

The Use of an Interactive Whiteboard in Promoting Interactive Teaching and Learning

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In today's society both children in educational settings and adults in workplaces are exposed to a wide variety of information technology that allows learning and production of knowledge to take place in a variety of ways. Walter McKenzie, the Instructional Technology Coordinator for Arlington Public Schools, asks:

With the Information Age evolving so rapidly, how do schools adopt a new model of thinking and learning that adequately parallel's society's demands? The change is already taking place in classrooms across the country. But, if we as teachers tend to teach in the same ways that we ourselves were taught, how then do we break away from the standardized, homogeneous approach to schooling that we knew as students? (McKenzie, 2002, p. 5).

McKenzie claims that the Information Age requires workers to have the ability to access information and manipulate information in a variety of ways using digital tools, allowing them to evaluate information using critical-thinking strategies and problem-solving skills in ways that allow them to interact with colleagues to complete complex tasks and present information and ideas in novel or unique ways.

It appears then that two issues face teachers of today. The first issue is the need to recognize that the Information Age has brought new demands on how we teach our students within classroom settings. Many students come to school already exposed to technology that allows them to learn in a variety of ways at home such as the use of computer game software, interactive learning Web sites, television with DVD's, and talking books to name just a few examples. The second issue is how do we, as educators, make changes in the ways we were traditionally taught and make better use of technology

so that we help our students develop the information, literacy, problem-solving, collaboration and creativity skills they need to be successful in today's workplace?

In March 2004, we (two second grade teachers and the technology resource teacher at Deer Park Elementary School in Centreville, VA) attended several sessions on the use of interactive whiteboards in the elementary school setting at the Virginia Society for Technology in Education (VSTE) Conference in Roanoke, VA. In particular, we saw an ACTIVboard that uses a computer connected to a projector and a touch-sensitive whiteboard. The projector displays images from the computer and the computer is controlled by touching the board with an electronic pen. Teachers can display Internet Web sites, run educational software, show live video, give multimedia presentations, all in an effort to engage students in interactive learning (Fernandez and Luftglass, October 2003).

Intrigued by the claims of the presenters at the VSTE Conference that the use of this technology promotes interactive teaching and learning, we asked our school's principal to purchase an ACTIVboard (produced by Promethean, Inc.) for our school. Our principal suggested that we "field-test" the use of this interactive tool with a group of students and conduct a year-long study of its effects on promoting interactive teaching and learning before he purchases other active boards for use throughout the school. He allocated a resource room close to the second grade classrooms to house the ACTIVboard, and we promptly dubbed the room "The Board Room." He also bought a laptop and a projector that were dedicated for use with the ACTIVboard. In addition, we obtained an Impact II Teacher-Researcher Grant from our school system to support our year-long study. We used the grant funds to purchase ACTIVotes, hand-held voting

devices used by the students to record their individual responses to questions asked during the whiteboard lessons. After voting to indicate choices to questions, the students' responses are shown as bar graphs on the whiteboard, showing how many students voted for each possible response and which response was the actual correct one.

During the year we received support and guidance from our school's Teacher Research Team (TRT) as we went through the process of collecting and analyzing data for our research project. Our first guiding question was, "How does the use of the ACTIVboard promote interactive teaching and learning?" We felt this question was particularly important because as teachers, we wanted to discover and develop ways of using the ACTIVboard that will change our traditional relationship with our students as transmitters of knowledge to enablers of learning. We also wanted to discover how the use of whiteboard technology can be used to tap into the various multiple intelligences and learning styles of our students and learn what happens when it is used to promote interactive learning and the development of literacy, problem-solving, creativity, and collaboration skills with our students. So, our second guiding question was, "How does the use of the ACTIVboard support instructional strategies that lead to the development of literacy, problem-solving, creativity, and collaboration skills of students?"

Literature Review

Most of the published research on the use of interactive whiteboards comes from the United Kingdom, little so far from the United States. The ACTIVboard's parent company, Promethean, Inc. is located in England, although the distributor in the United States is located in Atlanta, Georgia. Julie Cogill at King's College at the University of London, conducted a small scale study of two schools involving interviews of five

teachers and observations of the teachers and their students using the whiteboard technology. Her study was entitled, “How does the interactive whiteboard affect teaching and learning?” (Cogill 2002). Two major research questions guided her inquiry:

- What is happening in the whiteboard classroom?
- What is the pedagogical approach of teachers using an interactive whiteboard?

Cogill found that the teachers did not in general feel the use of the whiteboard had really changed their classroom practice. She determined that one reason for this finding was that the use of the board was too infrequent to assess change. Cogill’s observations, however, led her to conclude that, “Even though the board may not necessarily be changing the teachers’ practice, it was enabling them to teach with greater flexibility.” (Cogill, p. 35).

Two of the teachers Cogill interviewed felt that the whiteboard was empowering them to become more facilitators of learning rather than just purveyors of knowledge. Cogill’s observations of these two teachers confirmed that she saw this type of interaction happening between the teachers and their students (Cogill, p. 40).

