

Teachers' Perceptions Regarding the Use of the Interactive Electronic Whiteboard in Instruction

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Abstract

The purpose of this study was to investigate teachers' use and perceptions regarding the interactive electronic whiteboard as an instructional tool. A 67-item survey was posted on the internet and completed by 30 participants. The questionnaire included 16 questions about demographic information and 60 Likert scale questions related to five hypotheses which predicted that teachers and students would offer favorable opinions about various aspects of its use. Respondents were whiteboard users familiar with the equipment, its uses, and its unique characteristics. The interactive and collaborative qualities of board use were regarded as important reasons for using the equipment. Outcomes indicated a high degree of user satisfaction with most aspects of the board and its use.

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Chapter One

Introduction

The growing presence of computers in schools, businesses and homes is a trend which will continue to evolve in coming years. Attendant to the increased emphasis on the use of computers is the proliferation of choices regarding other devices utilizing technology in instruction. One area of particularly intensive development is that of presentation devices and systems. As presentation devices gain popularity with teachers and trainers, there is an increased demand for software which lends itself to use in this medium. Research leading to best practices for use of technology

in instruction should point the way to choices for what hardware and software to purchase and how to use new technology in creative and exciting lessons to which students will respond positively.

While it is true that many new applications and tools exist and will continue to evolve which offer instructional applications using technology, it is also true that many teachers still need to be convinced of the value of these innovations and trained in their use. In some cases, instruction presently offered is of the rote variety, which fails to use equipment to its capacity and may fail to inspire teachers. Technology can and should be incorporated into the teaching styles of many teachers who have previously been hesitant to test the waters using computers for instruction. For these reasons, the interactive whiteboard is a device which is gaining popularity as a visual presenter and interactive teaching aid for use in multimedia instruction.

Statement of the Problem

One way to assess the value of the interactive electronic whiteboard was to survey current users. The board has been touted as a tool which can improve student learning (New and Existing, 1998). Its effect on teacher enthusiasm was also a focus. (Scalet, 1997). Student reaction and response to instruction using the board was cited as a third area of interest (Weiser, 1996). In particular, its collaborative and interactive qualities were praised (Kouzes, 1995). A survey could provide answers to questions about the perceived value of the equipment, which features are particularly useful, how the boards are being used, and what problems have occurred related to use. Particular emphasis was placed on the board's effectiveness as a teaching tool, and its effect on student learning. This study was designed to go beyond product reviews and provide information about the board's usefulness by those who are most involved: teachers and instructors actively using it in their lessons.

Purpose of Study

The purpose of this study was to survey users of the electronic interactive whiteboard as to their perceptions regarding its use in instruction. The interactive whiteboard can offer certain features which lend it to effective group presentations:

1. Any notes, diagrams, or other images shown on the surface can be printed out and given to students. Students' personal notes can be augmented by distribution of presentation notes to all participants.
2. The use of color marking on the board in the note-taking mode or in conjunction with other programs running on the board can provide an important dimension in focusing student attention on the board as it is used.
3. Students and teachers can use the whiteboard interactively. Users can write on the board once an image has been projected on it, and the teacher can add comments or notations at the computer. Students or the instructor at the board can use the markers or their fingers to press on the board and interact with it as one would with a traditional screen and mouse.

The interactive quality of the board can lend itself to a degree of student participation not offered by other presentation methods such as the chalkboard or overhead projector and screen. Because it is a relatively new product which has only recently been viewed as an affordable option for use in public schools, there is a lack of research regarding its impact on instruction. The interactive electronic whiteboard shows promise in demonstrations but needs assessment in practice to determine its instructional value. Gathering the opinions of teachers and trainers who have experience using the board was one way to begin to evaluate it objectively.

Significance of Study

Decisions regarding instructional methods and acquisition of new technologies should be reached only after serious study and consideration. Dr. Linda Roberts, director of the Office of Educational Technology at the Department of Education, recently called for educational research to explore use of technology in teaching (Roberts, 1998). The interactive whiteboard has gained recognition

as an attractive instructional aid, receiving awards in technology reviews and appealing to schools through special pricing and incentives. While literature exists to describe features of the equipment to be tested and to offer instructions regarding use, little research has been conducted to examine its effectiveness as a teaching tool. This study examined the whiteboard's use by surveying teachers and trainers currently using the boards and by reporting their opinions about the board.

