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MICHIGAN TEACHERS AND THE WORLD WIDE WEB, "WILL THE WORLD WIDE WEB CHANGE MY CLASSROOM?"

By

Nathan Ernest Butki

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ABSTRACT

Michigan Teachers and the World Wide Web

By

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National, state, and local leaders have realized the need to integrate technology with instruction in order to prepare students with the necessary skills to succeed in the workplace. In order to ensure adoption of telecommunication technology, and not simply provision of technology, effective policy and resources must be developed reflecting the needs of users. A user study was conducted in order to gain insight into usage, opinions, and barriers facing early adopters of the World Wide Web (WWW) in K-12 education. A survey instrument was created and distributed to a sample of educators in the state of Michigan yielding 389 responses. In addition to presentation of user opinion, it was found that:

- 75.3% agree the WWW gets through to students in ways books cannot.
- Nearly 50% of educators who rarely or never use the WWW feel their day is already too busy and the WWW is *"one more headache"*.
- 76.2% feel the WWW enables them to cater to students needs and interests.

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INTRODUCTION

"Simply to regard adoption of the innovation as rational (defined as use of the most effective means to reach a given end) and to classify rejection as wrong or stupid is to fail to understand that individual innovation-decisions are idiosyncratic and particularistic." (Rogers, Diffusion 111)

One of the goals set by the current presidential administration is to have every K-12 classroom wired for connection to the Internet by the year 2000. This project appears to be well on its way. The percentage of public schools connected to the Internet grew from 35% in 1994 to 50% in 1995 to 78% in March 1998 (U.S. Department of Education Office of Educational Technology). Providing teachers and students with access to the Internet, specifically the World Wide Web (WWW), has appealing educational potential. The WWW enables teachers and students to access a vast array of resources and people on a seemingly unlimited number of topics that may otherwise be unavailable to them. Access to the WWW breaks down the classroom walls and fosters the development of engaged learning (see rationale p.9) to make the educational experience global. WWW access has diffused rapidly, and with great excitement, in K-12 education. Numerous federal, state, and local initiatives currently aim to develop the technological infrastructure thereby allowing teachers and students to access the WWW.

In his work on diffusion of innovations Everett Rogers defines diffusion as, "the process by which an innovation is communicated through certain channels, over time, among members of a social system." (Diffusion 35). Telecommunication technologies, the networked computers and infrastructure that allow users to connect to the WWW, are an innovation in K-12 education. The existence of this innovation, and its future role in education, has been communicated to teachers from national and state leaders through their commitment to connect every classroom to the Internet. Schools nationwide are quickly working toward this goal. While great strides have been taken toward this effort few are pausing to examine the last two components of Rogers' diffusion definition, the time factor and the social system in which diffusion occurs. The individual innovation-decision process, where a user decides to adopt or reject an innovation, takes place over time. To understand the individual innovation-decision process one must understand the individual and, in turn, the social system in which that person is operating. In K-12 classrooms teachers and students are the users of the WWW. While examination of effects and use by students is a critical component in evaluating overall success of telecommunication technologies in education, this thesis focuses on teachers. Once classrooms are connected to the Internet, the decision to use the available resources and the extent to which they are used in daily instruction rests largely with the teacher.

This thesis surveys Michigan educators, examining their opinion toward telecommunication technologies and the setting in which they are used. The *"Will the World Wide Web Change My Classroom?"* user study measures background, usage, opinion, and barriers to WWW integration. In addition, the following research questions are addressed:

- Does location of WWW access at school (in the classroom, the building, or not at all) impact opinion of the WWW?
- Does frequency of web use impact opinion of the WWW?

LITERATURE REVIEW

Background

Change is inherent in diffusion of any innovation. The Internet and telecommunication technologies represent an innovation in K-12 education. By Rogers' definition, adoption of an innovation results in a change in a system. "Diffusion is a kind of social change, defined as the process by which alteration occurs in the structure and function of a social system. When new ideas are invented, diffused, and are adopted or rejected, leading to certain consequences, social change occurs." (Diffusion 6) To use Rogers' words again, understanding the individual "idiosyncratic and particularistic" (11) decisions teachers face when deciding to implement the WWW, and adapt to the inherent change, impacts many from policy makers to content designers. Educational policy maker's decisions on how to best implement telecommunication technologies have the greatest impact when they reflect the needs of the teacher. Designer's decisions on how to create usable WWW based resources are maximized through understanding of the environment in which resources are applied. K-12 education is increasingly gaining access to telecommunication technologies. K-12 education is historically ineffective in adopting technological change in classroom instruction. In order to ensure successful adoption of technology in K-12 instruction, and not just provision of the technology to K-12 instruction, a focus on users must be established and maintained. This thesis examines the current status and environment facing educators' using telecommunication

technology in K-12 schools in Michigan. It moves away from a quantitative analysis of infrastructure to examine user opinion of the World Wide Web and it's impact on teaching and classrooms.

A 1997 study by Wells and Anderson titled, "Learners in a Telecommunications Course: Adoption, Diffusion, and Stages of Concern", examined early adopters of technology. The sample group consisted of students enrolled in a graduate level, Internet-based education course. They determined that "...successful curricular integration of new innovations such as CMC technologies relies heavily on the opinions of the early adopters, their role in the diffusion process is vital for two primary reasons. First, these individuals act as filters of new technology innovations that are presented for inclusion in the instructional-delivery system. Second, their resulting opinions ultimately determine the decision to adopt or reject." (Wells and Anderson 85) CMC refers to Computer Mediated Communication - use of computers not as stand-alone tools, but as a communication device. Telecommunication and multimedia applications are examples of CMC. Wells and Anderson's rationale for studying early adopters motivated the study of early adopters in this thesis. The experience and human network of the Great Lakes Collaborative (GLC) was tapped to provide access to educators believed to be early adopters of the WWW.

GLC is a service of Wayne County Regional Educational Services Agency (WC RESA). WC RESA is the largest Intermediate School District in Michigan serving Michigan's largest city, Detroit, and the surrounding area. GLC supports

statewide initiatives aimed at integrating multimedia and telecommunication technologies in K-12 instruction. GLC has received funding from the United States Department of Education and the Michigan Department of Education for its projects. GLC has worked collaboratively with Advanced Learning Technologies Center for Research on Learning, at the University of Kansas, on the Explorer Resource Library, an electronic classroom resource database. Explorer has received national acclaim. Articles have appeared in Classroom Connect Newsletter, Electronic Learning, Syllabus, an index of the top 40 educational sites, New Media Magazine, and Supplement to Family PC magazine. GLC is recognized as a leader in producing products that support electronic delivery of classroom resources. GLC was awarded a Goals 2000 grant by the Michigan Department of Education for the 1997-98 school year. A K-12 multimedia classroom resource CD-ROM, written in hypertext mark-up language (WWW) format, was produced as a result of the project. 10,000 copies of the CD-ROM were distributed statewide.

During the production process GLC was approached by the researcher proposing a research study involving usability testing and Human Computer Interaction (HCI). HCI concerns itself with , "the design, evaluation, and implementation of interactive computer systems for human use and with the study of major phenomena surrounding them" (qtd. in Preece 6). Jenny Preece summarizes the goals of HCI as, "to develop or improve the safety, utility, effectiveness, efficiency, and usability of systems that include computers."(14)

Usability is a key concept of HCI. The goal of usability testing is to make systems that are easy to learn and use. Research revealed that the U.S Department of Education and Michigan Department of Education have compiled detailed inventory of the amount and type of hardware in schools. Considerably less information is available on current users, their opinions, and the environments in which they apply the technology. For this reason a user study was conducted to provide critical knowledge of users. Findings can be used for policy and design decisions. This research will also serve as the groundwork for incorporating elements of HCI into WWW based telecommunication initiatives in K-12 education. The researcher worked for three years as State Facilitator for GLC, experiencing first hand GLC's expertise with early adopters of the WWW.

To accomplish this goal the researcher created a survey instrument (Appendix A). The "Will the World Wide Web Change My Classroom?" survey gathered descriptive information on current educators' use and opinion of the WWW. GLC agreed to include the survey on its 10,000 copy CD-ROM and to distribute the survey through a variety of conferences and mailings. Responses were solicited from teachers known to have some interaction with, or motivation toward, technology in instruction. The researcher collected, coded, and analyzed the data after it was removed of personal identifiers. The CD-ROM was written in HTML format allowing users to access resources in 'Internet fashion' independent of a physical connection to the Internet. The CD-ROM provided educators with resources utilizing the web and multimedia technologies.

Rationale

K-12 education remains one of the very few areas of our society that has yet to be significantly changed by telecommunication technology. National, State and local leaders have realized the need to integrate technology with instruction in order to promote engaged learning[1] and prepare students for the 21st century. Ambitious goals for teacher and student achievement, and the breadth of technological resources available in our schools have been defined in response to this recognized need.

The National Plan for Technology in Education, developed by the President, the U.S. Department of Education, and championed by Vice President Al Gore, addresses four primary goals. These goals, known as the four pillars, are:

- *Training-* All teachers in the nation will have the training and support they need to help students learn through computers and the Information Superhighway.
- *Hardware-* All teachers and students will have modern computers in their classrooms.
- *Access and Connectivity-* Every classroom will be connected to the Information Superhighway.
- *Content Resources-* Effective and engaging software and online learning resources will be an integral part of every school curriculum.

[1] Engaged learning by definition is very similar to *constructivist learning*, the title for learning which is user centered and based on authentic tasks.

K-12 public education has a long history of resistance to the change associated with adoption of technology resources in the classroom. The potential for technology to revolutionize and change instruction was realized as early as 1913 when Thomas Edison commented on the potential of films in classrooms stating, "Books will soon be obsolete in schools...It is possible to teach every branch of human knowledge with the motion picture. Our school system will be completely changed in the next ten years" (qtd. in Saettler 98).

Technology has held the promise to provide an impetus for instructional change in the past. Despite the enthusiasm of charismatic leaders like Edison, education has remained largely untouched by technology as compared to other industries. Elliot Solloway, professor at the University of Michigan, has commented on the lack of technological resources in K-12 classrooms: "Standard issue for a white-collar worker is a desk telephone and a desktop computer. Teachers, however, can hardly get a phone in their room let alone a computer dedicated to their use." (Solloway 11).