The most interesting concluding statement Cogill made in her report was:

Teachers were employing the board effectively to provide initial lesson structure, but further scaffolding to meet individual needs did not occur. In general, the board was not being used to instigate higher order discussion and collaborative work, although I did observe one example of such whole class engagement.

(Cogill, pg. 41)

Researchers at Cascade, a multimedia interactive training center at the Centre for Educational Studies at the University of Hull, Scarborough, UK, spent two years looking

at the identification of effective practice in over 200 classroom observations in schools and colleges throughout England. One of the questions that guided their work was, “What are the advantages of using an interactive whiteboard for teaching literacy?”

The Cascade researchers found that many teachers reported being able to control the software that is used with the whiteboard and as they interacted with the whiteboard, it helped students visualize and remember concepts, and process information and ideas. “Some ideas are dependent on the type of software being used. In addition, using sound and video clips can also enhance literacy teaching. Being able to see and hear text spoken will be very useful for many students. Some whiteboard software allows you to click on a link to start a sound or video file.” (Walker, 2004)

Pamela Solvie, an English primary teacher, reports that when using the interactive whiteboard for shared reading and guided writing, her first-grade students were quite interested and contributed to her lessons. In addition, when helping her prepare theme projects to share with parents, Solvie states, “Students were actively engaged in the preparation of slides with graphics and text to demonstrate their understanding of thematic material.” (Solvie, Feb. 2004, p. 4)

After reviewing the articles and studies from English primary classrooms on the use of the whiteboard, we reviewed the literature on the importance of using technology to improve pedagogical skills and promote active student learning. Robert Marzano conducted a meta-analysis of 100 research reports on instruction and identified and reviewed categories of instructional strategies that enhance student achievement. can be Marzano, Pickering and Pollock identified nine categories of instructional strategies that are most likely lead to enhanced student achievement when they wrote their book,

Classroom Instruction That Works: Research-Based Strategies for Increasing Student Achievement. Then Kathy Brabeck, Kimberly Fisher, and Howard Pitler took the nine strategies and showed specific examples of how *technology* could support those instructional strategies in their article, *Building Better Instruction: How Technology Supports Nine Research-Proven Instructional Strategies* (Brabeck, Fisher & Pitler, February 2004). We believe that the nine instructional technology strategies mentioned in this article can be directly applied to effective uses of the whiteboard:

1. Classroom practices associated with identifying similarities and differences, including comparison and classifying tasks.
2. Summarizing activities (deleting or substituting information that is not critical to the overall meaning of text) and note-taking (determining what is most important and stating that information succinctly).
3. Reinforcing student effort and providing recognition for solving problems, deducing a correct answer or achieving specific goals.
4. Mastering skills through practice.
5. Learning new knowledge through both linguistic and non-linguistic ways (drawings, images, diagrams, video clips and kinesthetic movements).
6. Cooperative learning (working with others to complete a task).
7. Setting objectives and providing feedback (including an explanation of why an item is correct or incorrect, letting students know where they stand relative to a specific target of knowledge or skill).

8. Generating and testing hypotheses (planning and conducting simple investigations, formulating and testing questions, making observations and developing logical conclusions).
9. Using cues, questions and advance organizers to give students a preview of what they are about to learn or experience and activate their prior knowledge.

Methodology

We began our research by first looking at the features of the ACTIVboard in terms of instructional delivery. The two second grade teachers kept detailed journal observations and interview data from their 48 students when they used the ACTIVboard. In addition, three other second grade teachers who also taught ACTIVboard lessons and provided the teacher-researchers with their input based on their own observations of how and what their students learned as a result of using the ACTIVboard. The technology resource teacher kept a detailed journal to record her observations and interview data from students she taught or observed while the other teachers used the ACTIVboard.

Next, the two second grade teachers and the technology resource teacher recorded their observations and student interview reactions in their journals that were related to the nine technology instructional strategies. The technology resource teacher also videotaped and digitally photographed various ACTIVboard and follow-up classroom assignments for analysis. Some of the lessons were taught in different ways (traditional instruction vs. ACTIVboard instruction). Differences in student responses to the lessons (oral responses, test or quiz results, authentic student work performances); as well as what students said about the use of the ACTIVboard vs. non-ACTIVboard presentations were noted in the teacher's journals so that we could compare what the students demonstrated

that they knew and could do as a result of the learning sessions using the technology and not using technology.

Data Collector software, a qualitative data-analysis computer program, was used to record each observation or interview entry made by the teachers when they wrote reactions to the lessons. The second grade teachers e-mailed their journal entries to the technology resource teacher who copied and pasted the reactions on to the software's data cards. In addition, other teachers such as the inclusion special education teachers observing the lessons also contributed their observation and reaction statements and data collector cards were also created. In all, sixty-one data cards were created and then coded according to the following categories:

- Lesson Delivery
- Student and Observer Reactions
- Instructional Strategies (specifically the nine instructional strategies listed by Brabeck, Fisher & Pitler.)