Hypotheses

1. Teachers and trainers presently using the interactive electronic whiteboard would express satisfaction with its ease of use.
2. Teachers and trainers presently using the interactive electronic whiteboard would express enthusiasm regarding its effectiveness in lesson delivery.
3. Teachers and trainers presently using the interactive electronic whiteboard would describe student reactions to whiteboard presentations as attentive and enthusiastic.
4. Teachers and trainers presently using the interactive electronic whiteboard would express a preference for its use for group presentations over the use of more traditional methods such as lecture, chalkboard presentations, or overhead projector and screen.
5. Teachers would state that the interactive quality of the interactive electronic whiteboard gives it particular value as a teaching tool.

Assumptions

1. It was assumed that all respondents would have first-hand experience with the use of an interactive electronic whiteboard.
2. It was assumed that respondents were familiar with the board's various features.

Limitations

1. Because this equipment has only recently been used in classroom instruction, particularly in public schools, the survey had to be distributed to all users who could be located rather than to a randomly selected group.
2. The cost of the equipment precluded its use in some settings and has been a limiting factor on what institutions have acquired boards and upon the number of boards available at any given location.
3. Survey respondents could be using one of several brands or models of the interactive whiteboard. Differences in the various boards' features and capabilities affected responses to some questions.
4. Since it was likely that respondents had some or all responsibility for incurring considerable expense in order to obtain the board and become adept in its use, there was a likelihood of bias in favor of positive reactions and evaluations of the board and its use.

Definition of Terms

Interactive Learning

In interactive learning situations, the learner is a participant in the process rather than a spectator (Bork, 1978.)

Interactive Electronic Whiteboard

The electronic interactive whiteboard is an electronic device which interfaces with a computer. The computer images are displayed on the board where they can be used interactively (Weiser, 1996). Notes can be added, points of interest highlighted, and programs manipulated as one would a giant touch pad. Resulting notes, drawings, etc. can then be printed out from the computer or saved for future reference.

Video Presentation Device

Video presentation devices place objects to be viewed on a surface such as a screen or board. They can be connected to a computer, VCR, or other projection tool. Images may be displayed large enough for a group to view (1996).

Video Projector

The video projector can connect to a computer, VCR, or laser disk player and project a bright, sharp image on a large surface such as a screen or wall (Weiser, 1996).

Document Camera

The document camera is a presentation tool which, when connected to a video projector, television, or computer, can display either a flat or three-dimensional object. When used to display documents with the whiteboard, students can view and annotate the document projected on the board (Willis, 1997).

Electronic Mailing List

A electronic mailing list is an Internet e-mail list which usually focuses on a single topic and whose members subscribe as they might subscribe to a newspaper. Messages are sent to a central mailbox and automatically forwarded to subscribers (Jonassen, 1996).

Organization of the Study

This study is organized into five chapters. The first chapter includes an introduction, statement of problem, purpose of the study, and its significance. Also included in Chapter One are hypotheses, assumptions and limitations, definitions of terms, and this statement of organization. Chapter Two provides a review of related literature. Chapter Three includes the type of research design, sampling procedure, data-gathering instruments, collection procedure, and statistical analysis used in the study. In Chapter Four, data analysis and appropriate discussion are presented. To conclude, Chapter Five includes a summary of the study, conclusions drawn from the study, implementations of the investigation, and recommendations for further study.

Chapter Two

Review of literature

Few would argue that technology has dramatically changed almost every aspect of our society, including education. With these dramatic developments have come examinations of how best to utilize emerging technologies in education, or indeed whether or not to embrace them at all. As long ago as 1978, Dr. Alfred Bork described the computer as an instrument of revolutionary change in education. He stressed the need for students to interact with computers and thus be engaged in the learning process as opposed to being passive recipients of knowledge dispensed by the teacher.

