The Influence of Interactive Whiteboards on Fifth-Grade Student Perceptions and Learning Experiences

Sharon Amolo
Valdosta State University
GA, United States
sharon_amolo@gwinnett.k12.ga.us

Elizabeth Dees, Ed.D.
Department of Curriculum, Leadership, and Technology
Valdosta State University
GA, United States
ecdees@valdosta.edu

Abstract: The purpose of this research was to evaluate the influence of interactive whiteboards on student learning of social studies. This research also assessed whether using an interactive whiteboard altered student perceptions of instructional technology. One fifth-grade class consisting of twenty-six students participated in the study. Both qualitative and quantitative data collection methods were used to assess student perceptions and student learning during the intervention. The results of the research indicated student perceptions of technology were positively influenced. Additionally, student learning and engagement increased when the interactive whiteboard was used.

The use of instructional technology began in schools through the support of the National Science Foundation in the 1950s (Coley, Cradler & Engel, 1997). Since then schools have sought new ways to integrate technology into instruction with the goal of preparing students for the future (United States Department of Education [USDOE], 2004). Traditionally, instructional technology was used to transmit information and disseminate knowledge (Jonassen, Carr, & Yueh, 1998). According to Gagne (as cited in Dick, Carey, & Carey, 2005) learning occurs when newly acquired knowledge is incorporated into a person's prior knowledge. In addition, in order for the user to become proficient in skills, new information must be incorporated into prior knowledge. Thus, instructional technology promotes the learning process by providing new knowledge to learners (Rogers, 2002). To develop new technology skills students need access to emerging technology. According to the USDOE (2004), students in the United States are not achieving academically as well as students in many other countries. To address this concern, schools implemented the use of instructional technology in various forms as a means to improve student achievement (USDOE, 2004).

The use of interactive whiteboards offers a flexible and versatile method for teaching students in various subjects and settings (British Educational and Communication Technology Agency [BECTA], 2003). According to Bell (2000) interactive whiteboards are ideal for presentations since the presenter can run the application from the board. Several features of interactive whiteboards were noted. The board can accommodate different learning styles; classrooms with one computer can make the most of limited software; they do not create chalk dust or leave behind dry erase residue; and images from the computer, video, or camera can be displayed. Additionally, interactive whiteboards are interactive and allow direct input from the user (BECTA, 2003; Bell, 2000).

Interactive whiteboards also allow the teacher to use a variety of media without having to switch between DVDs, computers, or TVs. Kent (2006) described teachers' use of interactive whiteboards to seamlessly navigate through charts, graphics, video streaming, or Internet sites during math lessons. This aspect of interactive whiteboards allowed teachers to be more spontaneous and flexible with their lessons. In addition, projected text and highlighted words within the written passages were used to reinforce important concepts (Hall & Higgins, 2005). In comparison, the use of traditional chalkboards or regular, non-interactive whiteboard was perceived as boring by students and did not provide the opportunity for them to be actively engaged in the lessons (Hall & Higgins, 2005).

During classroom visits and observations I noticed a lack of engagement during social studies lessons. Typically students were seen sitting at their desks, reading from the text and responding to oral or written questions. Student body language and facial expressions also implied boredom or lack of engagement with the learning

activity. In monthly grade level meetings, teachers confirmed my observations as they discussed the need for strategies to engage students in their lessons.

In contrast, various studies reported the value of using an interactive whiteboard to increase student motivation for learning and student attention during lessons (Beeland, 2001; Gerard, Greene, & Widener, 1999; Hall & Higgins, 2005; Levy, 2002; Solvie, 2004). As the media specialist and a member of the support staff I decided to research a method of instruction to address the student engagement concerns shared by the teachers. As I researched methods for increasing student attentiveness and the use of technology as a motivational tool, I became aware of the value of the interactive whiteboard. Several studies reported the use of the interactive whiteboard was a factor in increased student motivation and student attentiveness during lessons (Beeland, 2001; Gerard, Greene, & Widener; 1999; Hall & Higgins, 2005; Levy, 2002; Solvie, 2004). Based on the previous research, I concluded that the more time students were engaged with the lesson, the more likely they were to retain knowledge or demonstrate a gain in achievement. With a focus on increasing student attention and engagement through the use of technology, I utilized the interactive whiteboard's software and components to provide academic content and skills to elementary school students. The purpose of this research was to evaluate the influence of interactive whiteboards on fifth-grade student learning and whether it altered their perceptions of instructional technology as a learning tool. The research questions considered in this action research were:

1. How does the use of an interactive whiteboard influence student learning?
2. What are the learning experiences recorded in journal entries of fifth-grade students about the use of an interactive whiteboard as an instructional delivery method for social studies?
3. What are student perceptions of using an interactive whiteboard to learn about social studies?