Using the find and sort feature of the software program, topic cards were created for each category. This process enabled us to explore relationships between concepts and determine frequency of occurrences.

In order to determine how the use of the whiteboard facilitates and promotes interactive teaching and learning, we triangulated the data from four data sources:

1. Our analysis of student work samples completed by students following whiteboard lessons.
2. The consolidated information on the Data Collector topic cards.

3. The paper and pencil survey responses of the students who indicated what they liked and did not like about using the ACTIVboard.
4. What we saw students doing when we reviewed the videotapes and digital images taken during ACTIVboard lessons.

Findings

Lesson Delivery. By far, the most common responses students and teachers made about the use of the ACTIVboard for lesson delivery were related to viewing the lesson. Respondents used the words “brighter”, “bigger”, “wider”, and “clearer” when comparing what they were able to “see” on the ACTIVboard screen to what they view from a computer on a classroom TV monitor. However, hearing sounds was another matter. The laptop’s built-in speakers were not very loud. Once we attached external speakers to the laptop, then a whole class could hear sounds such as those embedded in interactive Web sites.

When reviewing the data for evidence of student motivation and attentiveness, the words “student-centered” and “involved” were noted most often by the teachers when describing how engaged the students were during ACTIVboard lessons. The teachers were pleased that when using the ACTIVboard, students could take turns choosing and dragging graphics from various software programs to complete compare-contrast charts, create scenes, and plan a story by filling in story organizers. One teacher wrote in her journal, “Today we were able to open a story plan in Kidspiration and together, as a class, we planned the characters, setting, actions, problem and solution for a story. All the kids were involved, including the reluctant writers. As they lined up to go back to class, they were talking about their ideas for their stories.” She continued to describe how “eager”

and “excited” her students were to complete a follow-up lesson once they returned to their classroom. “When we got back to the classroom, they were very eager and excited to start their stories. They sat and wrote for about 30 minutes, which is quite a long time for sustained writing at this time of year in second grade. Most of them actually finished drafting their stories, which is unusual for one sitting. Most of the children had a beginning, middle and end. Most followed the plan pretty closely, adding some new ideas.”

Student and Observer Reactions. The words “fun” or “liked” were the most frequently used words when students were verbally asked to describe their reactions to the ACTIVboard lessons (sixty-eight times as noted in the sixty-three data collection cards.) They gave a variety of reasons as to why they liked using the interactive technology, but the most common reasons were:

- They liked moving graphic objects around the screen with the pen.
- They liked using the ACTIVotes to indicate their choices for answers when the teachers asked quiz questions.
- They liked playing an instructional game or engaging in an interactive Web site activity with other team mates on the board with the whole class being able to watch and cheer them on.

Observers (two special education inclusion teachers and a visiting technology specialist from another school) noted the value of using this technology for tapping into multi-sensory avenues of learning. For example, when the technology resource teacher taught a lesson to fifth grade students who were learning to plot points on a grid to win a race car game, a special education teacher wrote in her observation/reflection about the lesson:

I liked it because you know there are always students who are not going across and up/down to plot points during the classroom lesson, and in a big group with everyone working at a desk, it's not always easy to see who is doing it wrong. With the ACTIVboard, we were able to watch each student plot their path and correct them as needed. Also, the students loved watching the activity so they had the reinforcement of watching others plot their points. Since they were trying to "win" the race, they were very motivated and paying strict attention. It is hands on, which uses a kinesthetic sense, so hopefully more students will remember the lesson.

The technology specialist who visited us from another school noted in her observation/reflection report to us that when ACTIVotes were used, "the students' votes were compiled and shown as bar graphs with class discussions focusing on how people used factual thinking. Students were able to make choices and shared their preferences for making responses to questions [posed by the teacher]." She also noted that the use of the ACTIVotes was especially good for reviewing previously learned lessons for tests.

Nine Instructional Strategies.

How does the use of the ACTIVboard relate to improving pedagogical skills and promoting active student learning? We looked for evidence in our data that addressed the nine instructional technology strategies that Brabec, Fisher and Pitler said are effective in promoting student achievement. We found evidence that the lessons the teachers taught using the ACTIVboard fell into each of the nine categories:

1. Similarities and Differences- Most of the ACTIVboard activities involving comparing, contrasting and classifying concepts were math, social studies and science lessons:
 - a. Students matched money words to images and values of coins.
 - b. Students used highlighting pens to show patterns on a 100's chart.
 - c. Students used clipart to show similarities and differences between the United States and Mexico (people, places and traditions)
 - d. Using images, students completed compare-contrast charts to indicate the characteristics of insects.
 - e. Students chose images to show “opportunity cost” in an economics lesson by showing two objects on a screen (such as a hamburger and a teddy bear) and asked the students which one they would want to have. Once an object was chosen, the other was dragged from the screen showing the remaining object. The object eliminated was known as the opportunity cost because it was the object that was sacrificed.
2. Summarizing and Note-taking- Graphic organizers and list charts were most commonly used for writing and reading lessons:
 - a. Completing story planners to write fairy tales or story retellings.
 - b. Completing data retrieval charts with images of animals so students could have visual reminders of ideas to use when writing about the animals.
 - c. After reading a “big book” on the ACTIVboard screen, students completed column lists of short vowel words found in the story.