As technology has continued to evolve, its tools have become increasingly complex and capable. Michael Dertouzos referred to the importance of computer interfaces with other devices and to the development of "smart" tools which would be components in intelligent rooms, where computers will be embedded in all aspects of one's environment (1997). Dertouzos' associate at MIT's Learning Lab, Nicholas Negroponte, described "intelligent environments" where computerized components of one's surroundings have the capability to sense human presence and automatically react appropriately (1995). Seymour Papert, also from MIT, joined in the description of how computers play a part in education. He coined the term "mathetics" in the 1980's to refer to the manner in which students learn, as opposed to "pedagogy," which describes the manner in which educators teach. He stressed the importance of giving students control of their learning as previously heralded by Piaget, Vygotsky, and others (1993). By allowing students control of the learning process, affording them opportunities to collaborate with one another, and encouraging them to interact with computers and other smart devices, educators can use technology in the classroom in the context of new ideas and views of the learning process.

The interactive electronic whiteboard has gained recognition and popularity as a teaching tool when used with computer and video projector. The board can be used to involve groups in lessons displayed on the board. Because students actively participate in these lessons, the board

can serve as a valuable tool in an interactive learning environment. The board itself is touch-sensitive, so that students can manipulate applications at the board as if it were a giant touch pad. They can also add notes to any display, make annotations, or compose original documents which can be saved, printed and distributed, or sent electronically to recipients in other locations. The user can control any application by touching the board with a finger, and can mark with tools such as a stylus, dry-erase marker, or finger ("Devices that spark," 1996). The interactive whiteboard has the "smart" qualities described by Dertouzos in that it interacts by interface with a computer and in the manner in which it allows interactivity between the computer, the board, and users at both locations (1997).

The whiteboard itself without interactive ability can trace its history back only a few years, and originally differed little from other marking surfaces such as chalkboards or flip charts. Early reviews praised its ability to introduce color into marking presentations and to eliminate the problem of chalk dust (Lee, 1992). Whiteboards began to offer unique capabilities in the early 1990's with the ability to save written documents to a computer's hard drive and provide instant print-outs of board displays. As such, it was touted as a useful tool in conferencing and was reviewed in a number of business and technical publications and in educational journals. Product reviews as early as 1993 praised the whiteboard as an interactive learning tool (Filipczak, 1993). Early descriptions stirred interest in the whiteboard as an attractive medium for providing group participants with shared notes at the end of a class or session ("Devices that spark," 1996). The evolution of the whiteboard as a smart tool had begun.

The next step in the whiteboard's development was its growing popularity in distance communication. The whiteboard came to be so frequently used in distance communication and business situations that it now appears ubiquitous. While boards gained favor in the business world, cost was a factor which kept interactive whiteboards out of classrooms for several years. This began to change as recent price reductions and special offers to educators by manufacturers have caused considerable interest in the educational community (Project, 1998). As the cost became more reasonable, universities and public schools began acquiring and using boards in growing numbers.

Numerous schools and universities have incorporated use of the interactive electronic whiteboard, and it has found favor in educational journals. While product reviews have been favorable, little scholarly research has been done regarding the use of the board (Sugar, 1995.) The purpose of this study was to observe students interacting with one another as they used the board as a shared learning environment. The emphasis was on the students and the characteristics of their interactions rather than on the nature and value of the board itself. It was noted in the conclusions, however, that the board offered unique qualities which would merit additional study.

Because of the importance of the interactive and collaborative aspects of the electronic whiteboard, the qualities of collaboration and interactivity were explored in preparing this study. Two key components of constructivist instructional design and methodology related to technology and learning are learner control and collaborative learning (Duffy, 1996). When learners manipulate applications from the board and enter their own written contributions at the board, they enjoy a level of control not afforded by other presentation devices. Furthermore, since by necessity there must be at least one participant at the computer and one or more at the board in order to use as intended, collaboration is inherent in the use of the interactive whiteboard. This collaboration was lauded by Hanke (1997), who pointed out that while computers will continue to grow as valuable teaching tools, there will still be a need for human interaction.

No single approach should be the sole structure by which instruction should be presented in today's classroom, but certainly valuable components of a successful blended curriculum should include the combination of collaborative, individualized, and competitive approaches. Indeed, Hertz-Lazarowitz and Miller viewed collaboration in schools important enough to be deemed an

end in itself as well as a means to other ends or learning objectives (1992). When collaborative exchange occurs in the classroom, teacher and learner continue to be involved in a vital process even as technology continues to evolve (Hanke, 1997).