Current leaders in government and education address the potential impact of telecommunication technology to be as revolutionizing as Edison once predicted for motion picture. The WWW and telecommunication technologies allow for a new type of learning- engaged learning. Engaged learning involves more collaboration among teachers, classrooms, and experts, and increased student interaction with content resources as well as other students. Engaged learning prepares students to become decision-makers, information evaluators,

and effective communicators; skills recognized by national leaders as necessary in the future. This type of learning is wholly different than that provided through traditional educational means (NCREL 1).

The need to integrate technology in support of engaged learning to improve education and prepare students for the future workplace is being met with support from a variety of federal and state initiatives. The present environment facing technology in education offers broad commitment both philosophically and financially. Advocacy for integration of technology to improve teaching and learning and to prepare students for the workplace has become a leading issue among local policy groups. A survey of school priorities in 1995 concluded that educational technology was one of the top six issues facing education (Plotnick 1).

The rise in advocacy is being met with enormous financial investment into the expansion of telecommunication technologies nationally toward development of the Presidential Administration's four pillars. Among these are:

--The Federal Goals 2000 grant program has made over $800 million available during 1996 and 1997 nationally for technology and educational improvement projects. In 1997, Michigan received nearly $20 million alone (U.S. Department of Education, "Goals 2000 Funding Allocations").

-- The Universal Service Fund is a federal program designed to provide K-12 schools with rebates of 20-90% on their telecommunication expense based on their free and reduced lunch count[2]. This funding resource is a result of the Telecommunications Act of 1996, and in particular, a section of that Act referred to as the Universal Service Fund (USF). USF dollars have yet to be awarded, but are anxiously anticipated (Merit Network, Inc.).

--The Technology Literacy Challenge Fund made approximately $8.2 million available to Michigan schools in 1997 and has made $17.3 million available in 1998. The purpose of this program is to "...support the acquisition and use by elementary and secondary schools of technology-enhanced curricula, instruction and administrative support resources to improve the delivery of education services" (Michigan Department of Education, Office of Grants and Technology).

--Local districts in Michigan have made substantial commitments through voter approved "qualified" bond issues. Under the state's School Bond Loan Fund building-level technology infrastructure investments of over $190 million have been approved.(Michigan Department of Education, "State Technology Plan" 5)

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[2] Free and reduced lunch count refers to the number of students at a local school who qualify for federal aid in providing free and reduced meals. Generally, the higher the free and reduced lunch count the poorer the school and/or district.

Michigan policy toward advancement of technology in education is developed in alignment with the National four-pillar model. In 1998 the Michigan Department of Education passed it's State Technology Plan. The plan expands on the ideas of each of the pillars to define state and local goals. The plan is being used to secure funds from Federal initiatives and to provide structure and direction for allocation of grant money within the state. The State Technology Plan was also written to align itself with another statewide plan, the Michigan Information Network (MIN) plan. In his 1995 plan to reform Michigan schools Governor John Engler called for the "creation of the Michigan Information Network in order to access information from around the world" (Michigan Information Network Plan). In 1995 the State of Michigan developed a plan for the MIN with the goal of serving as the link to the information superhighway for the people of Michigan. The MIN is the collaborative effort of private telecommunication companies, the State of Michigan, and users, to share voice, video, and data for the public good. Development of MIN is intended to result in increased resources for education through a virtual, integrated statewide network linking local and intermediate school districts, public school academies, public and private colleges, community colleges, universities, and libraries. Statewide leaders have identified content, delivery, and user interface as the three essential elements upon which the MIN concept hinges ('delivery' is similar to the national four pillars *access and connectivity* pillar, 'user interface' is

similar to the *hardware* pillar, and 'content' is similar to the national definition)[34]. The MIN plan explicitly makes delivery and user-interface its mission. In fact the MIN plan states that it does not address the content piece. The MIN plan defines content as "...anything from high quality distance learning, to medical diagnostics, to multi-party engineering design, to e-mail between teachers and parents..." As the leaders in the state draw educational institutions and industry ties together to create this network, evaluation and development of content materials are left to take place on their own.

Obtaining technological resources and equipment to establish technical systems (the *access and connectivity* and *hardware* pillars) is far different from the goal of creating new learning environments supported by knowledgeable teachers and effective resources. In order to create new learning environments equal attention must be paid to *training* and *content* resources. Provision of the *access and connectivity* and *hardware* portions of the national four-pillar's model can be largely quantified. The President can count and see if every classroom is wired for connection to the Internet in the year 2000. Examination of trends reveals significant increases in computer acquisition and networking. In 1988-89 the student/computer ratio in the United States was 22:1; in 1995 it was 12:1 (Plotnick). The ratio of students to Internet capable computers in Michigan in

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[4]MIN plan definitions:-
Delivery: how is content delivered? Does it require fiber optic cable, satellite transmission, cellular/wireless linkages, simple phone lines or some other medium?
User Interface: By what means does the potential user get the message? Does he/she need a phone, a

1996-97 was 22:1 (Quality Educational Data). According to the U.S. Department of Education's four-pillar model, many studies indicate that a five to one student to powerful multimedia computer ratio is ideal[5]. While access and hardware have intuitive implications, without them the benefits of technology cannot be received, the implications surrounding the *training* and *content resources* pillars play an equally vital, though less quantifiable, role in successful integration of technology. The President cannot count to see how *training* and *content resource* initiatives are effecting and advancing teacher effectiveness and student learning. In order to understand the impact of all four pillars, and devise strategies and training to increase their effectiveness, user-study must take place.

> "Education has always been susceptible to "silver bullet" solutions to its problems, and imposing a new technology has often been such a solution. Yet time after time, the "technology du jour" has collided with the realities of the classroom and resulted in only marginal changes in how teachers teach and students learn." (Educational Testing Service 7)

Success of the National four-pillar model requires support of all pieces. This research begins to address the 'realities of the classroom' by obtaining teacher feedback. Applying Rogers' diffusion of innovation theory toward the national four pillars model, we can hypothesize about characteristics and needs of teachers. Through development of the four pillars, and toward the goal of connecting every classroom to the Internet, early adopters of the technology will

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computer, a modem, a satellite dish, or some other hardware which can receive delivery of the content? What software is needed?

face different innovation-decisions than later adopters. Understanding the motivation of current teachers using the WWW in their classrooms (the early adopters) and realizing that subsequent users (later adopters) hold different motivations leads us to the importance of the *training* and *content resources* pillars. Research on diffusion of innovations realizes that early users of a technology have an interest in the technology and the ability cope with a higher level of uncertainty inherent in a new technology than later adopters (Wells and Anderson 84). Whereas early adopters look for reasons to use a technology, later adopters look for reasons to stick with their current system. For early adopters *access and connectivity* and *hardware* are the most crucial pillars and likely will provide sufficient impetus to adopt. Later adopters will need to be provided with more reasons to use the technology over traditional means of instruction. For later adopters *training* and *content resources* are the critical pillars. For these users 'more of the same' is insufficient. In order to realize the classroom potential of telecommunication technologies, new and innovative applications of the technology need to be developed. In order to develop these resources most effectively, users need to be included in the development process; user study needs to take place.

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[5] www.ed.gov/Technology/pillar1.html

> "...Why do evaluation? The general answer to this question is: to find out what users want and what problems they experience, because the more understanding designers have about users' needs, then the better designed their products will be" (Preece 603).

The need to study and understand users has received more attention with student teachers (pre-service teachers) than with practicing teachers. Studies have addressed pre-service teachers attitude, belief, and use of technology. A 1995 study by Huang, Waxman, and Padron at the University of Houston at Clear Lake addressed teacher education students' attitudes toward technology. The study was driven by the need "to understand what teacher education students feel and think about educational computing so that policies and strategies can be designed to enhance the readiness of prospective teachers in integrating computers into the teaching and learning process" (Huang, Waxman, and Padron).

215 students in an upper division teacher education course served as subjects. The study examined teacher education students' general attitudes toward educational computing, background characteristics and variables affecting attitudes toward computers, and to what extent these variables influence attitudes. The study found that the longer teachers were exposed to computers and the more types of computers they had experienced, the more comfort they felt working with computers. It was also found that when teachers felt at ease with computers they enjoyed using them more, leading to the

conclusion that "it is very important to provide prospective teachers the availability and training to use computers effectively" (6).

An examination of telecommunication technology in K-12 education reveals that a lack of sufficient training adds to the problem of insufficient tools. A 1996 report by the Educational Testing Service (ETS) found that helping teachers learn to integrate technology into the curriculum is critical to successful implementation of technology. The ETS report was designed to provide a baseline of information on what is known about technology in schools to track change over time. ETS also found that teachers largely have not received enough training to effectively integrate technology into the curriculum. As of 1994 only 15 percent of U.S. teachers reported having at least nine hours training in educational technology and only 16 percent use telecommunication for professional development. As of 1996 18 states did not require an educational technology course for a teaching license. The cover story for the September 1997, issue of *Civic.com*[6], "Grading Educational IT," reported US Department of Education findings that most teachers feel inadequately trained to use computer-based technologies. Based on reports from the Office of Technology Assessment only 13% of public schools required training for teachers in advanced telecommunication, 31% provide incentives to encourage training, and in about half the schools it was up to the teachers to initiate training (White).

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[6] Civic.com is an electronic newspaper for IT professionals in state and local government,

As presented above, national, state, and local funding toward technology in K-12 education are substantial. Moving beyond acquisition and funding of technology takes us to the real challenge; ensuring adoption of technologies and not simply provision of technology. The potential of telecommunication technology, specifically the WWW, to foster engaged learning has received a great deal of positive press in educational research and publications (ETR&D, Kerka, NCREL). Funding and social acceptance exist to infuse technology and introduce broad changes in teaching. This change is expected to provide students with a vastly different learning experience than provided in the past. In any instance of change facilitated by technology, recipients are faced with uncertainty toward their future role, toward the institutional commitment to the technology, and toward the effectiveness of the technology. In education this uncertainty toward telecommunication technology is increased through lack of training and lack of effective resources. In order to maximize the benefit of current funding opportunities, and bring about effective educational change resulting in increased engaged learning, user feedback must be collected and drive decisions. This research provides an initial footing to bridge the gap between infrastructure and resources through user study and promote adoption of technologies and not simply provision of technology.