3. Reinforce Effort and Recognition- Voting with the ACTIVotes and seeing how votes were cast through bar graphs reinforced correct responses. Students actually cheered when their whole class gave a correct answer. Oral discussions often occurred, giving students opportunities to discuss why they had chosen specific answers.
4. Homework and Practice- Some of the PowerPoint presentations teachers created and used with the ACTIVboard were posted on the school's Blackboard Web site for homework review. Practice activities using the ACTIVboard in school included lessons on:
 - a. Using counting back strategies using number charts.
 - b. How to study spelling words using "look, cover, write and check" spelling practice exercises.
 - c. Re-grouping in math using virtual manipulatives (ones and tens blocks).
5. Linguistic and Non-linguistic learning- Using graphics to illustrate words and concepts was the most common use of the ACTIVboard. However, having students move word boxes to complete CLOZE reading sentences was also another way for teachers to assess students understandings. Other specific lessons were:
 - a. Creating maps to include mountain ranges, rivers and lakes using a template map of the USA.
 - b. Demonstrating the concepts of "how many more?" by creating stacks of virtual blocks to compare number values.

- c. Using graphic images to convey story elements (Example- a student used an unhappy face, a deer and a skunk to convey the “problem” in the story that involved a skunk spraying a deer in the forest).
6. Cooperative Learning- Students worked in pairs, teams of students or one at a time when responding at the board. When using the ACTIVotes, they worked in pairs or alone when voting. Students had to discuss their choices with one another, giving reasons for those choices, and at times they had to “negotiate” in order to come to a compromise.
7. Setting Objectives and Providing Feedback- Using the ACTIVboard to use images or story planners to retell stories or create a story was the most common example of setting objectives. Again, the use of the ACTIVotes was the most common way to provide feedback to responses.
8. Generate and Test Hypotheses- Making observations and developing conclusions were most evident when the teachers developed PowerPoints to teach students about science and social studies concepts. For example, when showing a presentation on the Hopi Indians, students were shown pictures of pueblos built under cliffs. When asked why they thought the houses were built there, students had to discuss (collaborate with one another) to generate viable reasons and then used ACTIVotes to give their best responses.
9. Using cues, questions and advance organizers- Comparing, contrasting and categorizing activities gave children opportunities to see a preview about what they would be learning, activate prior knowledge, or review concepts previously taught:

- a. Using story planners, students used images and words to show beginning, middle and end of stories.
- b. Using VENN diagrams, students used cultural, political and economic images relating to Mexico and the U.S. to show their understandings of same and different.
- c. Students found images of creatures to show which creatures are insects and which are not insects.

What were the carry-over effects of the ACTIVboard lessons? Many of the lessons began in the ACTIVboard room and involved follow-up work in the classroom. One second grade teacher gave this example of how she saw the use of the ACTIVboard tying into two areas of effective technology uses:

We did a math lesson today in the boardroom about adding two digit numbers.

We used ten sticks on the ACTIVprimary software to add two digit numbers in the tens counting pattern. The children recorded the answers in their math book.

They took turns using the ten sticks on the board to help solve the problems.

After doing three or four problems together with the tens sticks, the kids seemed to understand the pattern. Most were able to quickly solve the problems without using manipulatives. When we returned to the classroom children independently completed a practice paper with these kinds of problems they all did very well.

This lesson incorporated two strategies: homework and practice and nonlinguistic representations.

There were also a number of unexpected examples of extended student thinking. During an observation that the technology resource teacher made during the Hopi Indian lesson, she noted:

I noticed one boy making a math problem out of each ACTIVote response. For example, in one response 6 students voted one way, and 9 students another way to the question, "Which Hopi game would you like to play? The dart game or field hockey?" After looking at the bar graph showing 6 and 9 votes, he said, "That's 6 plus 9 making 15 of us!"

During the same lesson, she observed:

A girl student offered a suggestion to her teacher after the class had just used the ACTIVotes to make a response to a question, "You should add a question to that. You should ask the children which vegetable (based on what the Hopi eat) would you like to eat? Corn? Beans? or Squash?"

In this case, the young girl was thinking like a "test creator" and thinking her teacher should be asking children to express preferences for their responses.

Limitations

For the most part students did not have trouble using the ACTIVboard pen to click and select objects on the screen. However, clicking to drag objects was a problem for some children since they had to remember to keep the pen straight, and not hold it at an angle. Also, students and teachers had to remember to stand slightly off to the side of the screen because standing in line with the light from the projector tended to cast a shadow on the screen.

The height of the board should also be considered when setting it up for primary students. Quite often we noticed very short students having difficulty dragging images or clicking on spaces that were at the top of the board. Our board sits on a stand and the legs would need to be adjusted so the board sits lower to the floor if it remains designated for primary use.

