating responses were close to the mean is "What are your perceived levels of student engagement when the IWB is being used?" The lowest average rating was generated by the statement "Technical difficulties negatively affect student engagement with the IWB," averaging 4.5. This response also had the highest standard deviation of 1.5 indicating response were more variable. The statement "IWBs help my students learn in groups" received the second highest standard deviation of 1.12, all other standard deviations ranged between . 71 and .83.

Results Focused on Individual Differences Between CTE Teachers and IWB Operation Use

Question 6 of the questionnaire was a two part question and asked what IWB operations do you use and how engaged do you believe them to be for your students? 17 operations and one "other" choice were given. Following a Likert scale of 1-10 with 1 being not at all engaged, 5 being somewhat engaged, and 10 being highly engaged, teachers circled their response of perceived engagement levels of their students. Note, blanks in the Figure are meant to show the CTE teacher does not use that particular operation of the IBE. Results are displayed in Figure 1.

Figure 1. Operation Use and Perceived Engagement of Students



There were some major differences among CTE teachers perceived levels of student engagement. Teacher 1 found drawing and importing pictures, movies, etc. the most engaging. Teacher

2 also found these two to be the most engaging with the addition of the highlighting feature. Teacher 3 gave a score of 10 to drawing, snapshot, using the internet, using hyperlinks, and the "other" category. Teacher 4 gave a score of 10 to drag and drop, using the gallery, handwriting recognition, using the internet, using hyperlinks, and the "other" category. Operations that were found to be the least engaging was drag and drop according to teacher 1 with an engagement level of 4, and the virtual keyboard and input pictures, movies, etc. according to teacher 4 with a score of 3. Operations that did not receive an engagement level were not operations used by that teacher in his/her classroom. Teacher 1 marked the "other" category responded with classroom grouping. Teacher 3 wrote PowerPoint and Prezi use for the "other" category, and lastly, teacher 4 responded with the gallery and clicker smart response tests for the "other" category.

Emerging Themes from Open Response Questions

The last two questions of the questionnaire were open response. From the two questions asked, "How do you think IWBs are best used for teaching purposes, and how do you think IWBs are best used for the learning process" themes emerged from the similarities in the responses (see Table 3).

Table 3. Emerging Themes from Open Response Questions

Questions	Theme	Frequency
How do you think IWBs are best used for teaching purposes?	Organization	1
	Interactive for students	2
	Difference sources and means of information	2
How do you think IWBs are best used for learning purposes?	Keep students engaged by being interactive	4
	Multiple modes of presenting	2

The common themes that emerged from the open ended questions showed the CTE teachers believed IWB were useful for teaching purposes because they help with organization, they allow a chance for interactiveness for the students, and difference material can be presented in a variety of

modes and mediums. The CTE teachers believe IWB are best used for learning purposes because they keep students engaged due to the interactiveness of the board, and the multiple modes of presenting material.

The following sections will take an in depth look and these results and begin to discuss the patterns, themes, and implications of this study.

Discussion

This study aims at adding to the growing research of Interactive Whiteboard (IWB) use in the classroom, and specifically the Career and Technical Education (CTE) classroom. While the results indicated positive thoughts and perceptions for IWB technology, we must also take a closer look to see what these results signify and the future implication that accompany them.

CTE teacher IWB use and experience is quite strong; however, the “interactive” board is seldomly used by students in some of the classrooms. The results indicate a teacher-dominant use of the IWB while students get to participate on occasion. Perhaps some of the reasoning behind this has to do with some of the IWB traits. Current IWBs can only be used by one person at a time. The SMART Boards that resided in the CTE teachers' classrooms have the capability for a single pen interaction with the board at a time. Right away, this puts major limitations on the interactiveness of the board. Inevitably, one person will always be at the board and every one else will be watching. Because students are not using IWBs as frequently as are teachers, there tends to be somewhat of a learning curve when using them. Without proper orientation of the pens, handwriting can be difficult to read. Perhaps teachers with limited time cannot wait for each student to get accustomed, and properly orient the board to their own specifications. Additionally, the cost of the board itself can be a deterrent for student use. It is never a sure thing in schools if broken technology can or will be fixed in a timely manner if at all. It is possible the risk of student use and breakage does not outweigh the reward of

some board interactions.