METHODS

Instrument

A self-administered, descriptive survey was created and distributed to groups believed to be early adopters of WWW technology (Appendix A: Survey Instrument) The focus of the survey was to gain a deeper understanding of current educators using the WWW to drive creation of more effective resources and related policy. Responses were solicited in five categories; *demographic information* to gain an understanding of who responded, *telecommunication technology efficacy, web usage, opinions of the web,* and *barriers to use.*

Telecommunication technology efficacy:

When surveying teachers regarding technology it quickly becomes difficult to obtain a baseline of comparison. In an environment with vast differences in local technology emphasis, access to training and equipment, and individual teacher expertise, simply using age, grade, or gender, as the sole base for comparison is insufficient. This thesis measures *technological efficacy* and *web usage* for comparison of respondents beyond demographic differences.

Enochs, Riggs, and Ellis created scales, which investigate elementary science teachers' beliefs toward microcomputers. The scales were built using Bandura's social learning theory surrounding the role efficacy plays in behavior (research suggests that positive beliefs promote positive behaviors). 197 science teachers participating in a microcomputer inservice training program served as

subjects. Through development and implementation of these scales it was concluded that, "To improve the use of microcomputers in teaching, teachers' beliefs concerning the use of microcomputers must be considered. Change efforts should utilize these constructs as prior conditions before developing and planning inservice activities" (260). Enochs, Riggs, and Ellis present the idea that in order to maximize use of microcomputers in education effective training is paramount. Change strategies and training are most effective when developed with a thorough understanding of user beliefs. This same idea carriers over from pre-service teachers in elementary science, to current teachers in all subject areas.

Web Usage:

Web usage is measured by examining time on the WWW and location and function of use. As mentioned previously, the goal of the current presidential administration is to wire every classroom for connection to the Internet by the year 2000. Usage and location are examined to assess the number of respondents who currently have classroom access and further to explore the effect of location of use and amount of use on user opinion toward the WWW. Function and opinion questions give insight into the impact of the WWW on instruction.

In a commentary by researchers involved in the *Apple Classrooms of Tomorrow (ACOT)* project it was found that introducing technology with the goal of creating instructional change deeply challenged individual teachers instructional beliefs and practices (Dwyer, Ringstaff, and Sandholtz). Over the

course of multiple years of involvement in ACOT, teachers faced significant inner struggles with personal attitudes toward instruction and the role and capability of technology. The ACOT project, funded by Apple Computer, was started in 1985 collaboratively by teachers, researchers, educators, students, and, parents. ACOT explored the development and effect of highly technological learning environments in K-12 classrooms longitudinally. ACOT also aimed to develop and demonstrate powerful uses of technology in teaching and learning. Findings from the ACOT study revealed that significant time and support were needed for teachers to developed positive beliefs and uses of the technology. While much of the ACOT research took place prior to existence of the WWW, the aspects associated with challenging beliefs toward instruction and development of positive beliefs toward technology remain consistent.

Opinion:

Opinion questions were asked on five topic areas concerning the impact of the WWW in K-12 education; instructional/teacher achievement, navigation, student achievement, content, and environmental effects.

Robert Kozma and Edys Quellmalz of the Center for Technology in Learning at SRI International were commissioned to create a white paper for the U.S. Department of Education titled, "Issues and Needs in Evaluating the Educational Impact of the National Information Infrastructure" (Kozma and Quellmalz). In their report they identify teacher expertise in a subject as a critical

element in quality instruction. With the addition of telecommunication technology the opportunity to include external expertise in daily instruction is afforded. Kozma and Quellmalz note that the increasing availability of on-line expertise and resources will create the need to assess teachers' effectiveness in helping students use and interpret these resources. *Instructional/Teacher Achievement* opinion questions address this broadly as an indicator of the impact of telecommunication technology on instruction.

Few studies have attempted to evaluate of the effectiveness of the WWW in learning. Research into this realm is important in that it provides feedback upon which decisions concerning training of effective, confident users, and the design and delivery of information can be made. A study by Hill and Hannafin of fifteen current and prospective educators enrolled in a university-level technology for educator's course attempted to do this. Hill and Hannafin studied strategies used by adult learners in hypermedia environments. It was found that self-reported knowledge of technology impacts the strategies used in manipulating hypermedia environments. Qualitative and quantitative measures were used to gather data on participants' metacognitive knowledge, perceived orientation, perceived self-efficacy, system knowledge, and prior subject knowledge toward open-ended hypermedia information systems. It was also found that perception of disorientation and perceived self-efficacy influence the strategies used when manipulating and navigating hypermedia environments (Hill and Hannafin 59). Users with high perceived self-efficacy were found to be

more successful in their searching of the WWW and more likely to try numerous approaches in their searching.

Hill and Hanafin stress the notion that hypermedia information systems, such as the WWW, promote access to a wide range of resources, but are not designed to facilitate learning. Identification of background variables of effective and novice users, and their ability to make use of the WWW, can be utilized to develop and train more effective users and/or promote more intuitive environments. This knowledge can then be applied toward the goal of creating systems that are effective at facilitating learning. *Navigation* opinions are measured to gain an idea of how users feel toward use of the WWW and assess impact of time and location background variables.

Research indicates that access to online communication has a positive impact on student learning. A study by the Center for Applied Special Technology (CAST) realized the need for measurable results from investments in telecommunication technologies in K-12 education. CAST studied approximately 500 fourth and sixth graders in 28 elementary and middle school classes from 7 large urban area districts in the United States. One of the goals of the CAST study was to "measure the effects of online use on students learning including information processing, communication, and presentation skills" (2). Student projects resulting from a common unit of study on civil rights were evaluated as a measure for the study. The experimental group was allowed to take part in online resources, activities, and communication in support of the

unit while the control group was not. Students with access to online resources, "were more effective in their ability to present their work, state a civil rights issue, present a full picture" (3). Making the findings even more powerful is the fact the students in the control group had access to, and used, computers and multimedia resources, just not online resources. This isolated access to online resources as the contributing factor to increased students performance in the experimental group.

While this thesis does not speak directly to student performance it does address educators' opinion of the WWW's impact on student achievement. With findings such as the CAST study to document positive student gains resulting from online access, one would hope that teachers also feel positive in their opinion of these resources so they become confident users themselves and with their classes.

Barrier's:

A number of barriers face educators in their effort to integrate telecommunication technologies into K-12 instruction. Four common barriers are examined in this study; training, access, administrative support, and time. Research has shown that each of these elements are critical to successful adoption of technology (Educational Testing Service, Public Service Telecommunication Corporation, Hoffman, ACOT).

Procedure

Purposive sample groups were created to capture unique groups of Michigan educators. Purposive sampling is a means of non-probability sampling in which groups are chosen based on specific characteristics and qualities. Groups are chosen with the knowledge that they do not represent the general population, but posess unique characteristics (Wimmer and Domminick 67). The survey was administered to five sample groups. The sample groups were chosen based on their geographic location and experience with technology. All groups are known to have some interaction with, or motivation toward, technology in instruction. The extent of technological interaction among the groups was not available. A total of 389 responses were received. Respondents were provided a copy of a classroom resource CD-ROM in exchange for completing the survey.

To estimate time needed to complete the survey and to correct for any ambiguities in wording a pilot test of the survey was conducted with fifteen respondents. Prior to distribution to the larger sample, adjustments and corrections were made. Surveys were administered through mail, via CD-ROM, and in person. Data was collected over two months. Data was entered from the print surveys into a database. Data was then cleaned and re-coded to account for missing responses and Likert scales were reduced from seven points to agree/neutral/disagree responses.

Sample Groups

Sample Group 1:GLC Goals 2000 Sites

38 Respondents: response rate: 29%(n=130)

The Great Lakes Collaborative (GLC) operates statewide technology initiatives out of the Wayne County Regional Educational Services Agency in Wayne County, Michigan. The GLC is currently in its third year of a statewide Goals 2000 grant project aimed specifically at incorporating multimedia and telecommunication technologies in K-12 instruction. The GLC Goals 2000 participant sites were studied to gain a representative sample of Michigan teachers. The Goals 2000 project includes Intermediate School Districts and educational institutions statewide. Sites are geographically dispersed throughout Michigan and serve school districts that represent a microcosm of the state as a whole. Districts from inner city, urban, suburban, and rural areas of the state are represented among the Goals 2000 sites. Thirteen sites received ten copies of the survey by mail with instructions to distribute the survey to teachers in their constituency and not to copy these surveys. These ten surveys where tagged prior to being sent out in order to gather an accurate reading on the number of responses from each site.

Sample Group 2:B4 CD-ROM recipients

13 Respondents: response rate: unobtainable

This channel did not accommodate the lowest end user and was chosen for this reason. It was anticipated that respondents from this group would be more knowledgeable and experienced in using technology and the WWW, as software installation and moderate technological knowledge was required to access and print the survey from the CD-ROM. This means of distribution was chosen for two reasons; the number of potential respondents (10,000 copies of the CD-ROM were made), and the notion that CD-ROM users represent current, experienced users of the WWW, not simply the general pop ulation.

The response rate for this group was unobtainable. 10,000 copies of the CD-ROM were made, but actual distribution is unknown. CD-ROM's were distributed to Intermediate School Districts (ISD's) throughout the state, who in turn distributed them to their constituency. A count of the number of CD-ROM's actually distributed by the ISD's is not available. An accurate count of the response rate per CD-ROM also had potential to vary. Some users may have printed multiple surveys from a single CD-ROM and other users may not have printed any. Given all the factors facing potential responses from the CD-ROM sample the fact that any were returned was significant.

Sample Group 3: Conference Participants

139 Respondents: response rate: 70%(n=200)

Participants in a multimedia session at the annual Michigan Association of Computer Users in Learning (MACUL) conference were surveyed. The MACUL conference is an annual conference attracting more than 5,000 attendees from all over Michigan. The multimedia session had an audience of 200 educators and focused on integration of WWW resources in instruction. MACUL participants are considered technological leaders in the state and are likely among the more technologically motivated. It is anticipated that this group would be biased in favor of WWW after attending a session on multimedia and WWW. Nonetheless this group provided access to a geographically diverse population and the opportunity to survey technology leaders.

Sample Group 4: Best Practices Teachers

60 Respondents: response rate: 71%(n=85)

In the fall of 1997 the Regional Educational Media Center Association of Michigan along with the Michigan Association of Intermediate School Districts held a contest to identify 'Best Practices in Technology Integration' throughout the state. Teachers were offered the opportunity to win a $200.00 mini-grant to be used toward technology in the classroom in exchange for submitting their best practice in technology integration to be shared statewide. 85 winners were

selected. Each winner received a copy of the survey. This group, like the MACUL sample group, provides valuable insight to highly motivated, technologically experienced teachers.