Another limitation was where the ACTIVboard was used. A room dedicated to the ACTIVboard did not allow adequate space for students. Students seemed cramped in this small room and it was often hot during the winter months. Children had to sit on the floor since there was no room for desks, tables or chairs. Getting to the board to take a turn was difficult and students did not have the opportunities to respond using manipulative objects or writing/drawing materials as they would have if the board had been in the classroom with the students sitting at their own desks. Students wanted to get started on their responses to the ACTIVboard lessons right away, and the time it took to travel to and from *The Board Room* was time consuming and this seem to destroy momentum of a lesson.

Conclusions and Implications

In addition to looking at how the use of whiteboard technology can be used to improve our pedagogy skills, we wanted to determine how this form of technology taps into the various multiple intelligences and learning styles of our students. Specifically, we wanted to learn what happens when the ACTIVboard is used to promote interactive learning and how it can be used in the development of literacy, problem-solving, creativity, and collaboration skills with our students. We found that delivery of instruction provided us with an opportunity to actively engage our students in a variety of

ways from planning stories, to reinforcing skills and learning new concepts. Students were able to move images, click on links, activate sounds and movies with a simple tap and drag of a pen and in doing so, be easily seen and heard by the rest of the class. Students engaged in collaborative problem-solving skills as they worked in partner and larger team groups, Using ACTIVote devices each class member's response to questions was counted and the votes were visually shown in bar graphs, tying wonderfully into mathematics. Most of all, using the ACTIVboard helped us make significant changes in how we teach. We were no longer front and center purveyors of information. (See Appendixes A and B, the second grade teachers' reflections).

What will be the future use of interactive whiteboards at our school? The second grade teachers would like to see one in each of their classrooms. It is evident from what they have learned and the lessons they have used and developed that it would be used on a daily basis in all subject areas. (See Appendix C for a list of the lessons tested in this study). Who knows, when we share this report and demonstrate the lessons to the rest of the faculty, there may be a stampede of teachers on their way to *The Board Room* to sign up for its use.

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Appendix A

My Experiences with the ACTIVboard
Brenda Wolters, Second Grade Teacher
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March 2005

Ever since I started teaching first and second grade, seventeen years ago, I have spent an unbelievable amount of time scrounging for visual images large enough for the children to see and with which to interact. In my first year, I created my own posters, coloring with markers on posterboard into the wee hours of the morning. I would then use rolls of clear laminate to cover the posters and let the children write on them with permanent markers. Of course, then I had to clean them off with that stinky hairspray. After working a year, I was able to buy some posters and I even had them laminated for protection. I learned to have the children use colored overhead markers to write with, as they easily cleaned off with water.

In the meantime, computers appeared in the classrooms and we were eventually able to use the Internet to find large, colorful images to print and make posters. Using the television screen hooked up to the computer to show pictures from the internet was even more exciting, except that the images still weren't large enough. The only time I was truly satisfied was when I borrowed the projector and hooked it up to my computer and displayed the pictures on the movie screen in my classroom. Yes, it was big enough, but the children could only sit and look at it. I started to miss the old reel-to-reel movie projectors. There had to be something even better!

Imagine my surprise, when I attended one of the sessions at the VSTE conference in March 2004, and, there, at the front of the conference room was a large interactive

whiteboard doing everything I had always hoped for. The images were BIG, the children could write and they could draw on the board, and they could even click and drag images across the board! They could go to a Web site and do everything that one could do at a computer. This wonderful invention was called the ACTIVboard. I was in love!

My principal, being the supportive administrator that he is, agreed to purchase an interactive whiteboard to be piloted by myself, a teammate and the technology specialist at our school. The technology specialist even helped us write a grant and we won money to buy an intriguing set of accessories for the ACTIVboard, called ACTIVotes!

Planning lessons for the ACTIVboard became a time-consuming compulsion for me. I'm sure I was more excited than the children, although they cheered every time the whiteboard was listed on the daily schedule. We happily clicked, dragged, wrote, drew and created with and on the ACTIVboard. It was everything I had ever imagined or hoped for. I taught spelling, writing, math, science and social studies using the ACTIVboard. I created some lessons, but there were hundreds of lessons and activities already available. After each lesson, I asked for the student's reactions, and invariably, they commented on how much fun it was and how well they could see everything!

A few months into the 2004-2005 school year, our ACTIVotes arrived. Each child answers questions typed on the ACTIVboard flipcharts with these hand-held mouse-sized objects. For example, if a flipchart was created about the Powhatan Indians, then at the end of the informational section, questions could be typed to test the students' understanding of the concepts/ information presented in the flipchart set. Each child can answer A, B, C, D, E, or F by pointing their ACTIVote at the ACTIVboard and pressing a lettered button. This vote is recorded into the ACTIVboard software and is tallied and

presented in graph form. Then the correct answer is given and the children are given immediate feedback on their answer.

