Interactive Whiteboards: A Tool for Enhancing Teaching and Learning

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Abstract: Data indicates that the United States lags behind in the introduction of interactive whiteboards into K-12 classrooms (Decision Tree Consulting, 2008). Early research indicates that elementary students benefit significantly from interactive whiteboards. This is consistent with long-term learning studies and conventional wisdom of education experts over many decades. With school districts facing stringent consequences for failing to meet Adequate Yearly Progress, it is vital for teachers to engage students in the learning process. Recommendations include proposals for United States public policy makers to fund extensive interactive whiteboards into classrooms in conjunction with other current education considerations.

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INTRODUCTION

Interactive whiteboards are the cutting-edge technology in education today. They are by far the most sought after, popular current technology tool for the classroom. Decision Tree Consulting (DTC), a London-based market research firm, who documented interactive whiteboard sales from 2000 to 2007, revealed that the number of classrooms around the world that have interactive whiteboards has grown dramatically. Decision Tree Consulting (2008) expects this growth to accelerate and forecasted that interactive whiteboard sales will increase by 200% worldwide in the next five years which means one in seven classrooms will have an interactive whiteboard by 2011.

In the United States, the use of whiteboards in educational settings lags behind several other countries. In the United Kingdom, about 60% of classrooms have interactive whiteboards; in the United States, that figure is about 12%. However, DTC projected that figure to grow considerably in the United States over the next five years (DTC, 2008). New policies support this predicted trend.

UNITED STATES PUBLIC POLICY AND INVESTMENT IN INTERACTIVE WHITEBOARDS

In his 2011 State of the Union Address, President Barack Obama spent a significant amount of time speaking about education and technology. "Maintaining our leadership in research and technology is crucial to America's success. But if we want to win the future -– if we want innovation to produce jobs in America and not overseas-–then we also have to win the race to educate our kids" (Obama, 2011). In addition to speaking about the importance of education and technology, President Obama recently allocated $919 million in State Educational Technology Grants specifically for states to encourage and incorporate new technologies into the classroom (United States Department of Education, 2009). In an effort to upgrade the nation's "infrastructure" as part of an economic stimulus plan and as an Illinois state senator and United States Senator, Obama consistently voted to increase funding in education. Obama has supported an increased focus on teacher training and early childhood education. Given this

federal spending impetus and the early research data, it is increasingly clear that interactive whiteboards have the potential to become a major tool in revamping American education. Interactive whiteboards can have a widespread impact by positively affecting learning environments in terms of learners who are engaged, teachers who develop curriculum and content that is accessible to all.

Existing research indicates that the anticipated federal investment in education infrastructure should include a significant focus on interactive whiteboards. The funding should be directed at purchase of the equipment, training teachers and support staff in its operation. Continuing education and certification for teachers should also be part of any funding initiatives for training teachers in how to use interactive whiteboards.

HOW AND WHY INTERACTIVE WHITEBOARDS WORK

Widely respected child development expert Jean Piaget's work helps us understand why interactive whiteboards have the potential to revolutionize education. Piaget (1959) reasoned that cognitive performance cannot be achieved unless cognitive readiness is brought about by maturation and environmental stimuli. For millions of students, interactive whiteboards can provide the environmental stimuli identified by Piaget as a necessary prerequisite to learning.

In essence the interactive whiteboards allow teachers and students to display pre-designed presentations on the larger screen in vivid colors. Teachers and students can enrich presentations by including relevant video clips, images, animations, or other built-in digital enhancements.

Interactive whiteboard screens illuminate and display larger versions of companion computer screens. Interactive whiteboards therefore can be used to display anything that can be displayed on a computer screen such as websites and educational software. Users can record instruction using an interactive whiteboard to post to a website for later viewing. Also, one interactive whiteboard offers access to a built-in gallery of a variety of items including up-to-date maps of countries, a protractor, and dice that actually roll with the touch of a finger (*Installation and User's Guide*, 2007). These built-in tools have the potential to actively engage students in the learning process.

POTENTIAL EFFECTS OF INTERACTIVE WHITEBOARDS ON LEARNERS

Children learn best when they are involved in the process of learning itself (Piaget, 1959). Piaget's cognitive theory posits that children organize patterns of behavior and thought as they interact with their environments. This allows for adaptation to environments and a good fit between conceptions of reality and real life experiences through assimilation and accommodation. Consequently, children develop intelligence through meaningful, related interactions within their environment.