Method

Participants

This action research study was conducted at an elementary school in a suburban community in central north Georgia. Twenty-six fifth grade students were participants in the study. Of the eighteen boys and eight girls, thirteen were Caucasian, six African American, three Hispanic, and four Asian. Fourteen students in the class are enrolled in special education classes (nine of which are gifted), two have limited English proficiency, and one qualified for free or reduced lunch. The class was selected for the social studies interactive whiteboard study because of the teacher's willingness to integrate technology into her lessons and her flexibility to adjust to the timeframe of the research. Permission for participation was obtained through passive permission consent forms. Permission was also obtained from students through assent forms. In addition, the school principal granted permission to conduct the study.

Intervention

The intervention occurred over a 3½ -week period. The twenty-six fifth grade students received ten hours of instruction with the interactive whiteboard or SmartBoard in the media center. The purpose of the instructional plan used was to allow students to interact with a new technology as the primary medium for social studies instruction and learning. The SmartBoard was used in all phases of instruction to display and manipulate objects projected on its surface. Students were shown examples of primary sources through streamed videos and letters. Pictures were shared with the students. The Internet and graphic organizers were employed to obtain or categorize the social studies information. The individual student response systems were used to determine student understanding of the lessons and concepts taught.

Measures

Several data collection methods were used to measure the results of the intervention. Pre- and post-tests on the social studies content were given to measure student learning of the concepts taught. A post-intervention survey was administered to gain insight on student perceptions of the use of interactive whiteboards and the individual student response systems. Student journals were used to record perceptions of their experiences using the interactive whiteboard and individual student response systems. Throughout the intervention field notes were kept to record the students' behaviors while interacting with the SmartBoard and the individual student response systems. Grades from a previous, non-technology based, social studies unit were compared to the grades from the intervention to determine student acquisition of the concepts. After the instructional phase of the action research was completed a

focus group interview was conducted. The focus group provided an opportunity to delve deeper into the students' experiences using the interactive whiteboard and the individual student response systems.

Procedures

During a 3 ½ week period, the fifth-grade participants received 11 lessons of 55 minutes each in the media center. Each lesson covered a different aspect of World War I. Students learned about the weapons and technology, important people, home front campaigns, and the major events of World War I. Although the classroom teacher and researcher collaborated on the lessons prior to the intervention, the actual lessons were taught by the researcher. The interactive whiteboard or SmartBoard was used with each lesson. The students had no previous experience using an interactive whiteboard since this was the first one installed at the school. During the intervention a variety of data collection methods were utilized.

Before the intervention a pre-test was given to use as a baseline to gauge student learning during the intervention. The pre-test consisted of 23 true/false and multiple choice questions. The pre-test was administered in the classroom by the teacher and the researcher. Students worked individually on the pre-test and were given up to 25 minutes to complete the pre-test. Once the research was completed a post-test on World War I was administered. The post-test was identical to the pre-test. The post-test was administered in the media center by the researcher. As with the pre-test students worked individually and were given 25 minutes to complete the post-test. The mean and standard deviation of the responses was compared to those from the pre-test. In addition, the pre-test and post-test scores for individual students were compared to determine if any students increased their scores. This analysis was used to measure student learning during the intervention and was used to answer the first research question.

During the first lesson I explained and demonstrated how to use the interactive whiteboard. Students were shown how to manipulate and move objects on the whiteboard and how to use the writing tools. Students also observed how streamed videos could be displayed and viewed using the whiteboard. Later, when the individual student response systems were introduced, students were shown how to enter the answers on the keypad. As the lessons were being taught I observed and recorded the frequency and experiences of the students using the interactive whiteboard and individual student response systems to measure student engagement. Data from the field notes were categorized into themes to allow further findings. Behaviors noted during the observations were divided into several categories; student involvement with technology, student engagement in content, and student interaction during learning. In addition, students kept a journal of their experiences with the interactive whiteboard and its accessories. The journals were used to categorize students' experiences with the interactive whiteboard. Students recorded what they liked most and least about the interactive whiteboards and its accessories (specifically the individual student response system) and whether the use of the interactive whiteboard made the lesson more interesting. An analysis of the emerging themes in the student journals answered the second research question.