Sample Group 5: Wayne County Administrators

139 Respondents: response rate: 28%(n=500)

Principals at each of Wayne County's K-12 public schools were mailed a survey and asked to distribute it to a teacher with WWW or Internet experience (500 total). Detroit, Michigan's largest school district, is located in Wayne County. Wayne County has a very diverse group of school districts, from inner city to suburban, representing a wide range of economic and ethnic backgrounds. Diversity in race and in technology is very high in Wayne County.

SUMMARY FINDINGS

Due to the large amount of data collected from the survey findings and interpretation are presented together. Responses were collected in five categories; *general information, telecommunication technology efficacy, web usage, opinions of the web,* and *barriers to use* (Appendix B: Opinion Groups)

Category 1: Demographic Information

An initial series of questions gathered general background information on respondent's number of years teaching, sex, and grade currently teaching.

Table 1-1: Years Teaching

Years Teaching	**97.4% response (n=379)**
1-5	18.7%
6-10	15.6%
11-15	11.1%
16-20	14.0%
21-25	17.2%
26-30	19.5%
31-35	3.2%
36+	0.08%

Table 1-2: Sex

Sex	**97.7% response (n=380)**
Male	26.1%
Female	73.9%

The actual percentage of male and female teachers in Michigan is 28.7% male and 71.3% female (Michigan Department of Education, 1995-96). This study favors females by a very small margin.

Table 1-3: Grade Teaching

Grade Currently Teaching	85.6% response (n=333)
Elementary	60.1%
Middle	20.7%
High School	19.2%

The actual distribution of teachers in Michigan is 48.7% elementary, 22.7% middle school, and 28.6% high school (Michigan Department of Education, 1995-96). This sample favors elementary educators, a point to be remembered when making generalizations.

Category 2: Technology Efficacy

Since telecommunication technologies in K-12 education are still relatively new, reliable scales focusing specifically on the WWW were not available for use on the survey instrument. A scale was created to measure technology efficacy. A seven point Likert scale was used to examine ten questions. The questions were adapted from the 'Technology Proficiency Self-Assessment' scale used in dissertation research by Meg Ropp at Michigan State University College of Education. The original scale was a twenty-question survey addressing the four core areas of MSU College of Education technology competency requirements for their undergraduate teacher education students. Nine questions focusing on electronic communication technologies and classroom applications of technology were pulled from this scale to create the ten-question format used. The adapted measures are essentially measures of self-efficacy. Individuals rated their

confidence in their ability to perform various tasks related to electronic communication, specifically the WWW.

The scale proved to be too broad and not a reliable measure of any specific technology skill. For this reason the measure was not used for comparison against opinion responses. See *Further Research/Limitations of Study* section (p.64) for comment on existing scales and need for measures.

Responses are presented to provide background information on respondents' skills and confidence, but can only reliably be examined individually. Respondents were asked questions on a seven point Likert scale examining their confidence on a variety of statements concerning use of the WWW and electronic communication. Data was reduced by grouping all of the agree responses, disagree responses and neutral responses.

Table 2-1: Technology Efficacy-Use
I feel confident I could...

...send e-mail to a friend.

98.7% response (n=384)

Disagree	8.6%
Neutral	2.9%
Agree	88.5%

...open a web browser.

98.9% response (n=385)

Disagree	9.6%
Neutral	4.2%
Agree	86.2%

...use an Internet search engine (e.g.Infoseek, AltaVista) related to my subject matter interests

99.2% response (n=386)

Disagree	8.8%
Neutral	3.9%
Agree	87.3%

...search for and find the Smithsonian Institution web site.

98.5% response (n=383)

Disagree	8.1%
Neutral	5.2%
Agree	86.7%

...keep track of web sites that I have visited so that I can return to them later.

98.5% response (n=383)

Disagree	13.8%
Neutral	4.7%
Agree	81.5%

Over 85% feel confident that they can send electronic mail and open a WWW browser. Over 80 percent also feel confident in their ability to search for, find, and keep track of information on the WWW. This may seem like a high number, but it must be remembered that sample groups were known to have interaction with or motivation toward technology. One would hope agreement to be closer to 100% from technology leaders.

Table 2-2: Technology Efficacy-Development
I feel confident I could...

98.7% response (n=384)

...create my own homepage	
Disagree	42.4%
Neutral	18.0%
Agree	39.6%

98.9% response (n=385)

...maintain a web server.	
Disagree	50.6%
Neutral	20.3%
Agree	29.1%

A relatively small percentage feels confident in their ability to create and maintain WWW information. 40% feel confident they could create a homepage and only 29% feel confident they could maintain a web server. To draw on an often-used comparison between the Internet and automobiles, the majority of those sampled drive the cars on the information superhighway, but they're not the mechanics. This is understandable since their expertise is in educating students, not information systems management. If it is decided that educators need be proficient in these areas, then increased training and/or external support will be needed.

Table 2-3:Pedogogical/Adaptive Use

I feel confident I could...

...find primary sources of information on the Internet that I can use in my teaching.

98.7% response (n=384)

Disagree	10.9%
Neutral	4.7%
Agree	84.4%

...write an essay describing how I would use technology in my classroom.

97.7% response (n=380)

Disagree	10.5%
Neutral	11.1%
Agree	78.4%

...use technology to collaborate with other teachers or students who are distant from my classroom.

98.9% response (n=385)

Disagree	15.8%
Neutral	10.1%
Agree	74.0%

Again, the responses to these questions appear encouraging at first glance; 84.4% can find information on the Internet that can be used in their teaching, over 78% can write an essay on using technology in the classroom, and 74% can use technology to collaborate with other teachers. However, we must ask ourselves the difficult questions as we continue to work toward wiring every classroom for connection to the Internet. Why aren't these numbers closer to 100% agreement? What will be the response to these questions among less technology motivated and experienced educators who will be provided access in the coming years? What needs to be done to prepare them to effectively use new technologies when they gain access? Obviously these are questions for further inquiry.

Category 3: Web Usage

Respondents were asked to circle the appropriate choice to questions regarding frequency of WWW use, access to WWW, location of use (at school or at home), and purpose of use. Responses to frequency, access, and location of use are also further examined in the analysis section.

Table 3-1: Frequency

	98.2% Respondents (n=382)	
I use the web...	Rarely or never	12.6%
	Monthly	8.4%
	Weekly	23.3%
	Daily	23.0%
	1+ hour daily	23.3%
	3+ hours daily	9.4%

Table 3-2: Location (access)

	93.8% Respondents (n=365)	
At school I have access...	In my classroom	46.6%
	In my building	37.5%
	Not at all	15.9%

Table 3-3: Location (use)

	89.2% Respondents (n=347)	
I use the WWW primarily...	In my classroom	32.0%
	In the building	23.1%
	At home	45.0%

Nearly 80% of respondents use the WWW either daily or weekly. 21% use the WWW monthly or not at all. Access to the WWW was largely available either in individual classrooms, or within the school building. 16% reported having no access to the WWW at school. Interestingly, 45% choose the home as the primary location of use. This leads to future questions regarding the classroom as the preferred location - should it be?

If educators are partial to using the WWW from home should we not consider a plan to provide home access to every teacher as well as wiring every classroom? Elliot Soloway, professor in the College of Engineering at the University of Michigan suggests this very plan boldly stating, "Making sure each teacher has a home computer would be the single most important tactic in helping to bring our schools into the 21st century. If teachers themselves experience the benefits of technology, they become evangelists demanding more technology for their classrooms." (12)

Following this idea through examination of networks makes this concept even more powerful. As telecommunication services and networks converge, and high bandwidth access continues to stretch to more and more homes, educators will have the ability to access services and resources quickly and easily beyond the school building. This may provide an incredible return on technology investments if teachers are working from home, on 'their time', to become familiar with technology and to integrate new resources.

A series of rank order questions explored respondents use of the web for research, presentation, or personal interests. 29.1% of respondents incorrectly replied to the rank order questions commonly marking all responses the same rather than ranking items. For this reason summary findings of rank order questions are presented for comment only and not as a basis of statistical analysis. Results in this section show the score given to each choice regardless of if it was rank ordered. Though many respondents did not properly fill out these questions, some insight can be gained and trends observed.

Table 3-4: Purpose of use

		80.5% response (n=313)
I use the web for research on topics I'm teaching.	Highest use	45.0%
	Medium use	42.2%
	Lowest use	12.8%
		79.9% response (n=311)
I use the web to find information on personal interests	Highest use	35.0%
	Medium use	30.5%
	Lowest use	34.4%
		71.9% response (n=280)
I use the web to allow students to access information	Highest use	27.5%
	Medium use	32.1%
	Lowest use	40.4%

A trend noticed in table 3-4 reveals that educators use the WWW themselves more than they allow students to use the WWW. Only 12.8% ranked *"I use the web for research on topics I'm teaching,"* the lowest use. In contrast, 40.4% ranked *"I use the web to allow students to access information,"* the lowest use. This is

analogous to teachers accessing the library, but restricting student use. This would have a positive impact on delivery of instruction, but would not be maximizing the available resource. The question of why student use is not as high as teacher use is material for further study. Exploration of likely barriers to student use, such as access to equipment, time, teacher comfort/familiarity, and administrative restrictions would call for examination. Building level acceptable use policy, or lack there of, relating to student and teacher use of telecommunication technologies likely holds partial explanation of this finding.

Table 3-5: Purpose of use

		73.8% response (n=287)
I use the web as a research tool	Highest use	35.9%
	Medium use	41.5%
	Lowest use	22.6%
		76.1% response (n=296)
I use the web for personal entertainment	Highest use	23.6%
	Medium use	22.6%
	Lowest use	53.7%
		78.7% response (n=306)
I use the web to obtain the most current information for instruction.	Highest use	44.8%
	Medium use	41.2%
	Lowest use	14.1%

Obtaining the most current information for instruction was scored the highest use of the WWW at 44.8%. Use of the web for personal entertainment had the most distinguished ranking with over half of the respondents, 53.7%, scoring this their lowest use. In comparison, only 34.4% ranked *"...find information on personal interests"* (table 3-4) their lowest use. The trend may

indicate that educators use the WWW for research and person interests, but do not associate it with entertainment. This opens future study of the WWW as an 'edutainment' environment. The WWW may represent an environment that is rich, productive, and educational, but not viewed by educators as a 'work' environment.

Over 87% of respondents ranked using the WWW for research on topics taught (table 3-4) as either their highest or medium use. A similar question concerning impact of WWW use on instruction, *"I use the web to obtain the most current information for instruction,"* received a similar ranking of 86%. These findings reflect positively on use of the WWW impacting what and how teachers teach. Teachers use the WWW to aid their instruction.