A recent study of interactive computer use in a collaborative learning environment by Singhanayok and Hooper showed increased learning by both high and low achievers when compared to lessons delivered by more traditional means. The researchers concluded that future studies should focus on learner control and collaboration in computer-aided instruction (1998). Inkpen's recent dissertation further demonstrated the value of collaboration in student computer work. Her study showed that students demonstrated increased learning when working collaboratively at computers as opposed to doing the same work on their own at individual computers. The fact that the interactive electronic whiteboard offers opportunities for teachers and students to participate in collaborative endeavors with increased learner control was a compelling reason why the use of the board should be evaluated through research.

Using the interactive whiteboard with computer applications which engage students and enhance sharing elevates it to a medium exhibiting several of the properties cited by David Jonassen when describing a "mindtool." Jonassen defines mindtools as computer applications which encourage critical thinking, assessment of information, and organization of personal knowledge. The board can display any software application and allow for its shared use, thus providing the collaborative quality of a mindtool, which allows each student to have personal and individual responsibility for creating his own understanding (1996). Instead of a classroom setting where students passively receive information, the shared use of the whiteboard offers an environment where students and teacher can interact and communicate as a topic is explored. Immediate feedback can be displayed on the board as students mark and the teacher responds, with all contributions immediately visible to all participants. At the end of a discussion, mutually shared and developed work can be printed out for future reference or revision. Jonassen also stressed the importance of collaboration as a tool for developing critical thinking skills among students (1996), and the whiteboard can be a promising vehicle for such interchange. Moreover, the board can provide an excellent medium by which students can use the applications Jonassen favored as mindtools, such as mind mapping applications and databases. Thus, the interactive whiteboard can provide an ideal interface with which to employ mindtools.

One way to begin the process of evaluating the interactive electronic whiteboard as an instructional tool was to go to teachers and trainers currently using boards and gather information. Questions about board use and about its value as an instructional tool could yield responses offering insights regarding best practices for its use. The survey conducted for this study was intended to be one component of such an evaluation.

Chapter Three

Research Design

The purpose of this study was to investigate the use of the interactive electronic whiteboard in instruction. Information for this study was gathered by survey. The survey was composed and then was posted on the Internet with the use of FilemakerPro survey software. Since the interactive electronic whiteboard is a new device with relatively few users, it was necessary to solicit responses from individuals presently having access to the board and using it in instruction. Such respondents were located by posting queries to various Internet mailing lists, by contacting school district personnel in districts known to use the boards, and by referrals from board distributors. The survey was composed of short answer questions regarding demographics and board use, Likert scale questions about user satisfaction and use, and open-ended questions to further explore these areas.

Sampling Procedures

Because of the novelty of the interactive electronic whiteboard, it was not possible to locate a

large number of users from whom to draw a sample group of subjects for this survey. Respondents had to be teachers and trainers currently using the board in instruction. Therefore, it was necessary to limit participants to those who were whiteboard users and to make efforts to reach as many of these individuals as possible and solicit their responses.

Data Collection

In order to locate respondents and request their participation, the following techniques were used:

1. In September 1998, two months prior to posting the survey, notices were posted to two electronic mailing lists for educators, LM_Net and EDTECH. Members who were using the whiteboard in their classrooms were asked to respond to the queries if they would be willing to participate in a survey. Twenty individuals offered to participate in the survey, and some of them indicated they could contact colleagues who would also take part. When the survey was posted, these individuals were contacted personally.
2. Other whiteboard users were located by web searching for locations describing whiteboards and their use. These searches identified several university and commercial sites where board users were named. Individuals mentioned as whiteboard users were personally contacted by e-mail and asked to respond to the survey.
3. Individuals known to be board users or known to work in districts where the boards were in use were contacted personally by telephone or by e-mail.
4. When the survey was posted on the Internet, additional announcements were posted to the following electronic mailing lists: LM_Net for school librarians, EDTECH for technology educators, teach.net for k-12 teachers, and Ph.D. Board for graduate students and professors.

Survey participants were directed to an Internet website where the survey was posted. The survey was available for responses for nine days. The software used to compose the survey was FilemakerPro, a computer program for generating surveys for Internet use. Responses were stored in the FilemakerPro database and downloaded for analysis at the end of the posting period.