After the intervention was completed, the student post-intervention survey and focus group interview was completed. Questions in the post-intervention survey centered on student perception of the use of instructional technology to teach social studies. The questionnaire consisted of 15 agree or disagree questions about their perceptions of the interactive whiteboard and its accessories. Students answered the post-intervention survey immediately following the last lesson. The other form of data collected to obtain student perceptions was the focus group interview. Six students were selected for the interview. The students selected were representative of the class's ethnicity, sex, and academic level. The focus group session was tape recorded so it could be transcribed later. The interviews were used to clarify any questions about the behaviors seen in the observation periods and the student responses to the survey. The data from the interviews and the post intervention survey were analyzed for themes. The analysis of this data provided answers to the third research question.

Results for all data collection methods were analyzed individually and collectively. The data were examined to determine the experiences, perceptions, and influence on student learning. Data collected from the field notes, student journals, and interviews were analyzed, and compared to determine emerging themes. The pre and posttests provided quantitative data. The utilization of multiple data collection techniques insured the three research questions were answered. The overlapping data collection methods used in this study complemented each other. The weakness of one method was strengthened by another method and enhanced the reliability and validity of the study.

Results

Student Learning

All students demonstrated an increase in learning based on the pre-test and post-test, as shown on Table 1. All student grades in the intervention class improved. Prior to the intervention the mean was 60.81 (SD = 14.56) and after the intervention the mean was 92.96 (SD= 5.94). The intervention grades for the prior social studies unit were compared to the post-intervention grades on Table 2. Overall, students' grades in the intervention class demonstrated an increase in learning (M= 92.96, SD= 5.94) over the non intervention grades by the same students in a previous lesson (M= 86.12; SD= 18). As one student said, "It was so much fun and the lessons were so cool it didn't even feel like learning." This was reinforced by another student who commented, "I love using the interactive whiteboard. I like all the different stuff you can do on it while learning about something."

Table 1

Student Grades on a Pre Test and Post Test on World War I

Student	Pre-Intervention Test Scores	Post-Intervention Test Scores
1	60%	91%
2	52%	95%
3	79%	100%
4	65%	95%
5	43%	86%
6	82%	100%
7	34%	86%
8	56%	95%
9	60%	100%
10	69%	91%
11	65%	91%
12	34%	91%
13	69%	100%
14	79%	100%
15	39%	91%
16	69%	86%
17	52%	86%
18	60%	91%
19	56%	95%
20	43%	86%
21	65%	79%
22	69%	91%
23	47%	100%
24	73%	91%
25	82%	100%
26	79%	100%

Table 2

Student Grades for Prior Social Studies Unit Without the Use of an Interactive Whiteboard and Post-Intervention With an Interactive Whiteboard

Student	Social Studies Grade on Prior Unit	Post-Intervention Grades
1	88%	91%
2	90%	95%
3	100%	100%
4	88%	95%

5	88%	86%
6	100%	100%
7	80%	86%
8	90%	95%
9	100%	100%
10	91%	91%
11	91%	91%
12	8%	91%
13	100%	100%
14	100%	100%
15	91%	91%
16	76%	86%
17	80%	86%
18	84%	91%
19	95%	95%
20	80%	86%
21	72%	79%
22	76%	91%
23	84%	100%
24	91%	91%
25	96%	100%
26	100%	100%

Student Engagement

Before the study students had no prior experience with using an interactive whiteboard. During the intervention students came to the media center for 11 lessons. The results for the recorded field notes and observations are shown in Table 3 and Table 4. The field notes were used to determine the amount of time each student spent at the board and student attention while at their seats. During lessons approximately 40 out of the 55 minutes required interaction with the board. To ensure the lessons were student focused the students interacted with the board on average 35 out of the 40 minutes. On average each student was able to interact with the board for 1 minute and 36 seconds as shown in Table 3. The most frequent comment listed in student journals was how much they enjoyed the use of the interactive features. One student elaborated on this in his journal when he said, "With a regular class you just sit there and raise your hand. You may get to go to the board and write something, but that's it. With the interactive whiteboard you get to do more. You can look at the images displayed, drag, and sort stuff and you can also click and go straight to the Internet. I really like using it."