However, it is surprising to find that only 80.5% of the survey group responded to the question regarding use of the WWW for research on topics they teach (table 3-4). As stated previously, one would expect the sample, consisting of teachers known to have exposure or motivation toward technology, to have a higher percentage of respondents using the WWW as a research tool. Examining this group in light of diffusion theory would lead one to expect higher use from the early adopter group.

Category 4: Opinion

Do educators feel the WWW has the ability to change teaching and learning or is it just the next in line of 'good technologies' that fail to significantly impact education? Respondents were asked questions on a seven point Likert scale examining their agreement to a variety of statements about the WWW. Data was reduced by grouping all of the agree responses, disagree responses and neutral responses. Half the questions represented positive effects the technology plays on education and half address negative effects. Questions address a variety of factors that effect the impact of the WWW in the classroom; instructional/teacher achievement, student achievement, navigation, content, and concerns related to classroom environmental effects of the WWW.

Table 4-1: Instructional/Teacher Achievement

The web has improved the way I present material to students.

95.8% response (n=373)

Disagree	15.5%
Neutral	27.3%
Agree	57.1%

I can find an abundant amount of classroom material easily on the web.

95.4% response (n=371)

Disagree	14.6%
Neutral	12.1%
Agree	73.3%

The web helps me keep current on topics I teach.

95.6% response (n=372)

Disagree	12.1%
Neutral	15.9%
Agree	72.0%

The web enables me cater to students needs and interests.

94.1% response (n=366)

Disagree	8.2%
Neutral	15.6%
Agree	76.2%

In looking at these four questions, *disagree* responses are more telling than *agree* responses. With an average of 12.6% disagreeing with positive statements regarding instructional/teacher achievement a number of conclusions can be drawn. Assuming that there does exist sufficient material on each curricular area of K-12 education on the WWW than one would hope far fewer technology leaders disagree with these statements. In order for investments in telecommunication technologies to significantly impact education this issue needs to be addressed. Two possible solutions rise to the forefront; 1) resources need to be created which are more sensitive to teachers needs, and 2) teachers need more training to effectively find and integrate resources into their instruction.

Table 4-2: Navigation

		96.4% response (n=375)
There is too much information on the web to make sense of.	Disagree	58.4%
	Neutral	15.7%
	Agree	25.9%

		95.9% response (n=373)
I get frustrated when I get lost on the web.	Disagree	44.5%
	Neutral	18.0%
	Agree	37.5%

		96.4% response (n=375)
It is difficult to find what I need on the web.	Disagree	56.5%
	Neutral	12.8%
	Agree	30.7%

An average of 31.4% agree with statements that reflect difficulty using and understanding the WWW. This finding is consistent with other research. A 1996 national opinion poll released by Sun Microsystems revealed that teachers overwhelmingly support the Internet in the classroom, but receive low grades in knowledge of the Internet. When asked to grade themselves on their knowledge of the Internet, 53% gave themselves a "C" or a "D", and 19% gave themselves an "F" (Sun Microsystems). Findings such as this force us to think back to the four-pillars model, or any model of technological deployment, and assess the progress, success, and focus. If 31.4% of early adopting educators have difficulty using telecommunication technologies then greater emphasis and focus needs to be placed on training and understanding. The goal of wiring every classroom in a specific time frame (by the year 2000) loses a great deal of impact if it is not accomplished with similar initiatives focused on training, policy, and resource

development. This finding, that teachers have difficulty navigating the WWW, reaffirms this need.

Table 4-3: Student Achievement

		94.3% response (n=367)
The web helps expand student interests.	Disagree	5.7%
	Neutral	11.4%
	Agree	82.8%

		93.6% response (n=364)
The web 'gets through' to students in ways books cannot.	Disagree	8.5%
	Neutral	16.2%
	Agree	75.3%

		94.1% response (n=366)
Students learn when they use the web.	Disagree	4.9%
	Neutral	10.9%
	Agree	84.2%

Educators have an overwhelmingly positive view of the impact of the WWW on students. On average, over 80% agree the WWW produces positive student achievement. This is contrasted by a low average of 6.4% disagreeing with positive student achievement. The natural progression of this finding is to move from examination of teachers to examination of students. Measuring gains in student achievement resulting from telecommunication technology is topic for further study.

Table 4-4: Content

		89.5% response (n=348)
Students quickly get off topic when using the web for research.	Disagree	28.2%
	Neutral	40.5%
	Agree	31.3%

		96.7% response (n=376)
Web information is good for recreation, but bad for education.	Disagree	89.6%
	Neutral	4.5%
	Agree	5.9%

		95.4% response (n=371)
The web is dangerous for student use due to the large amount of explicit material	Disagree	64.4%
	Neutral	13.5%
	Agree	22.1%

		94.6% response (n=368)
Being able to connect to global resources is necessary in my classroom.	Disagree	12.8%
	Neutral	22.3%
	Agree	64.9%

Over 40% responded *neutral* to the statement, *"Students quickly get off topic when using the web for research"*. This large number may be due to lack of experience of many educators working with students using the Internet. Another possible explanation is the changing role of the teacher. With integration of telecommunication technologies the teachers' role is changing from that of "sage on the stage" to "guide on the side". A reality of engaged learning is an increased number of directions students can expand and explore on any given topic. Where a teacher traditionally focused on concrete aspects of topics in the past they now guide students in many directions. This change in roles may also contribute to the large number of neutral responses as "getting off topic" is no longer as clearly defined as it once was.

Nearly 90% disagree with the statement, *"Web information is good for recreation, but bad for education."* This suggests that educators feel positive about the nature of content on the WWW. In contrast however, 22.1% feel that the web is dangerous due to a large amount of explicit material on the web. It is anticipated that this disparity in response is due largely to use and familiarity with the WWW. See *Statistical Analysis* (p. 50) for further analysis of this finding.

Table 4-5: 'Environmental' Effects

		96.1% response (n=374)
When I think of the web I get a headache, my day is already too busy!	Disagree	70.1%
	Neutral	11.0%
	Agree	19.0%

		95.4% response (n=371)
The web is just another distraction from teaching	Disagree	87.3%
	Neutral	7.5%
	Agree	5.1%

		95.6% response (n=372)
Increased student use of the web will lead to decreased need for teachers.	Disagree	89.5%
	Neutral	4.0%
	Agree	6.5%

		95.4% response (n=371)
Using the web helps me become more comfortable using a computer.	Disagree	9.4%
	Neutral	19.7%
	Agree	70.9%

Educators largely disagree with negative statements and agree with positive statements regarding the impact of the WWW on their time and work environment. Time has been shown to be a factor facing educators using technology (Public Service Telecommunications Corporation). The survey found that teachers disagreed with negative statements concerning time. 70.1% disagree that their day is too busy for use of the WWW and 87.3% disagree that the web is a distraction from teaching. Nearly 90% disagree that increased use of the web will lead to a decreased need for teachers. It was mentioned previously that positive beliefs promote positive behavior (Enochs, Riggs, and Ellis). These are positive findings for proponents of telecommunication technology in education.

Use of the WWW also showed a positive impact on teachers' comfort with computers. Over 70% agree that using the WWW helps them become more comfortable with computers. This finding is significant as it provides the opportunity for future economic gains in training. Development of basic training delivered over the WWW would enable educators to become more comfortable using their computers, increase their knowledge and technology skills, and save on logistical expenses associated with traditional training (substitute teacher expenses, travel, cost of courses). The major roadblock on this front is the up front cost of developing training and commitment to utilize it.

Category 5: Barriers

Respondents were asked to rank order potential barriers to use of the WWW; training, access, environment, and time. Examination of barriers is an important element in that it can help define causal relationships and explore reasons for why things are occurring as they are. Unfortunately the same problem plaguing the previous rank order questions occurred here also. A high percentage of respondents, 38%, failed to correctly fill out the rank order questions. As with the previous rank order questions, findings presented here are summary findings and used for inference and examination of trends.

Table 5-1: Barriers

I have not been trained enough on the web to understand it well enough to allow my students to use it.

69.2% response (n=269)

Least Barrier	26.0%
	26.8%
	28.6%
Largest Barrier	18.6%

Limited access to equipment prevents me from allowing students to use the web more frequently.

84.8% response (n=330)

Least Barrier	6.4%
	11.8%
	16.7%
Largest Barrier	65.2%

Pressure from administrators prevents me from allowing students to use the web more frequently.

62.2% response (n=242)

Least Barrier	50.8%
	24.4%
	16.9%
Largest Barrier	7.9%

I already struggle to cover what I need to in a single day. Using the WWW is 'one more hassle'.

74.8% response (n=291)

Least Barrier	30.2%
	29.9%
	29.6%
Largest Barrier	10.3%

Educators scored *"...access to equipment"* as the largest barrier 65.2% of the time. Surprisingly, only 7.9% scored pressure from administrators as the largest barrier. This is a very encouraging finding. Other studies and reports have emphasized the critical role that administrative support plays in use of technology in education (Center for Applied Special Technology 2). It appears that administrators are largely supportive of telecommunication technology.

STATISTICAL ANALYSIS

As mentioned previously, one of the goals of the current presidential administration is to have every K-12 classroom wired for connection to the Internet by the year 2000. In order to evaluate the impact of wiring every classroom the effect of frequency of use and location of use on user opinion toward the WWW is examined.

Two research questions are addressed:

1) Does location of WWW access at school (in the classroom, the building, or not at all) impact opinion of the WWW?
2) Does frequency of web use impact opinion of the WWW (ex. Educators think positively of the WWW yet never use.

In each case cross-tabs were calculated to examine changes in opinion responses. Statistically significant findings are presented. Opinion questions are group by topic category (not in order of the survey). In addition, certain findings that reveal interesting trends, but are not significant, are also presented. Complete findings are presented in Appendix C: Complete Findings.

RQ#1 - Does frequency of web use impact 'opinions' of the WWW?