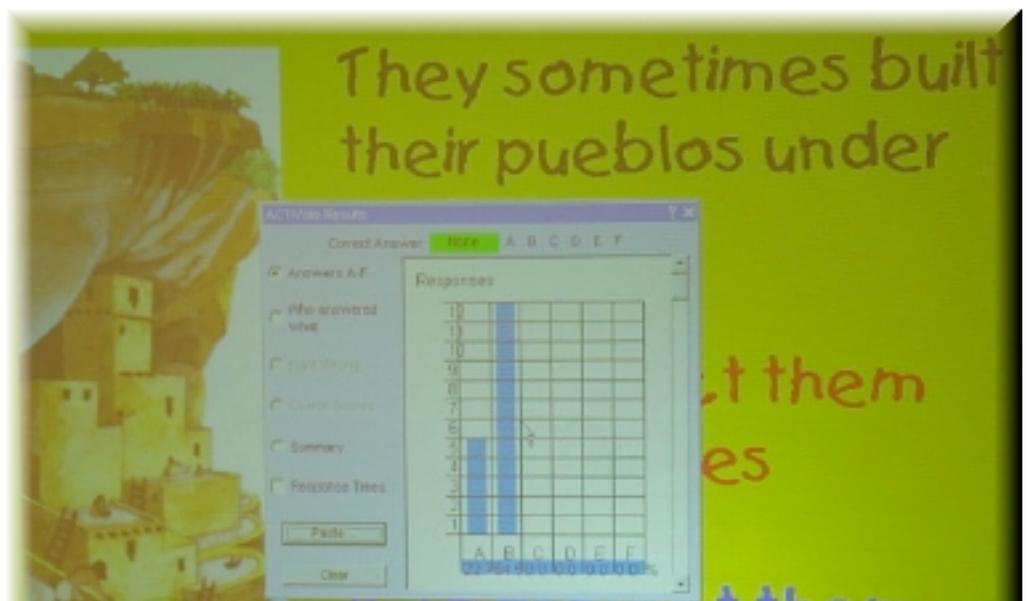
Of course, the children were thrilled with this new educational toy. They easily mastered the ability to use the ACTIVotes and were eager to share their knowledge. Imagine that! They were excited to be quizzed! The ACTIVotes enabled even shy students to contribute their answers to a group discussion. As I learn more about the ACTIVboard and its' possibilities, I'm sure I will discover even more ways to use the ACTIVotes.

So, how has the ACTIVboard and ACTIVotes impacted the learning of my second grade students? Using the nine categories of instructional strategies identified by Marzano, Pickering and Pollock, I found that six of the nine strategies were supported in MY lessons through the use of the ACTIVboard and the ACTIVotes.

Speaking specifically of the ACTIVotes, I would like to focus on strategies three and six, "Reinforcing Effort and Providing Recognition" and "Cooperative Learning". "Reinforcing Effort and Providing Recognition" deals with students' attitudes and beliefs. It discusses how important it is to reward students for achieving specific goals. The ACTIVotes do this by rewarding students because it is fun to use and gives them immediate feedback on their progress. Strategy six, "Cooperative Learning" involves using informal or formal groups as a powerful instructional strategy. As the children use the ACTIVotes there is much discussion about the answer they are going to choose. They spend a minute sharing their ideas/opinions with their classmates before choosing an answer. Sometimes they learn that they should have trusted their instincts and sometimes

they wish they had listened to the majority. But it is all learning and it is all very exciting to see.

The ACTIVboard is the most innovative teaching tool I have used since I first turned on an Atari computer in my classroom seventeen years ago. It enables me to teach students using a brand new, exciting hands-on method. The entire class can easily see everything on the board and the students can interact with the information that is presented to them. It has completely changed the way I present new social studies and science topics. Using the ACTIVotes with flipcharts hooks the child into enjoying learning because of their active role. Imagine learning about American Indians, famous Americans, the Sonoran Desert and the ancient empire of Mali sitting in a darkened room, watching larger-than-life size images of people, places and things, Not only are the images easier to see than in a book or on a computer screen, the ante is upped when I hand the child a cool tool to record their answers. When not using the ACTIVotes, students can use a stylus to circle answers, draw lines to connect like objects, and write, draw, type and access numerous clip art objects. The ACTIVboard has done more for advancing the art of teaching, and, consequently, the art of learning in my second grade classroom than anything I have ever used.



Appendix B

Interactive Teaching and Learning Using the ACTIVboard
Betsy Whiting, Second Grade Teacher
Deer Park Elementary School
March 2005

How does the use of the interactive whiteboard promote interactive teaching and learning?

How does the use of the ACTIVboard support instructional strategies that lead to the development of literacy, problem-solving, creativity and collaboration skills of students?

For years we have mainly used technology as a vehicle for kids to reinforce and demonstrate what they have already learned. A few years ago, my principal asked the technology committee, "How are you using technology for instruction?" We replied with droves of projects used to reinforce and display what the kids had learned. The kids had made slideshows in *KidPix* multimedia software. They had created projects using the software *Claris for Kids*. The list went on and on. She repeated, "How are you using technology for instruction?" After much thought we named Windows On Math and Windows On Science laserdisc technology, and one or two other software titles that actually helped teach information. It was an "Aha" moment for me. Since then I have given much thought to the question.