Table 3

Student Engagement for Interactive Whiteboard

Lesson	Amount of Time Spent Using the Interactive Whiteboard	Number of students who used the Interactive Whiteboard	Average amount of interaction per Student
1	35	26	80 sec.
2	42	26	96 sec.
3	40	25	96 sec.
4	32	23	83 sec.
5	48	24	120 sec.
6	44	22	120 sec.
7	39	21	39 sec.
8	48	26	110 sec.
9	42	23	109 sec.
10	44	26	101 sec

11	46	26	106 sec.
		Average time of student engagement	96 sec.

Table 4

Student Observation Data

	Frequency of Behavior		
Behavior	Always	Sometimes	Never
Student is focused on the lesson	84%	16%	0%
Student is actively engaged in the lesson	85%	14%	1%
Student uses the interactive whiteboard and accessories effectively	75%	15%	10%
Student contributes to the class discussion	78%	17%	5%

Student Perception of the Interactive Whiteboard

Overall, 99% of the students had a positive experience using the interactive whiteboard and reported they learned better when using it for lessons. Data for student perceptions were gathered during and after the intervention. The results are listed in Table 5. Since students had not used an interactive whiteboard before the intervention a pre survey was not taken. However, several items on the survey indicated a strong preference for the use of an interactive whiteboard with lessons. All students, 100%, answered strongly agree for the questions. "I pay more attention when the interactive whiteboard is used"; "I enjoy learning with an interactive whiteboard"; "Lessons are more interesting when taught using an interactive whiteboard"; and "I enjoy the use of multimedia with the interactive whiteboard." Following the intervention, 88 % of students agreed it was easy to learn how to use the interactive whiteboard and its accessories. In addition, 99% of the students suggested the school needed more interactive whiteboards. Not all experiences were positive; 11% of students indicated they were nervous when using the interactive whiteboard. This information was supported through group interviews and journals kept by the students.

In their journals, 80% of students specified they liked the seamlessness of using the streamed videos with the interactive whiteboard. Additionally, 84% noted they enjoyed being actively engaged in the lesson rather than just raising their hand. One student wrote, "It is better than just a regular whiteboard because in the classroom we would have read our textbooks and then had to raise our hand to answer the question. With the interactive whiteboard you can watch a video clip or discuss something and then immediately get to do stuff on the board with it." Another student said in the focus group interview, "I like it because it is a better way to interact with the lessons by moving and circling things and it gave you a more visual experience."

Table 5

Student Perceptions of Technology and the Interactive Whiteboard

Perception	Strongly Agree	Agree	Disagree	Strongly Disagree
I enjoy learning with an interactive whiteboard.	100%	0%	0%	0%
I feel comfortable using an interactive whiteboard.	20%	69%	11%	0%
Using an interactive whiteboard is difficult.	0%	1%	76%	23%
Using an interactive whiteboard is boring.	0%	0%	8%	92%
Lessons are more interesting when taught using an interactive whiteboard.	100%	0%	0%	0%

The school needs more interactive whiteboards.	84%	15%	1%	0%
It is easy to learn how to use an interactive whiteboard.	46%	42%	11%	0%
I pay more attention when the interactive whiteboard is used.	100%	0%	0%	0%
I get nervous when I have to use the interactive whiteboard.	23%	34%	26%	17%
I understand the lesson better when we use the interactive whiteboard.	75%	24%	1%	0%
Using an interactive whiteboard is better than using a computer.	12%	76%	12%	0%
Using the individual student response system was easy.	84%	15%	1%	0%
Using the individual student response system was hard.	0%	1%	15%	84%
I learn more when using the individual student response system.	32%	53%	15%	0%
I enjoy the use of multimedia with the interactive whiteboard.	100%	0%	0%	0%

Discussion

The purpose of this study was to determine if interactive whiteboards influenced student perceptions of technology and how the use of the interactive whiteboard influenced student learning. Information gathered during the post-intervention indicated interactive whiteboards positively impacted student perceptions. Further data also confirmed the use of interactive whiteboards increase learning. During the study there were three research questions I wanted to investigate. The first question was, how did the use of an interactive whiteboard influence student learning? Secondly, what were the learning experiences recorded in journal entries of fifth-grade students about the use of an interactive whiteboard as an instructional delivery method for social studies? The final question was, what were student perceptions of using an interactive whiteboard to learn about social studies? Multiple data gathering methods were utilized to obtain the answers.