Table 6-1: Instructional/Teacher Achievement

		I use the World Wide Web…					
I can find an abundant amount of classroom material on the web.		Rarely or never	Monthly	Weekly	Daily	1+ hour daily	3+ hour daily
	Disagree	40.0%	25.9%	24.7%	10.5%	7.6%	2.9%
	Agree	60.0%	74.1%	75.3%	89.5%	92.4%	97.1%
	83.0% response (n=323)						
	Chi-square=.000						

		I use the World Wide Web…					
The Web helps me keep current on topics I teach.		Rarely or never	Monthly	Weekly	Daily	1+ hour daily	3+ hour daily
	Disagree	60.9%	31.8%	16.9%	7.0%	4.9%	2.9%
	Agree	39.1%	68.2%	83.1%	93.0%	95.1%	97.1%
	79.4% response(n=309)						
	Chi-square=.000						

		I use the World Wide Web…					
The web has improved the way I present material to students.		Rarely or never	Monthly	Weekly	Daily	1+ hour daily	3+ hour daily
	Disagree	70.0%	61.9%	29.8%	9.5%	5.5%	8.8%
	Agree	30.0%	38.1%	70.2%	90.5%	94.5%	91.2%
	68.9% response (n=268)						
	Chi-square=.000						

		I use the World Wide Web…					
The web enables me to cater to student needs and interests.		Rarely or never	Monthly	Weekly	Daily	1+ hour daily	3+ hour daily
	Disagree	25.0%	16.7%	9.4%	5.4%	6.0%	9.1%
	Agree	75.0%	83.3%	90.6%	94.6%	94.0%	90.9%
	78.7% response (n=306)						
	Chi-square=.036						

Table 6-1 reveals a relationship between use and opinion. Increased use is related to increased positive view of the WWW. This trend varies slightly when WWW use exceeds one hour daily. The most distinct example of this is found in response to the statement, *"The web helps me keep current on topics I teach."* Educators who rarely or never use the WWW agree with this statement 39.1% of the time. As use increases to three or more hours daily agreement increases to 97.1%.

If it is assumed that wiring classrooms will result in increased use by educators than the WWW innovation is likely to be adopted. However, it must be remembered that provision of technology does not guarantee use of technology. Later adopters and laggards will require training, motivation, and resources to encourage use.

Table 6-2: Navigation

There is too much information on the web for me to make sense of.		*I use the World Wide Web…*					
		Rarely or never	Monthly	Weekly	Daily	1+ hour daily	3+ hour daily
	Disagree	60.0%	46.4%	55.3%	77.0%	81.9%	81.8%
	Agree	40.0%	53.6%	44.7%	23.0%	18.1%	18.2%
	80.5% response (n=313)						
	Chi-square=.000						

I get frustrated when I get lost on the web.		*I use the World Wide Web…*					
		Rarely or never	Monthly	Weekly	Daily	1+ hour daily	3+ hour daily
	Disagree	22.2%	30.8%	41.8%	63.6%	63.4%	87.9%
	Agree	77.8%	69.2%	58.2%	36.4%	36.6%	12.1%
	77.6% response (n=302)						
	Chi-square=.000						

It is difficult to find what I need on the web.		*I use the World Wide Web…*					
		Rarely or never	Monthly	Weekly	Daily	1+ hour daily	3+ hour daily
	Disagree	37.0%	42.3%	48.7%	72.7%	79.5%	84.8%
	Agree	63.0%	57.7%	51.3%	27.3%	20.5%	15.2%
	83.3% response (n=324)						
	Chi-square=.000						

Navigation questions contained negative statements concerning use of the WWW. In this category the same trend noticed in table 6-1 appeared in reverse. As usage increased the percentage of respondents who *disagree* with negative statements increases. Worded differently, increased use results in an increasingly positive view of WWW navigation. For example, 77.8% of rare users of the WWW get frustrated when lost on the web. When use increases to

exceed three hours a day only 12.1% get frustrated. What is not revealed through this finding is the role played by training in increasing usage.

Table 6-3: Student Achievement

		I use the World Wide Web...					
The web helps expand student interests.		Rarely or never	Monthly	Weekly	Daily	1+ hour daily	3+ hour daily
	Disagree	15.6%	15.4%	7.2%	2.7%	3.5%	2.9%
	Agree	84.4%	84.6%	92.8%	97.3%	96.5%	97.1%
	82.5% response (n=321)						
	Chi-square=.035						

		I use the World Wide Web...					
Students learn when they use the web.		Rarely or never	Monthly	Weekly	Daily	1+ hour daily	3+ hour daily
	Disagree	15.6%	7.7%	7.1%	1.3%	3.6%	2.9%
	Agree	84.4%	92.3%	92.9%	98.7%	96.4%	97.1%
	83.0% response (n=323)						
	Chi-square=.052						

Again, a relationship between use and positive opinion was found. As usage increases, positive opinion toward the impact of the WWW on students increases (until daily use is exceeded). What is most interesting is the high percentage of rare or never users of the WWW who have positive opinion of the impact of the WWW on student achievement. Both, *"The web helps expand student interests,"* and *"Students learn when they use the web,"* received 84.4% agreement from rare or never users. This agreement climbs to 97.1% when use increase to over three hours daily.

This finding provides the opportunity for insight. Based on social learning theory mentioned previously, positive attitudes lead to positive beliefs (Enoch, Riggs, and Ellis). Lets assume positive beliefs will result in increased use. Teachers' in this study hold positive views toward the impact of the WWW on student achievement. Student achievement has been shown to improve with access to online resources (CAST). It can then be determined that educators' positive views toward student impact will allow increased student use as WWW access increases, resulting in increased student achievement! While this study does not validate the causal relationship presented it does outline a likely path to successful adoption of telecommunication. The challenge of this model lies in promoting positive views among educators and providing resources to utilize the WWW. This conclusion is intuitive. Difficulty arises in overcoming barriers to see that positive views are actually translated to increased use.

Table 6-4: Content

Being able to connect to global resources is necessary in my classroom.		*I use the World Wide Web...*					
		Rarely or never	Monthly	Weekly	Daily	1+ hour daily	3+ hour daily
	Disagree	33.3%	34.6%	20.0%	9.0%	11.6%	6.1%
	Agree	66.7%	65.4%	80.0%	91.0%	88.4%	93.9%
	73.0% response (n=284)						
	Chi-square=.002						

Only one question in the *content* group was statistically significant, "*Being able to connect to global resources is necessary in my classroom*". The same trend noticed in previous tables, linking use to positive views, was also found. Agree responses begin at 66.7% for educators who use the WWW rarely or never and increase to 93.9% for those using the WWW three or more hours daily.

Table 6-5: Environmental Effects

When I think of the web I get a headache, my day is already to busy.		*I use the World Wide Web...*					
		Rarely or never	Monthly	Weekly	Daily	1+ hour daily	3+ hour daily
	Disagree	53.1%	65.4%	72.6%	84.6%	87.4%	91.2%
	Agree	46.9%	34.6%	27.4%	15.4%	12.6%	8.8%
	84.8% response (n=330)						
	Chi-square=.000						

Using the web helps me become more comfortable using a computer.		*I use the World Wide Web...*					
		Rarely or never	Monthly	Weekly	Daily	1+ hour daily	3+ hour daily
	Disagree	37.0%	16.7%	11.5%	6.1%	7.2%	3.7%
	Agree	63.0%	83.3%	88.5%	93.9%	92.8%	96.3%
	76.3% response (n=297)						
	Chi-square=.000						

Nearly 50% of educators who rarely or never use the WWW feel their day is already too busy and the WWW is *"one more headache"*. This number drops significantly as use increases. Only 8.8% of those using the WWW more than three hours daily feel their day is too busy for the WWW. This trend is consistent with basic logic. What is interesting is the starting point from which this trend builds. It is not until educators use the WWW daily that feeling their day is too busy for the WWW drops below 25%.

As use increases agreement to the statement, *"Using the web helps me become more comfortable using a computer"* also increases. Agreement ranges from 63% among rare users of the WWW to 96.3% for educators using the WWW three or more hours daily.

RQ# 2: Does location of WWW access at school (in the classroom, the building, or not at all) impact 'opinion' of the WWW?

To examine this question responses to location of use of the WWW were compared to WWW opinion items. Opinion questions are group by topic category (not in order of the survey). All findings are not presented here. In addition, findings that reveal interesting trends, but are not significant, are also presented. Complete findings are presented in Appendix C: Complete Findings.

Table 7-1: Instructional/Teacher Achievement

		At school I have access…		
The Web helps me keep current on topics I teach		In my classroom	In the building	Not at all
	Disagree	8.1%	22.6%	15.2%
	Agree	91.9%	77.4%	84.8%
76.1% (n=296)	*Chi-square=.004*			

The Web has improved the way I present material to my students		*At school I have access…*		
		In my classroom	In the building	Not at all
	Disagree	12.3%	33.7%	25.9%
	Agree	87.7%	66.3%	74.1%
65.3% (n=254)	*Chi-square=.001*			

Respondents with classroom access to the WWW agree that the WWW helps them keep current on topics they teach 91.9% of the time. Agreement dropped to 77.4% when access was available in the building rather than in the classroom. Interestingly agreement rose again, to 84.8%, for those with no access at school. This may imply that educators with no building access, who agree with this statement, are home users.

The same pattern of agreement is found in response to the question, *"The Web has improved the way I present material to my students"*. Classroom access resulted in 87.7% agreement, dropping for those with building access (66.3%), and rising again for those with no access at school (74.1%). The same pattern was present in the other two survey questions based on Instructional/Teacher Achievement; *"I can find an abundant amount of classroom information easily on the web"* and *"The web enables me to cater to student needs and interests."* However, these relationships are not presented due to the lack of statistical significance.

Table 7-2: Navigation

		At school I have access…		
I get frustrated when I get lost on the web.		In my classroom	In the building	Not at all
	Disagree	58.0%	43.0%	60.0%
	Agree	42.0%	57.0%	40.0%
73.8% (n=287)	*Chi-square=.037*			

		At school I have access…		
It is difficult to find what I need on the web		In my classroom	In the building	Not at all
	Disagree	71.4%	55.2%	55.3%
	Agree	28.6%	44.8%	44.7%
79.2% (n=308)	*Chi-square=.013*			

Educators with classroom access to the WWW find it easier to find what they need on the web than educators with building access or no access at all. Difficulty finding material was scored almost identically for educators with building access and those with no access at all. Educators without classroom access find it difficult to find information 20% more frequently than those with classroom access.