Snowman and Biehler (2006) maintain that children learn best when they are motivated. Early reports on interactive whiteboard studies indicated an increase in student motivation. Bransford, Brown, and Cocking (1999) similarly found that engaged learning correlates positively with increased learning. Beeland (2002) claimed that the answer to the question of whether use of interactive whiteboards impacted student engagement was an unequivocal, "Yes," and determined that the use of interactive whiteboards in classrooms led to increased student engagement. These findings were confirmed by Richardson (2002) who found that the interactive whiteboard enhanced motivation and enthusiasm, which positively affected learning in the classroom.

According to Richardson (2002), interactive whiteboard activities not only increased students' self-esteem, but improved their sense of achievement. Merrett and Edwards (2005) found evidence of increased achievement, specifically in mathematical thinking skills of the students in the classrooms with interactive whiteboards, as a result of the students' increased confidence and motivation to learn mathematics. Marzano and Haystead (2009) research results indicated, in general, using the interactive whiteboards was associated with a 16 percentile point gain in student achievement. The interactive whiteboard allows for teachers to record important points and post the key comments which students can review at a later time. This option provides much-needed opportunities for repetition for English language learners (Echevarría, Vogt, & Short, 2010).

Beginning each class with a warm-up or mini-lesson review keeps key skills fresh and reinforces previous taught concepts (Leinwand, 2009). Also, it is an effective strategy for focusing students' attention as they enter the classroom; as well as, efficient use of every instructional minute. The interactive whiteboard provides the tool for managing a deliberate and carefully planned review. "The statistics indicate that kids prefer to learn in a visual world and like to have information at

their fingertips. Across the board, the latest and greatest classroom display products meet these needs" (Villano, 2006, p. 1). Also, calling on students more frequently promotes their achievement while maintaining a lively classroom with an interactive dialog creates a positive learning environment (Posamentier & Jaye, 2006). The interactive whiteboard supports instruction that is specially designed to be inclusive, to address individual needs, and to match a variety of learning styles.

Amolo and Dees (2007) determined that students were overwhelmingly excited using the interactive whiteboard and impressed with the seamless incorporation of various data sources all in one presentation. Students were more attentive and motivated to learn. Student achievement improvement was statistically significant (pre-intervention student grades mean was 60.81 (*SD*=14.56) and post-intervention student grades mean was 92.96 (*SD*=5.94)) compared to students without an interactive whiteboard in the classroom. While the interactive whiteboard is impacting students' enthusiasm for learning, they also have the capability to influence how teachers are approaching instruction.

POTENTIAL EFFECTS OF INTERACTIVE WHITEBOARDS ON TEACHERS

Instruction with interactive whiteboards shifts from a more traditional lecture-based approach to a student-centered environment. Merrett and Edwards (2005) determined that the whole-group interactive whiteboard lessons stimulated greater student interaction as compared to students working independently on laptops. Painter, Whiting, and Wolters (2005) found that as a result of using an interactive whiteboard in the classroom, the role of the teachers changed from front and center purveyors of information to facilitators within student-centered classrooms. This perceived shift in teaching methodology from a more traditional, lecture-based education to a student-centered classroom is consistently verified in research that confirms most children learn through student-centered discovery rather than teacher-directed activities (Snowman & Biehler, 2006).

Smith, Hardman and Higgins (2006) and Higgins et al. (2005) examined the data generated by the United Kingdom's Primary National Strategy's "Embedding ICT" pilot project which sponsored a large-scale evaluation of the impact of interactive whiteboards in more than 70 primary schools over a two-year period. Smith et al. (2006) reported that the data indicates that students experienced more whole-class teaching and less group work in classrooms with interactive whiteboards. However, the observed lessons involving interactive whiteboards were similar in that both included more open questions, answers from students, and evaluations from teachers. Together these contributed to a faster pace to the lessons.