To answer the question of how did the use of an interactive whiteboard influence student learning the following data was collected. Grades from a previous, non-intervention social studies assessment provided scores indicative of student learning using only traditional textbooks, videos, and occasional web pages. The non-intervention assessment scores were compared to the post intervention scores. Pre- and posttest means (60.81 and 92.96 respectively) indicated an increase in student achievement following the intervention. There also appeared to be a difference in the use of the whiteboard and not using the whiteboard in instruction when the intervention post-test results were compared to the previous, non-intervention unit assessment scores (M = 92.96 and M = 86.12, respectively).

The second aspect of the research focused on the learning experiences of the students. Students overwhelmingly indicated their excitement for using the interactive whiteboard. This translated into an increased attention span for many. Many students wrote how the features and content of the lesson made them want to pay attention and want to learn the material being presented. This was corroborated by my field note observations. Generally students were focused on the lesson 84% of the observed time. Additionally, students contributed to the classroom discussions 78% of the time. Students overwhelmingly indicated they liked the streamed videos which were included in the lesson. One student wrote in her journal, "I like that you can watch a short movie and then immediately do an activity on it. You don't even have to turn the lights out or move your chair around to do it." According to Kent (2006), interactive whiteboards offer a new way to teach subjects and to integrate multimedia seamlessly into the lesson. In addition to the interactive aspects of the board this was the feature I also enjoyed most about the interactive whiteboard.

The aim of the final research question was to determine student perceptions of using an interactive whiteboard. The post-intervention survey indicated students had a positive opinion and enjoyed using the interactive whiteboard. However, students did note they were nervous when using the board because they were afraid they might not use it correctly. In addition, 54% of students wrote in the journals or spoke about the learning curve of using the interactive whiteboard. One student said in the focus group interview, "Learning to use the pens was a

little hard at first. You have to make sure you press hard enough and not drag your wrist on the board or it messes up." Another student countered the comment with, "Yeah but once you write something you can turn it to text which makes it easier to read. That's really good for someone [who] doesn't have good handwriting." Students also wrote about the alignment problems and the trouble they had dragging objects if they didn't press hard enough. The focus group also revealed the technical problems were just a small inconvenience for them and multiple functions of the board outweighed the problems they encountered. Ninety-nine percent of the students wanted an interactive whiteboard in their classrooms.

Limitations

There were several limitations to the study. The two most significant issues centered on time and the number of participants in the study. Only one class was used in the intervention. The time constraint was the other factor. I only saw the students 10 hours and did not have enough time to use all of the features of the interactive whiteboard with them.

Future Action Research

There are several opportunities and suggestions for future action research. How does the interactive whiteboard impact learning with other subjects? Would primary grade students' use of the interactive whiteboard be the same as the upper grades? What would student perceptions of the interactive whiteboard be if external technology such as video streaming and individual student response systems were not used? How does the teacher's comfort with technology impact the use of the interactive whiteboard with students? Also a new study might include a control group that does not use the interactive whiteboard to determine if there is a difference in achievement scores between the control group and the intervention group. Testing two groups over the same content might provide a better view of the effectiveness of the interactive whiteboard. Also having another researcher or teacher to assist in data collection would eliminate any bias or oversight in observation data.

The findings of the action research were communicated with the teachers and administrators of my school. The principal was provided with a copy of the Action Research and the research findings. All teachers were invited to an after school celebration and research presentation; 23 of the 64 teachers invited attended. Snacks and drinks were provided for all attending guests.