Table 7-3: Student Achievement

The web helps expand student interests.		*At school I have access...*		
		In my classroom	In the building	Not at all
	Disagree	3.9%	10.4%	5.1%
	Agree	96.1%	89.6%	94.9%
78.7% (n=306)	*Chi-square=.098*			

Students learn when they use the web.		*At school I have access...*		
		In my classroom	In the building	Not at all
	Disagree	2.6%	8.5%	8.6%
	Agree	97.4%	91.5%	91.4%
79.2% (n=308)	*Chi-square=.071*			

While these findings do not show statistical significance they are presented to display educators opinion toward value of the WWW for students. Regardless of location of use those surveyed overwhelmingly feel that the WWW has a positive impact on students. Over 90% agreed with the statements, *"The web helps expand student interest"* and *"Students learn when they use the web"*. This positive response toward the student impact of the WWW is encouraging. These findings are consistent with student achievement questions analyzed in research question 1 (p.55).

Table 7-4: Environmental Effects

When I think of the web I get a headache, my day is already to busy.		*At school I have access...*		
		In my classroom	In the building	Not at all
	Disagree	84.0%	71.1%	72.1%
	Agree	16.0%	28.9%	27.9%
80.5% (n=313)	*Chi-square=.027*			

The web is just another distraction from teaching.		*At school I have access...*		
		In my classroom	In the building	Not at all
	Disagree	95.1%	93.3%	92.7%
	Agree	4.9%	6.7%	7.3%
83.0% (n=323)	*Chi-square=.747*			

Increased student use of the web will lead to decreased need for teachers.		*At school I have access...*		
		In my classroom	In the building	Not at all
	Disagree	93.2%	93.2%	90.7%
	Agree	6.8%	6.8%	9.3%
86.6% (n=337)	*Chi-square=.838*			

Using the web helps me become more comfortable using a computer.		*At school I have access...*		
		In my classroom	In the building	Not at all
	Disagree	8.5%	15.5%	11.8%
	Agree	91.5%	84.5%	88.2%
71.7% (n=279)	*Chi-square=.239*			

Compared to those with classroom access, a higher percentage with either building or no access feel that their day is too busy for use of the WWW. 56.8% with building or no access feel this way. This finding suggests that machines closer to the end user are less of an intrusion into daily routine. It is interesting to note also that 16% with classroom access still feel that their day is too busy for

the WWW. A number of causes for this, such as lack of classroom time to use equipment and lack of experience to use equipment effortlessly warrant further exploration.

While not significantly significant the other three questions are presented to show their one-sided responses. Over 90% disagreed with statements suggesting that the web is a distraction from teaching and increased use of the web will lead to decreased need for teachers.

FURTHER RESEARCH/LIMITATIONS OF STUDY

Further research is necessary to identify causal relationships among findings. For example, evaluating factors which contribute to increased use of the WWW by educators will aid development of strategies to maximize use. Measures of technological efficacy would also benefit research by providing reliable means of evaluating respondents. These measures would enable researchers to better define the status and knowledge of the group under study (ex. Are they in fact early adopters? What is the extent of their technological knowledge).

As mentioned in the METHODS section, a scale measuring technological efficacy was used on the survey, though not presented in the findings. There are a number of reliable scales in existence, which measure different facets of computer use and attitudes. The existing Computer Attitude Scale and Computer Anxiety Rating Scale scales address a broad range of computer applications and functions beyond the scope of this research. The Computer Self-Efficacy Scale was developed to measure opinions of subjects' capabilities regarding specific computer-related knowledge and skills to specific for this study. The Computer Self-Efficacy Scale was built off of Bandura's social learning theory surrounding the role efficacy plays in behavior (research suggests that positive beliefs promote positive behaviors). The scale created for this research attempted to serve this function, but proved unreliable.

Evaluation of the scales mentioned above deemed them inefficient for this study for two overriding reasons. First, this thesis focuses specifically on opinions toward the WWW and classroom effect. Other scales address a broader range of technological skills. Second, the measures require lengthy questionnaires. There is also concern associated with length of a questionnaire and the importance of keeping instrument short to encourage users to complete and return them (Preece 633). The value of proven measures was not determined great enough in light of their length, and resulting potential decrease in responses, to be included in this study.

It would have been a valuable asset to have pre-tested and validated a scale for this function. As mentioned previously, it is difficult to compare groups in an environment with vast differences in local technology emphasis, access to training and equipment, and individual teacher experience. A measure of technological efficacy would have provided another valuable base to work from in an effort to isolate causal variables for differing opinions toward the web in addition to those examined.

CONCLUSION/RECOMMENDATION

Of the group studied over 85% were confident in their ability to open a web browser and search for information. Over half feel the WWW has improved the way they present material to their students. 76.2% feel the WWW enables them to cater to student needs and interests. 75.3% also feel that the WWW 'gets through' to students in ways books cannot. It was found that increased use of the WWW is related to increased positive opinion toward impact of the WWW on the classroom. Classroom access to the WWW also was found to be related to positive opinion.

In contrast to these positive results it was found that greater than half of the respondents (56.5%) find it difficult to find what they need on the WWW. Nearly 20% feel that adding use of the WWW to their already busy day is 'one more hassle'. Access to equipment was noted as the largest barrier preventing increased student use of the web.

Technological innovations have historically failed to impact and change K-12 education. The current environment toward telecommunication technologies in education appears extremely favorable. Social and financial support exists, along with great anticipation among teachers for access to the WWW. However, technologically under-trained staff hinders diffusion of technology in K-12 education. Many educators struggle with integrating the massive amounts of available WWW based information into usable classroom resources. Among educators believed to be early adopters of the WWW over

25% feel that there is too much information on the WWW to make sense of. At the same time over 70% feel that the WWW helps them keep current on topics they teach and 83% feel the WWW helps expand student interests. It is even more encouraging to find that favorable opinion toward the WWW increases with increased access and increased use, almost without exception.

In order for telecommunication technologies to be adopted in K-12 education the particular innovation-decisions of individuals must be understood and anticipated. In an environment defined by limited training and resources finding the proper medium between two main factors increases successful adoption:

1. Increase training. Increased training will lead to a more knowledgeable, capable user group. Educators' need to be trained on how to use the readily available material in their instruction (integration). Educators' also need to be trained on finding existing information (navigation).
2. Resource development. Material on the web must be presented in a manner that meets the pedagogical needs of the teacher (accommodation) and is easily identified. Classroom content resources and training resources provide a reason for educators' to use the technology themselves and with their students.

In addition to his writings and theory on diffusion of innovations Everett Rogers has also written on the history of communication research. In his 1986

book, Communication Technology, The New Media In Society, Rogers describes the early roots of American communication Science. John Dewey, Charles Horton Cooley, Robert E. Park, and George Herbert Mead bridged European and American scholarship in the late 1800's and early 1900's to define the field of communication research. Rogers describes these four as, '...positivists, believing in the amelioration of social problems through social science research.' He proceeds to describe that all four felt their research had the greatest effect when applied to real world problems in real world settings, believing their studies could make a difference. While this research is not likely to singly-handedly solve all of the problems associated with the integration of technology in K-12 instruction, it does serve to begin creation of a foundation for understanding users of telecommunication technology in the K-12 setting.

APPENDICES

APPENDIX A

APPENDIX A

SURVEY INSTRUMENT

This survey is being conducted by the Great Lakes Collaborative (GLC), a service of Wayne County Regional Educational Service Agency, to gain a better understanding of our clients position and use of information technology. We would like to offer you **FREE**, for your participation in this survey, a copy of the next GLC CD-ROM. Your response will help us gain a better understanding of educators current uses and views of the World Wide Web (WWW) enabling us to create the highest quality instruction resources for use by all educators.

Your responses to the survey will be kept confidential. Your name and address will be used only for sending you a copy of the next GLC CD-ROM. Please fill in the name and address portion at the end of the survey to ensure delivery.

Thank you for your participation.

Will the World Wide Web Change the Classroom?

Years teaching
Sex District
Grade currently teaching
State
County
Would you like a copy of GLC's next resource CD-ROM 'Multimedia Michigan'? **Y/N**

I. Circle the number that indicates your level of agreement to the following statements:
1=Strongly Disagree, 4=Neutral, 7=Strongly Agree

SD N SA	"I feel confident I could...
1 2 3 4 5 6 7	1. ...send e-mail to a friend.
1 2 3 4 5 6 7	2. ...open a web browser.
1 2 3 4 5 6 7	3. ...use an Internet search engine (*e.g. Infoseek, AltaVista) related to my subject matter interests.*
1 2 3 4 5 6 7	4. ...search for and find the Smithsonian Institution Web site.
1 2 3 4 5 6 7	5. ...keep track of web sites I have visited so that I can return to them later. (*An example is using bookmarks).*
1 2 3 4 5 6 7	6. ...create my own web page.
1 2 3 4 5 6 7	7. ...find primary sources of information on the Internet that I can use in my teaching.
1 2 3 4 5 6 7	8. ...write an essay describing how I would use technology in my classroom.
1 2 3 4 5 6 7	9. ...maintain a web server.
1 2 3 4 5 6 7	10. ...use technology to collaborate with other teachers or students who are distant from my classroom.

II. Please circle the most appropriate response.

1. I use the World Wide Web...
   3+ hours daily 1+ hour daily daily weekly monthly rarely or never

2. At school I have access to the World Wide Web...
   in my classroom in the building not at all

3. I use the World Wide Web primarily...
   in my classroom in the school building at home

Please rank the following in order of use. Use each number only once.
(1=highest use, 2=medium use, 3=lowest use, enter N/A if not applicable)

4. "I use the World Wide Web...
   ___ for research on topics I'm teaching.
   ___ to find information on personal interests.
   ___ to allow student to access information otherwise unavailable to them.

5. "I use the World Wide Web...
   ___ as a research tool for students.
   ___ for personal entertainment.
   ___ to obtain the most current information possible for classroom instruction.

III. Circle the number that indicates your level of agreement with the following statement:
1=Strongly Disagree, 4=Neutral, 7=Strongly Agree

SD N SA	
1 2 3 4 5 6 7	1. The web has improved the way I present material to my students.
1 2 3 4 5 6 7	2. Students quickly get off topic when using the web for research.
1 2 3 4 5 6 7	3. I can find an abundant amount of classroom information easily on the web.
1 2 3 4 5 6 7	4. There is to much information on the web for me to make sense of.
1 2 3 4 5 6 7	5. The web helps expand student interests.
1 2 3 4 5 6 7	6. When I think of the web I get a headache, my day is already to busy!
1 2 3 4 5 6 7	7. The web helps me keep current on topics I teach.
1 2 3 4 5 6 7	8. Web information is good for recreation, but is inappropriate for education.
1 2 3 4 5 6 7	9. Being able to connect to global resources is necessary for my classroom.
1 2 3 4 5 6 7	10. The web is dangerous for student use due to the large amount of explicit material.
1 2 3 4 5 6 7	11. The web 'gets through' to students in ways books cannot.
1 2 3 4 5 6 7	12. The web is just another distraction from teaching.
1 2 3 4 5 6 7	13. The web enables me to cater to students needs and interests.
1 2 3 4 5 6 7	14. Increased student use of the web will lead to decreased need for teachers.
1 2 3 4 5 6 7	15. I get frustrated when I get lost on the web.
1 2 3 4 5 6 7	16. Using the web helps me become more comfortable using a computer.
1 2 3 4 5 6 7	17. It is difficult to find what I need on the web.
1 2 3 4 5 6 7	18. Students learn when they use the web.