Significance

The results from the IWB engagement and perception questions indicated that CTE teachers have a generally positive attitude and outlook of the IWB. This is on par with many other studies (Murcia & Sheffield, 2010; Smith, Higgins, Wall, & Miller, 2005; Türel, & Johnson, 2012). It is interesting that the statement, "What are your perceived levels of students engagement when the IWB is being used" earned an average rating of 8.25 and the lowest standard deviation of .43 since these same teachers also indicated that students interact with the IWB at the very most, 8 hours a week. It was not clear in the question or in the responses whether this meant per student or the class as a whole. CTE teachers indicated high marks across the board on all questions relating to IWBs helping student learning, interests, and motivation. It is possible that teacher perceive the IWBs to be so engaging and interactive due to the vast options of operations it can perform. Most CTE teachers indicated that they use most, if not all of the most popular functions of the IWB. The perceived engagement for each operation differs slightly among CTE teachers. This may be due to the fact that each program differs significantly, and the material and use for the IWB is individual to each program. While the CTE teachers indicated they all have experience of at least three years or more with the SMART Board, and the average confidence rating was very high at 8.75, it's still possible that teachers do not use certain IWB functions and operations because they do not know how to operate them.

While there are a variety of operations and functions for the IWB, very few are specific to the IWB itself, and not just the PC it's hooked up to. For example, CTE teachers noted they used the Internet, hyperlinks, and pictures with the IWB, but these are not IWB specific operations. One can perform this on any type of computer. Depending on the program, you would also be able to highlight, zoom, drag and drop, and take a snapshot or screen shot. This could be seen with a computer and a projector. The IWB specific operations are using the gallery, virtual keyboarding, and handwriting

recognition. The gallery is a part of the SMART Notebook software that offers pictures, diagrams, charts, tools, and maps. Indeed there are interactive and engaging tools in the gallery, but I question whether the IWB specific operations and features are enough to say IWBs are more engaging than computers hooked up to projectors without the interactive function, or even a white or chalk board and a TV in the classroom that can show what is on the teacher's computer screen. Slay, Sieborger and Hodgkinson-Williams (2008) found in their study that students thought the biggest advantage of the IWB was the size it could be projected on the wall. Unfortunately this has nothing to do with the IWB itself and has to do with the distance the projector is from the wall.

One of the major differences between this study and other current findings was the effect of technical difficulties on student engagement. Most literature on IWBs express frustration with technical glitches from both teachers and students (Beeland, 2002; Wall, Higgins, & Smith, 2005). The results of this study indicate CTE teachers did not believe technical difficulties negatively affected student engagement, or had a neutral feeling towards the statement.

Limitations

There are some major limitations within this study. Only four CTE teachers participated in this research project. The results of this study reflect the thoughts of four teachers from the same CTE school. All of the participants in the study are over the age of 45. If is possible that newer technology can seem more exciting to certain people or age groups and is just a way of life now for students. The other limitation was that students' opinions on their engagement with the IWB were not taken into consideration. Since engagement can look different and feel different for everyone, it's nearly impossible for teachers to accurately judge if all their students are engaged, and perhaps a bit misguided to think that not only can one piece of technology can grab and hold students attention and engagement levels, but that it also helps students learn and stay motivated.

Future Research

For the future, it would be interesting to study the perspectives of the students or perhaps do a comparison of IWB present versus non-present classrooms. If the true goal of such technology is to engage students to the point of higher academic achievement, than future research would lead to a comparison of grades and/or test scores before and after specific IWB tools and functions were used in the classroom.

Conclusion

The results of this study indicate that the use of IWBs and their accompanying tools are being used frequently in CTE classrooms. We have also seen that CTE teachers give the IWB high marks when it comes to engaging their students and helping with lessons in their own classroom. It is important to consider that these results were from one CTE school and from a sample of participants that are closer to the end of their teaching career than the beginning. It is also important to note that student's perception and actual academic achievement was not a part of this study. It is my belief that the IWB is here to stay. With proper training, lesson planning, and creating a certain classroom environment, the IWB does have the potential to be an engaging and interactive classroom tool. I caution teacher to remember it is not the board itself that will draw students into your lesson, but what you plan and create that will help them thrive in the classroom.

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