Data-Gathering Instrument

The survey was made up of six sections of questions. While participants were asked for demographic information, their identities were not requested and privacy was assured. After the survey was first posted, it was tested by several whiteboard users and the district webmaster to assure clarity of questions and proper functions of the automated response capabilities. Revisions were made to correct any problems identified when the survey was tested. After the survey was judged to be free of errors, its Internet location was announced and respondents were contacted.

The first section was comprised of 15 close-ended questions soliciting demographic data and basic facts about the board's setup and use. Efforts were made in the composition of survey questions to allow for differences between the various brands and models of boards which respondents might be using. The second section contained eight close-ended questions asking the respondents to indicate, on a 5-point scale ranging from "always" to "never," how frequently they used the board in specific situations. The third section offered twelve close-ended questions asking the participants to respond, on a 5-point scale ranging from "strongly agree" to "strongly disagree," with statements about the ease of use of the board. In the fourth section questions asked for estimations on a 5-point scale ranging from "extremely important" to "not important" as to the value of various features of the board. The fifth section offered close-ended questions on a 5-point scale ranging from "always" to "never" regarding the frequency of use of various features of the board. Section six, the last part of the survey, was comprised of six open-ended questions regarding uses of the board and satisfaction with the board. Responses were stored electronically and downloaded all at once for analysis.

Chapter Four

Demographic Information

The survey of interactive electronic whiteboard use was answered by 30 participants over an eight-day period in which it was posted on the Internet. Three respondents preferred not to supply demographic information. Of the remaining 27 there were 16 females and 11 males, ranging in age from 20's through 60's. Most respondents were in the 40-50 year age range. Ten individuals were computer teachers with other respondents mentioning a wide variety of subjects taught. Racial demographics indicated 26 whites, 1 Asian, and 1 Hispanic among participants. While the largest number of respondents were from Texas, responses also came from California, Canada, Colorado, Georgia, Iowa, Louisiana, Missouri, Massachusetts, New York, Pennsylvania, and Tennessee. The levels taught were of particular interest as this information might have affected responses later in the questionnaire, and are presented in Table 1.

Table 1: Teaching Levels

	Elementary	Junior High	High School	Junior College/ University	Training
Number	11	6	4	5	4
Percent	37%	20%	13%	16%	13%

Also included in the demographics section were basic questions about the equipment and setup. Inquiry about computer platforms used showed a preference for PC-compatible computers, with 21 PC users and 9 Macintosh users. All but two participants indicated they used video projectors with the boards, with one LCD panel being used and one indication of another device. Most boards were mounted on moveable stands, with wall mounting the second display preference. A wide variety of marking devices were utilized. Most campuses had only one board, with frequent sharing reported. As previously stated, the electronic interactive whiteboard is a relatively new device, and most users indicated their boards had been in use for one year or less. Many respondents indicated in the open-ended responses that they hoped to acquire additional boards in the future.

Likert Scale Questions

The survey contained 60 Likert scale questions, each of which could be related to one of the five hypotheses. The responses overall indicated a high degree of user satisfaction with the board and its features. Participants were positive in their estimations of the board's value as an instructional tool. They also shared their perceptions that students enjoyed using the board and were very receptive to instruction involving the use of the board.

Ease of Use

The first hypothesis stated that teachers and trainers using the board would express satisfaction with the ease of its use. The responses to questions related to this premise were quite positive, as illustrated in Table 2. Participants indicated that marking and erasing at the board were easily accomplished. They also expressed satisfaction with the ease of making notations and erasures from the computer during shared use of the board. The one aspect of board use where enthusiasm with ease of use was somewhat less positive was the ease of setup. As indicated in the comments in the open-ended question section, some users had difficulty setting up the board in preparation for use. Users also reported some difficulties in moving the board from one location to another.

A particularly significant area in which some respondents indicated lesser degrees of satisfaction was in the training they received in the use of the board. The need for more thorough and

extensive training was also expressed in the open-ended discussions and caused some individuals to find other aspects of board use difficult. It should be noted that there were only three responses to questions regarding the ease of use of the board which indicated a strong degree of concern, and two of these related to training. Overall, responses indicated that the facility of use of the boards was an attribute contributing to their success.