A PowerPoint presentation was used to present the findings of the intervention. Teachers were given the opportunity to ask questions and provide comments about the intervention. In addition, teachers were given the opportunity to experiment with the various features of the interactive whiteboard and the individual interactive student response systems to examine their features. All teachers expressed an interest in having access to an interactive whiteboard to use with their students and were pleased to learn that a grant I wrote would provide an additional interactive whiteboard for the computer lab. Additionally, teachers were informed that in-school workshops on the interactive whiteboard would be offered next school year.

Implications and Closing

The results of the study would be useful to other educational professionals. Since this research suggests interactive whiteboards positively affect learning, then the implications for education are clear for the district, school, and classroom teacher. More interactive whiteboards are needed in the schools. Teachers need professional development on how to use and implement the interactive whiteboards into their teaching. With adequate staff development teachers will have the foundation to ensure the whiteboard is used to its full potential as a successful tool for student learning.

The results of this action research suggest interactive whiteboards positively affect student learning. The research conducted concluded students pay more attention and are actively engaged in learning when technology is used. Students particularly liked the seamless integration of video, text, and pictures on the interactive whiteboard. Additionally, students indicated the interactive whiteboard allowed them to sort, compare, organize, and correct information easily and without the mess of a dry erase marker or an overhead pen. Therefore, educators can confidently look at the interactive whiteboard as an additional and valuable technology tool for student learning.

Reference

British Educational and Communication Technology Agency (2003). *What the research says about interactive whiteboards*. Retrieved September5, 2006, from http://www.becta.org.uk/page_documents/research/wtrs_ whiteboards.pdf

Beeland, W. D. (2001). Student engagement, visual learning and technology: Can interactive whiteboards help*? Action Research Exchange, 1*. Retrieved September 6, 2006, from http://chiron.valdosta.edu/are/Artmanscrpt/ volno1/belland_am.pdf

Bell, M. A. (2000). *Influence of the electronic interactive whiteboard on student attitudes and achievement in eighth-grade writing instruction.* Unpublished doctoral dissertation, Baylor University, Waco, Texas.

Coley, R., Cradler, J., & Engel, P.K. (1997). *Computers in the classroom: The status of technology inU.S. schools*. Princeton, NJ: Educational Testing Services. Retrieved September 6, 2006, from ERIC database. (Eric Document Reproduction Service No. Ed412893)

Dick, W., Carey, L., & Carey, J.O. (2005). *The systematic design of instruction* (6th ed.). Boston: Pearson.

Gerard, F., Greene, M., & Widener, J. (1999). *Using SMART board in foreign language classes*. San Antonio, TX: Paper presented at the Tenth Annual Society for Information Technology and Teacher Education International Conference, San Antonio, TX. Retrieved September 5, 2006, from ERIC database. (Eric Document Reproduction Service No. Ed432278)

Hall, I. & Higgins, S. (2005). Primary students' perceptions of interactive whiteboards*. Journal of Computer Assisted Learning*, *21*(2), 102-117. Retrieved September 6, 2006, from Professional Development Collection database.

Jonassen, D. H., Carr, C., & Yueh, H. (1998). Computers as mindtools for engaging learners in critical thinking. *TechTrends, 43*(2), 24-32. Retrieved September 6, 2006, from http://www.coe.missouri.edu/~jonassen/Mindtools.pdf #search=%22computers%20as%20mindtools%22

Kent, P. (2006). Using interactive whiteboards to enhance mathematics teaching. *Australian Primary Mathematics Classroom, 11*(2), 23-26. Retrieved September 5, 2006, from PsycINFO database.

Levy P. (2002). *Interactive whiteboards in learning and teaching in two Sheffield schools: A developmental study*. Retrieved September 6, 2006, from http://www.shef.ac.uk/eirg/projects/wboards

Rogers, P. L. (2002). *Designing instruction for technology-enhanced learning*. Hershey: Idea Group Publishing.

Solvie, P. A. (2004). The digital whiteboard: A tool in early literacy instruction. *Reading Teacher,57*, 484-487. Retrieved September 6, 2006, from Academic Search Premier database.

United States Department of Education. (2004). *Toward a new golden age in American education: How the internet, the law and today's students are revolutionizing expectations* (Publication No. ED000259P), Washington, D.C., United States. Department of Education. Retrieved September 6, 2006, from http://www.ed.gov/about/offices/list/os/ technology/plan/2004/site/ edlite-default.html