After receiving a laptop last year from my school district, I latched onto PowerPoint, excited about the possibilities for using technology for instruction. The one thing that I was not satisfied with was the quality of a presentation, interactive or demonstration, on a tiny little TV screen way above the eye level of the students. Then, last spring I saw a demonstration of the interactive whiteboard at the state technology conference. The possibilities for positively impacting student achievement were

immediately obvious. The interactive whiteboard is big enough for all to see. It is truly interactive because students become actively engaged with the screen itself. Students can manipulate information directly on the screen by using an electronic pen to drag images, write or draw, highlight information and activate links to cause actions or sounds which then can be seen easily by everyone in the class. This is different than traditional passive viewing of information such as a math problem, spelling word or concept presented on a T.V. screen projected from a laptop. When viewing information from a large T.V. monitor, students could only respond by mimicking what they see and hear by manipulating concrete materials or writing on paper at their desks. Students can also interact with the ACTIVboard with wireless devices called ACTIVotes. Each child has a wireless device that can be used to answer questions. Talk about truly interactive and engaging! Every single child in the class can become involved with the lesson and can respond to every single question posed by the teacher.

We started slowly, by introducing the kids to the whiteboard and showing them how to use the pen. The children learned quickly and we were able to easily move on to lessons directly related to the curriculum. The kids were enthusiastic. Each day as I reviewed the daily schedule, the children cheered every time I announced that we would be taking a trip to the “boardroom.” I documented each lesson taught on the board and the follow up activities and lessons in the classroom in my research journal. In my special education inclusion classroom, I began to notice patterns of involvement and achievement by children identified with special needs, and by children who were not formally identified, but who I suspected had some special needs. I noticed the same kinds of patterns with the average learners. Reluctant writers were becoming involved in the

writing process. Students with severe processing deficits were quickly performing math computations. Students with attention difficulties were listening, paying attention and participating in lessons. Many students were asking questions and making comments that reflected a deeper level of thinking than I had previously seen.

We entered this research project to look for evidence that the interactive whiteboard truly does have a positive effect on student achievement. Specifically, we wanted to look at how the interactive whiteboard would lend itself to the nine research proven instructional technology strategies influenced by a meta-analysis of research on instruction conducted by Robert Marzano (1998) as noted in the article *Building Better Instruction: How Technology Supports Nine Research-Proven Instructional Strategies* (Brabeck, Fisher & Pitler, February 2004). In my own research, I found all nine strategies were evident, but that there were two in particular that were easily integrated with our second grade lessons using the whiteboard and that they are key strategies used to help second graders learn. They were “non linguistic representations” and “similarities and differences.”

The “Nonlinguistic Representations” strategy is one that most primary teachers realize is extremely important, but one that has always required much work to prepare and include in lessons. The board made this easy to do. For example, I have always taught ordinal numbers by gathering 20 objects from the classroom and my home, displaying them in front of the classroom, then having kids label them with ordinal numbers. On the board, I dragged 20 objects onto the screen and the kids labeled them. It took much less time and the kids understood the concept with no problems. We used the board to show PowerPoint presentations about American Indians and forest animals

and famous Americans and Ancient Mali and the list goes on and on! We brought in photos from the internet of actual people and animals and artifacts related to these areas of study. We used virtual manipulative objects to teach math lessons. We used pictures in the software *Kidspiration* to plan stories for writing workshop. Using pictures and tactile activities to teach second graders is a strategy so important to teaching second grade that it is probably used by many teachers who do not know of its research proven background. The interactive whiteboard makes it easy and natural to use this strategy in lessons across the curriculum.

The second strategy from the effective instructional technology research that I feel is so important to second grade teaching and learning is “identifying similarities and differences.” Comparing and contrasting ideas is a powerful way to help children understand concepts. Again, the whiteboard made it easier than ever to use this important strategy. We could look at large pictures of actual coins, and compare their physical characteristics to help the kids remember which coin is which. We dragged pictures of different animals onto a T-chart labeled “insect/not insect” and compared the physical attributes to help us do the sorting. We compared photos of people from Mexico to ourselves and compared their clothing shelters and food to our own. We used a gigantic 100 chart to highlight numbers and find patterns within those numbers. Again, this strategy could easily be applied to lessons across the curriculum.

These examples show that the interactive whiteboard not only had a positive effect on student academic performance, but I found it very easy to integrate lessons on the board with the content and instructional strategies that I had been previously using. Of course, research proven strategies are very important to good instruction, but anybody

who has ever taught in the classroom knows that no matter what the research says, kids have to be engaged, motivated and having fun. Again the interactive white board fills this requirement. The students (as well as all the teachers in our study) have loved every minute of our time in the “Boardroom.” We are learning together and I see this technology as the future for teaching in primary grade classrooms. Someday I hope there will be one in every classroom.