Henrico County Schools (2010) reported the findings of a study of Promethean Whiteboards in Classrooms. Among its conclusions, the report found that teachers in classrooms with interactive whiteboards engaged learners in learner-centered activities more often than their "match classes." (Match classes were classes in the same schools which shared certain attributes but did not have the whiteboards.) In addition, learners were more engaged in classrooms with the boards than their peers in match classes. Teachers in classrooms with the boards monitored student learning more often by asking questions. Also, teachers in the interactive whiteboard classrooms tested learners at higher test levels than did teachers in match classrooms. The Henrico County Schools (2010) report concluded that the study did find benefits from use of the boards.

A case study conducted by Wood and Ashfield (2007) supported these results. All of the participants in the study stated that use of the interactive whiteboard enhanced whole-class teaching and learning. The study found that the functions of the device itself allowed access to better quality resources to insert in lessons and greater speed in lesson delivery.

The physical installation of interactive whiteboards into the classroom is a small initial step in integrating the technology into the classroom experience. Armstrong et al. (2005) discussed the results of an Economic and Social Research Council (ESRC) funded study of the interactions between students, teachers, and technology that occur in the classroom and emphasized that teachers are crucial in appropriate use of the technology and the promotion of quality interactions and interactivity in the classroom setting.

Teacher training and support in using the interactive whiteboards are critical components for effective implementation. Wood and Ashfield (2007) supported this idea and added that in order to properly utilize interactive whiteboard lessons in a classroom, extensive training and time for lesson development are necessary. Wood and Ashfield (2007) noted that simply having the technology in the classroom was not enough. Instead, it was critical for teachers to have a solid understanding of how the technology works and how to integrate it into whole-class teaching to facilitate student learning. Clyde (2004) likewise emphasized the need for skilled teachers

in order to effectively use the interactive whiteboard.

POTENTIAL EFFECTS OF INTERACTIVE WHITEBOARDS ON CONTENT

Interactive whiteboards positively impact students with discreet learning styles and have the ability to make content more accessible to learners with varying educational needs. Cuthell (2005) reported that the boards enable teachers to support a wide range of learning styles in the classroom. This is a significant statement as it reflects extensive research conducted over a four-year period (2002-2005) by an outside educational technology specialist, not a classroom teacher.

Several studies indicate that students with visual, tactile, and kinesthetic learning styles especially benefit from use of the interactive whiteboard (Beeland, 2002; Carter, 2002; Clemens, Moore, & Nelson, 2001; Wall, et al., 2005). Beeland (2002) stated that those who best learn as tactile or visual learners greatly benefit from using an interactive whiteboard in the classroom. Wall et al. (2005) agreed that the movement and colors of the presentation positively impact the visual learners' attention and motivation. The larger font sizes and bright colors may assist students with special visual or attention-based needs.

In addition, kinesthetic learners will benefit from the effects of touching the whiteboard and dragging and dropping objects on the screen. Mathematics students, especially those who experience difficultly in visualizing mathematical properties such as geometry, benefit from seeing the manipulations on the interactive whiteboard according to Clemens et al. (2001).

Interactive whiteboards also allow teachers to record and post instruction for later viewing by students. This is especially helpful for absent students or those in need of repetition or re-teaching, such as English language learners. The interactive whiteboard allows students to see the exact presentation that occurred in the classroom including teacher audio, thus extending the classroom experience to the world at large.

CONCLUSION

President Obama inherited an education system in need of strengthening and enhancement (National Assessment of Educational Progress, 2009). Less than one-third of America's youth demonstrates proficiency in reading on state standardized testing. Mathematics scores decline considerably once students enter high school. High school drop-out rates increase, as does a substantial achievement gap among minority and low income students as compared with their peers. Baird (2008) posits that the majority would agree that these unsatisfactory statistics are a reflection of stagnation in learning trends, one of the most critical issues facing education.

Many schools face stringent consequences for failing to meet Adequate Yearly Progress under *No Child Left Behind Act* (2001). Schools must engage students in the learning process now more than ever. Interactive teaching that incorporates the latest technology has the potential to play a critical role in transforming America's classrooms. Over the past few years, interactive whiteboards have become increasingly popular and it appears that their use will continue to grow (Becker & Lee, 2009).

Interactive whiteboards, cutting-edge technology tools, have the potential to enhance instructional practices in the classroom and in turn improve student achievement. With interactive whiteboards, students and teachers together can reach out and bring a world of learning into their classrooms. Interactive whiteboards, along with research-based instructional practices in the classroom, have the potential to increase student and teacher interactivity which has the greatest impact on teaching and learning.

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