Table 2: Ease of Use of the Board

	Number of Responses	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
Setup	30	27%	37%	23%	13%	0%
Marking at Board	30	20%	63%	13%	3%	0%
Notes from Computer	29	38%	41%	10%	10%	0%
Erasing at Board	30	43%	50%	6%	0%	0%
Erasing at Computer	29	31%	48%	21%	0%	0%
Saving Work	29	38%	41%	21%	0%	0%
Daily Setup	30	43%	50%	6%	0%	0%
Ease of Training	30	30%	37%	17%	13%	3%
Portability	28	21%	43%	18%	11%	7%

Effectiveness of Board as a Teaching Tool

The second hypothesis stated in Chapter 1 was that teachers would express a high degree of satisfaction with the use of the interactive electronic whiteboard in instruction. Three questions explored some of the different types of applications which individuals were using with the board. Table 3 shows that use of the whiteboard with the Internet and with multimedia applications were popular choices, with research databases used less often.

Table 3: Applications Used with the Board

	Number of Responses	Always	Frequently	Sometimes	Seldom	Never
With Internet	30	27%	47%	17%	6%	3%
With Databases	30	10%	27%	10%	40%	13%
With Multimedia	30	37%	40%	10%	10%	3%

Another series of questions, illustrated in Table 4, dealt with various aspects of board use and their perceived value in teaching. The most enthusiastic responses were those regarding the use of the board in viewing and editing diagrams and visuals, a feature of the board which was highly praised in product reviews. The appeal of the board to kinesthetic learners was also shown to be a characteristic which respondents considered important. The use of color, a quality long valued in whiteboards, was also valued highly by respondents. Less importance was placed on the board

as a time-saver, which may be related to the fact that some users found problems with setup and portability. The fact that students could be freed from the pressure of trying to take detailed and exact notes was also valued by fewer participants, but this may be related to the fact that many were elementary teachers less interested in giving notes to their students.

Table 4: Aspects of Board Use

	Number of Responses	Extremely Important	Very Important	Important	Not Very Important	Unimportant
Time Saver	29	31%	28%	34%	7%	0%
Frees Note-taking	29	14%	14%	38%	31%	3%
Use of Color	29	21%	48%	28%	3%	0%
Kinesthetic	29	17%	41%	34%	7%	0%
Diagrams/Visuals	29	38%	34%	28%	0%	0%

Finally, four questions were asked to measure teacher enthusiasm regarding the use of the board – results are presented in Table 5. The answers showed that most users felt good about the board from its very first use. Individuals who gave class notes indicated that they liked using the board for that purpose, a preference which was reiterated in the open-ended responses. The interactive quality of board use was valued highly by a large majority of participants. Responses to the questions related to the use of the board in teaching indicate that users did consider it a valuable tool. The numerical responses relevant to this issue were further borne out in the responses to open-ended questions.

Table 5: Teacher Enthusiasm for Board Use

	Number of Responses	Strongly Like	Like	Indifferent	Dislike	Strongly Dislike
Successful First Use	29	62%	38%	0%	0%	0%
Presenting Notes	28	46%	39%	14%	0%	0%
Interactivity	29	41%	48%	10%	0%	0%

Students' Responses to the Board

The third hypothesis presented in Chapter 1 stated that students would be enthusiastic about using the board and would respond positively to instruction incorporating board use. Like their teachers, students were described as responding positively to the board from their first introduction to its use. Teachers indicated that they were pleased with the attentiveness of their students to lessons presented with the board. While the initial novelty of the board might account to some degree for students' positive responses, continued use was also reported to be well received. There was slightly less enthusiasm on the part of students for note-taking, an activity which may not be particularly popular with students under any circumstances.

Table 6: Students' Responses to Board

	Number of Responses	Strongly Like	Like	Indifferent	Dislike	Strongly Dislike
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Students' First Reaction	29	79%	17%	3%	0%	0%
Student Attentiveness	29	64%	29%	7%	0%	0%
Ongoing Enthusiasm	29	41%	48%	10%	0%	0%
Students & Notes	28	29%	39%	32%	0%	0%

Whiteboard Preferred over Other Presentation Methods

The prediction stated in the fourth hypothesis was that board users would prefer using the interactive whiteboard over other presentation devices and instructional methods. Respondents indicated that they often use the board rather than previously favored devices such as the overhead projector or computer display shown via television. They favored the board over non-technological alternatives such as using chalkboards or flip charts. They also stated that in some cases they preferred shared use of the whiteboard over having students work individually at computers. Table 7 presents the responses regarding these preferences.