Resources:

Brabeck, K., Fisher, K., & Pitler, H. (2004). Building better

instruction: How technology supports nine research-proven instructional strategies. *Learning and Leading with Technology*, 31(5), 7-11.

Marzano, R.J. (1998). *A theory-based meta-analysis of research on*

instruction. Aurora, CO: Mid-continent Research for Education and Learning.

Appendix C

ACTIVBoard Lessons Used in the Study

Language Arts: ActivPrimary software

1. Short Vowels

Library, Literacy, Word Bank, Onset rhymes

Drag short vowel patterns onto the screen, then have students use the pencil tool to write words that fit the word pattern.

2. Long Vowels

Library, Literacy, Phonics by term, Y1 term 3

Drag words that fit the long vowel patterns onto the screen, then have students use the pencil tool to write other words that fit the word pattern.

3. Short Vowels

Activities Explorer, Literacy, Big books, Ant and Grasshopper

Do a shared reading of the story, then use the highlighter to select short vowel words.

4. Spelling/Look, Cover, Write, Check

Type each spelling word on a blank flipchart. Use the spotlight tool to show one word at a time and discuss how it is spelled. Cover the word and have students write it.

5. Verbs

Library, action verbs

Drag pictures of actions onto the screen and have students write the verb with the pencil tool.

6. Their/there and Where/were

Activities explorer, primary literacy

This activity gives cloze sentences in which the students have to choose the correct form of the word.

7. Alphabet Jigsaw

Activities Explorer, Games, Alphabet Jigsaw

This activity requires students to put together a jigsaw. Each piece of the puzzle has a letter of the alphabet and a picture of an object that starts with that letter.

8. High Frequency Words

Library, Literacy, Word bank, R-y1 high frequency

The teacher says a word and the student has to find it and drag it onto the screen.

9. Writing Process/Prewriting

Kidspiration

Use a story plan graphic to drag pictures that show characters, setting, problem and solution. Print a copy for each student and they can use it to write a draft of a story.

Mathematics: ActivPrimary software:

1. Hundred Chart

Activities Explorer, Primary Numeracy, Y2-count to 100

Although this includes a ready-made activity, it is useful because it shows a large hundred chart on which you can highlight patterns, skip count, add and subtract.

2. Count On/Count Back

Activities Explorer, Primary Numeracy, Numberline

Use the numberline to reinforce counting on and counting back when solving addition and subtraction facts.

3. Plane and Solid Shapes

1. Library, Numeracy, Shapes

The shapes can be used to introduce shapes.

2. Activities Explorer, Primary numeracy, KS1-shapes

This activity is a question and answer review of plane and solid shapes.

4. Number Order

Activities Explorer, Primary numeracy, number order

In this activity you can choose 1, 2 or 3 digit numbers and practice putting a group of numbers in order.

5. Addition and Subtraction

Library, Numeracy, Blocks or Counters

Use these as virtual manipulatives to solve addition and subtraction facts.

6. Place Value

Library, Numeracy, Place Value

Use these as virtual manipulatives to solve addition and subtraction facts and to make two-digit numbers.

7. Doubles

Library, Numeracy, Counting

Use these pictures to show doubles. Use the pencil to write the addition or subtraction fact that goes with the picture.

8. Money

Library, Numeracy, Money

Use these coins to practice counting money.

Science: ActivPrimary Software

1. Food Chains

Activities Explorer, Secondary Science, Food Chains

Follow the directions to create and learn about food chains.

2. Force

Activities Explorer, Secondary Science, Forces

Simple physics activities using push and pull

3. Magnets

Activities Explorer, Secondary Science, Magnets

Study of the north and south poles of the magnet

4. Animal Habitat

Resource Library, Activities and Games, Colouring In, choose a habitat background and add appropriate animals from Resource Library, General and Animals folder to add to the habitat.

5. Insect/Not an Insect

Resource Library, General, Animals, Invertebrates

Click and drag insects to review insect characteristics.

6. Teacher Created Flipcharts Activstudio 2 software

- ❖ Forest Critter Quiz - a review of forest animals (used ACTIVotes)
- ❖ Sonoran Desert - and introduction or review of the desert (used ACTIVotes)

Social Studies:

Teacher Created Flipcharts-

- ❖ ActivPrimary Map of the world - a review of continents and oceans
- ❖ ActivPrimary Map of the USA - a review of Virginia and the surrounding states
- ❖ Activstudio 2 Hopi Indians - an introduction or review of Hopi Indians (with ACTIVotes)
- ❖ Activstudio 2 Powhatan Indians - an introduction or review of Powhatan Indians
- ❖ Activstudio 2 Sioux Indians - an introduction or review of Sioux Indians (with ACTIVotes)
- ❖ Activstudio 2- Punxsutawney Phil - a Groundhog Day celebration (with ACTIVotes)

Interactive Web site- <http://www.nativetech.org/games/index.php> (learn about Native American art, games and clothing)

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