Table 7: Preference of Whiteboard to Alternative Presentation Methods

	Number of Responses	Always	Frequently	Sometimes	Seldom	Never
Replace Overhead	30	20%	40%	33%	3%	3%
Replace Computer/TV	30	30%	43%	13%	10%	3%
Replace Chart/Chalk	30	10%	27%	47%	6%	10%
Replace Solo Work	30	3%	27%	40%	17%	13%

Value of Interactive Quality of Board

The final hypothesis presented in Chapter 1 stated that whiteboard users would value the interactive quality of the board. Questions regarding various activities conducted with the board were asked in an effort to explore this theme. Two questions regarding the use of the board for demonstrations indicated that this was a popular use. Activities which were more likely to involve interactivity were also frequently used, such as computations, placing students at the board, and use of shared writing space. The method of use which would entail greatest student interactivity would be placement of students both at the board and at the computer. While activities employing this arrangement would call upon the teacher to relinquish a great deal of control, they were still reported to be used at least to some extent by three-fourths of the respondents. Table 8 summarizes activities using the board.

Table 8: Activities Utilizing the Board

	Number of Responses	Always	Frequently	Sometimes	Seldom	Never
Demonstration Only	30	20%	60%	13%	3%	3%
Students at Board	30	6%	17%	27%	27%	23%
Students at Board and Computer	30	0%	20%	33%	23%	23%

Demonstrate Software	30	40%	40%	17%	3%	0%
Shared Writing Space	30	20%	23%	27%	13%	17%
Computations	29	10%	21%	28%	28%	14%

A final question regarding interactivity was included which simply asked respondents to rate the importance they attached to this quality. Responses to this question once again demonstrated that users considered the interactive use of the board extremely valuable and effective. All but two individuals replied that they considered interactivity to be important, as shown in Table 9.

Table 9: Importance of Interactive Quality of Board

	Number of Responses	Extremely Important	Very Important	Important	Not Very Important	Unimportant
Value of Interactive Quality of Board	28	39%	43%	11%	7%	0%

Responses to Open-ended Questions

Six open-ended questions were posed in the last section of the survey. Participants were very generous with their time and attention as they provided thoughtful responses which were often too lengthy for the standard space provided by Filemaker Pro for such questions. The first question asked about ways in which participants used the board with notable success. Respondents described a number of creative uses for the board. At least half of the respondents made it clear that they found the board an excellent medium for presenting demonstrations. In particular, showing groups how to use computer applications and software was mentioned as very successful. Several individuals praised the board's ability to involve a group in cooperative revision and composition of writing samples. Showing student-made multimedia presentations was another use favored by several users. The interactive attributes of the board and the value of the large screen for presentations were the two most popular features mentioned.

Another of the open-ended questions asked users to tell what they liked best about the board. Responses were somewhat similar to the first question, with a few additional ideas expressed. One user praised the immediacy of lessons presented with the board, saying it "records what actually happens in class!" The ability to save work produced on the board was valued by another respondent. Specific references to the interactive use of the board included comments such as "students can see and do" and "using my finger," references to the ability to manipulate programs from the board. Several people felt that the board gave them more freedom to move around the room during presentations. Teachers felt that student motivation and interest were enhanced by use of the board. Marking on the board either with pens or with fingers was described as a popular attribute. The number, length, and enthusiasm of responses to the first two open-ended questions indicated a high degree of user satisfaction with the board.

One more question was included which asked about favorable views of the board in the hopes of eliciting specific lessons which proved effective. The question asked users to describe a situation where the board had particular value to them in teaching. Several respondents did provide accounts of specific events. One teacher told of using a document camera to magnify small objects, audio connectors, which were projected on the board for a lesson about their use. Students were able to see the connectors clearly and the instructor then added annotations to point out additional information. Another individual told of using the board in a writers' workshop for students to share ideas about composition and revision of creative writing projects. Several respondents liked using the board to teach Internet use and to let students collaboratively conduct searches. Other activities mentioned favorably were note-taking, brainstorming, web

page authoring, and teaching research skills in the library. The variety of described uses was indicative of the teachers' creativity and the versatility of the board.

An open-ended question about teaching with the board asked respondents if the actual use of the board differed from the intended use for which it was acquired. If so, they were asked to explain. Only three individuals felt that their original expectations had not been met, and several others stated they were pleased to find the board did do exactly what they hoped it would before acquisition. One of the respondents who felt that actual use had changed stated that he had originally planned to use the board more for distance education than was the case at the time of the survey. Another individual was unaware of the option of videoconferencing with the board and, upon finding out about this capability, was involved in plans to try it. The only other change reported was by a participant who said original plans called for the board to be moved around the building quite a bit when in fact it was mostly used in the library with classes scheduling time to use it at that location. The responses offered to this question did not indicate any dissatisfaction as a result of changed plans for the board's use.

Along with being asked to tell what they liked best about the board, respondents were also asked to tell what they liked least. Their responses clarified some of the instances in the Likert questions when satisfaction ratings were somewhat lower than was the case for most items. One individual was dissatisfied with the video projector used with the board because its image was not bright enough to allow the lights to be left on during board use. Several users whose boards were connected by cords to the computer were frustrated by the logistical problems of situating the board so that the cords were not in the way and students would not trip over them. Related to this issue was the fact that several individuals found setting up the board to be somewhat difficult and time consuming. The cost of the equipment was also mentioned as a drawback. Several comments were made that the expense was a barrier to obtaining additional boards to alleviate problems related to moving and sharing. One person wished for a rear projection board to do away with the cords and to increase mobility, but stated that the additional cost precluded getting one. Both in the Likert questions and in the discussions, the problem of inadequate training was cited. Interestingly, some of the negative comments came from participants who also contributed very favorable comments in other sections.

Chapter Five

Conclusion

The overall tenor of responses to the survey regarding use of the interactive electronic whiteboard was very positive. Responses indicated that teachers were using the boards in a variety of creative ways. Student response was described by the teachers as very enthusiastic. Answers to open-ended questions indicated that students were more involved, attentive, and motivated when lessons were offered using the board rather than using other teaching methods. Problems with the board which related directly to the equipment centered around the logistics of setting up, situating cords if necessary, and moving components from one location to another. While not an indictment of the board, the lack of adequate training was reported to be a problem by some participants. Features of the board repeatedly praised were interactivity, ability to mark and save notations, size of display for presentations, and ability to manipulate software from the board. Many respondents expressed the hope that additional boards would be available on their campuses in the future.

While the board was not deemed difficult to use by all participants, some indicated problems which they felt were the result of inadequate training. The beginning board user should be confident and well prepared before using it with students. Training, and the lack thereof, is often cited as a reason technology is not embraced by more educators, and evidently was an issue for some contributors to this survey. In one instance, a respondent directly stated that his technology center offered training which was too brief and incomplete. Other users relied upon colleagues to help them learn to use the equipment. Whether training is provided by vendors, district or

institutional staff, or other entities, it should not be neglected or abbreviated. Perhaps respondents who felt the need for training in the use of the board actually needed more general computer training than did other users, and their needs should be addressed. As with other equipment and applications, acquisition without training is a mistake which should be avoided.

Additional study of the implications of interactive and collaborative uses of the board and their effects on learning could prove valuable. Positive results from such research could offer justification for acquisition of the equipment. Since the board has very high appeal for students, it might be interesting to investigate the possibility that students who are apprehensive or uncomfortable using computers might find using the interactive whiteboard less threatening. Often these reluctant students are girls, and studying the board as a means for overcoming their reluctance to use technology might indicate additional value for the board.

The interactive electronic whiteboard is one of a growing number of devices which offer students shared workspace, thus encouraging interactive and collaborative learning. Web boards offer interaction but in many cases are used only with smaller computer screens. Large screen televisions can offer the size display needed for group presentations but lack the interactive features of the board. Because of the combination of size and interactive qualities, the board has earned high marks from users as a valuable learning tool. The interactive electronic whiteboard will surely grow in popularity and continue to evolve as a popular and useful mindtool for teachers, trainers, and students.

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