IV. Please rank the following barriers to student web use. Use each number only once. (1=largets barrier, 4=least barrier, enter BB if it is Not a Barrier)
1 -- 2 -- 3 -- 4
largest least

___ 1. I have not been trained enough on use of the web to understand it well enough to allow my students to use it.
___ 2. Limited access to equipment prevents me from allowing students to use the web more frequently.
___ 3. Pressure from administrators prevents me from allowing students to use the web more frequently.
___ 4. I already struggle to cover what I need to in a single day. Using the WWW is 'one more hassle'.

Mailing information to receive GLC's 'Multimedia Michigan' CD-ROM

Name: _____
Address: _____
_____
_____
_____

E-mail address:_____

Y/N It is o.k. to contact me for future projects utilizing technology in education.

Thank you for you participation.

APPENDIX B

APPENDIX B

OPINION GROUPS

Opinion questions were created around five areas; instructional/teacher achievement, navigation, student achievement, content, and environmental effects. Questions weren't designed to measure discrete aspects of these groups, but rather explore opinion based on these groups.

Instructional/Teacher Achievement
1.The web has improved the way I present material to students.
3. I can find an abundant amount of classroom information easily on the web.
7.The web helps me keep current on topics I teach.
13.The web enables me to cater to students needs and interests.

Navigation
4. There is too much information on the web for me to make sense of.
15.I get frustrated when I get lost on the web.
17. It is difficult to find what I need on the web.

Student Achievement
5.The web helps expand student interests.
11.The web 'gets through' to students in ways books cannot.
18.Students learn when they use the web.

Content
2. Students quickly get off topic when using the web for research.
8.Web information is good for recreation, but is inappropriate for education.
10.The web is dangerous for student use due to the large amount of explicit material.
9. Being able to connect to global resources is necessary in my classroom.

'Environmental' Effects
6. When I think of the web I get a headache, my day is already too busy!
12. The web is just another distraction from teaching.
14. Increased student use of the web will lead to decreased need for teachers.
16.Using the web helps me become more comfortable using a computer.

APPENDIX C

APPENDIX C

COMPLETE FINDINGS

Cross-tabs were calculated to examine the effect of access and amount of use on opinion responses. Many of the cross-tabs proved insignificant based on their chi-square value (greater than 0.05) and were not presented previously. Cross-tabs for ALL responses are presented here.

RQ#1 - Does frequency of web use impact 'opinions' of the WWW (ex. Educators think positively of the WWW yet never use it)?

Table C-1: Instructional/Teacher Achievement

		At school I have access…					
The web has improved the way I present material to students.		Rarely or never	Monthly	Weekly	Daily	1+ hour daily	3+ hour daily
	Disagree	70.0%	61.9%	29.8%	9.5%	5.5%	8.8%
	Agree	30.0%	38.1%	70.2%	90.5%	94.5%	91.2%
	68.9% response (n=268)						
	Chi-square=.000						

		At school I have access…					
I can find an abundant amount of classroom material on the web.		Rarely or never	Monthly	Weekly	Daily	1+hour daily	3+ hour daily
	Disagree	40.0%	25.9%	24.7%	10.5%	7.6%	2.9%
	Agree	60.0%	74.1%	75.3%	89.5%	92.4%	97.1%
	83.0% response (n=323)						
	Chi-square=.000						

		At school I have access…					
The Web helps me keep current on topics I teach.		Rarely or never	Monthly	Weekly	Daily	1+ hour daily	3+ hour daily
	Disagree	60.9%	31.8%	16.9%	7.0%	4.9%	2.9%
	Agree	39.1%	68.2%	83.1%	93.0%	95.1%	97.1%
	79.4% response(n=309)						
	Chi-square=.000						

		At school I have access…					
The web enables me to cater to student needs and interests.		Rarely or never	Monthly	Weekly	Daily	1+ hour daily	3+ hour daily
	Disagree	25.0%	16.7%	9.4%	5.4%	6.0%	9.1%
	Agree	75.0%	83.3%	90.6%	94.6%	94.0%	90.9%
	78.7% response (n=306)						
	Chi-square=.036						

Table C-2: Navigation

There is too much information on the web for me to make sense of.		At school I have access...					
		Rarely or never	Monthly	Weekly	Daily	1+ hour daily	3+ hour daily
	Disagree	60.0%	46.4%	55.3%	77.0%	81.9%	81.8%
	Agree	40.0%	53.6%	44.7%	23.0%	18.1%	18.2%
	80.5% response (n=313)						
	Chi-square=.000						

I get frustrated when I get lost on the web.		At school I have access...					
		Rarely or never	Monthly	Weekly	Daily	1+ hour daily	3+ hour daily
	Disagree	22.2%	30.8%	41.8%	63.6%	63.4%	87.9%
	Agree	77.8%	69.2%	58.2%	36.4%	36.6%	12.1%
	77.6% response (n=302)						
	Chi-square=.000						

It is difficult to find what I need on the web.		At school I have access...					
		Rarely or never	Monthly	Weekly	Daily	1+ hour daily	3+ hour daily
	Disagree	37.0%	42.3%	48.7%	72.7%	79.5%	84.8%
	Agree	63.0%	57.7%	51.3%	27.3%	20.5%	15.2%
	83.3% response (n=324)						
	Chi-square=.000						

Table C-3: Student Achievement

		At school I have access…					
The web helps expand student interests.		Rarely or never	Monthly	Weekly	Daily	1+ hour daily	3+ hour daily
	Disagree	15.6%	15.4%	7.2%	2.7%	3.5%	2.9%
	Agree	84.4%	84.6%	92.8%	97.3%	96.5%	97.1%
	82.5% response (n=321)						
	Chi-square=.035						

		At school I have access…					
The web 'gets through' to students in ways books cannot.		Rarely or never	Monthly	Weekly	Daily	1+ hour daily	3+ hour daily
	Disagree	7.4%	15.4%	10.0%	7.5%	12.3%	6.7%
	Agree	92.6%	84.5%	90.0%	92.5%	87.7%	93.3%
	77.4% response (n=301)						
	Chi-square=.793						

		At school I have access…					
Students learn when they use the web.		Rarely or never	Monthly	Weekly	Daily	1+ hour daily	3+ hour daily
	Disagree	15.6%	7.7%	7.1%	1.3%	3.6%	2.9%
	Agree	84.4%	92.3%	92.9%	98.7%	96.4%	97.1%
	83.0% response (n=323)						
	Chi-square=.052						

Table C-4: Content

Students quickly get off topic when using the web for research.		At school I have access…					
		Rarely or never	Monthly	Weekly	Daily	1+ hour daily	3+ hour daily
	Disagree	53.8%	69.2%	40.5%	48.1%	44.1%	48.1%
	Agree	46.2%	30.8%	59.5%	51.9%	55.9%	51.9%
	52.9% response (n=206)						
	Chi-square=.581						

Web information is good for recreation, but inappropriate for education.		At school I have access…					
		Rarely or never	Monthly	Weekly	Daily	1+ hour daily	3+ hour daily
	Disagree	91.2%	93.3%	92.7%	97.6%	92.1%	97.1%
	Agree	8.8%	6.7%	7.3%	2.4%	7.9%	2.9%
	91.3% response (n=355)						
	Chi-square=.554						

The web is dangerous for student use due to the large amount of explicit material.		At school I have access…					
		Rarely or never	Monthly	Weekly	Daily	1+ hour daily	3+ hour daily
	Disagree	73.3%	66.7%	70.3%	73.7%	80.5%	78.8%
	Agree	26.7%	33.3%	29.7%	26.3%	19.5%	21.2%
	81.5% response (n=317)						
	Chi-square=.639						

Being able to connect to global resources is necessary in my classroom.		At school I have access…					
		Rarely or never	Monthly	Weekly	Daily	1+ hour daily	3+ hour daily
	Disagree	33.3%	34.6%	20.0%	9.0%	11.6%	6.1%
	Agree	66.7%	65.4%	80.0%	91.0%	88.4%	93.9%
	73.0% response (n=284)						
	Chi-square=.002						

Table C-5: Environmental Effects

When I think of the web I get a headache, my day is already to busy.		At school I have access…					
		Rarely or never	Monthly	Weekly	Daily	1+ hour daily	3+ hour daily
	Disagree	53.1%	65.4%	72.6%	84.6%	87.4%	91.2%
	Agree	46.9%	34.6%	27.4%	15.4%	12.6%	8.8%
	84.8% response (n=330)						
	Chi-square=.000						

The web is just another distraction from teaching.		At school I have access…					
		Rarely or never	Monthly	Weekly	Daily	1+ hour daily	3+ hour daily
	Disagree	88.6%	85.7%	97.3%	96.3%	95.2%	94.3%
	Agree	11.4%	14.3%	2.7%	3.7%	4.8%	5.7%
	87.1% response (n=339)						
	Chi-square=.148						

Increased student use of the web will lead to decreased need for teachers.		At school I have access…					
		Rarely or never	Monthly	Weekly	Daily	1+ hour daily	3+ hour daily
	Disagree	87.9%	90.3%	95.3%	95.2%	91.9%	93.9%
	Agree	12.1%	9.7%	4.7%	4.8%	8.1%	6.1%
	90.7% response (n=353)						
	Chi-square=.649						

Using the web helps me become more comfortable using a computer.		At school I have access…					
		Rarely or never	Monthly	Weekly	Daily	1+ hour daily	3+ hour daily
	Disagree	37.0%	16.7%	11.5%	6.1%	7.2%	3.7%
	Agree	63.0%	83.3%	88.5%	93.9%	92.8%	96.3%
	76.3% response (n=297)						
	Chi-square=.000						

RQ# 2: Does location of WWW access at school (in the classroom, the building, or not at all) impact 'opinion' of the WWW?

Table C-6: Instructional/Teacher Achievement

The Web has improved the way I present material to my students		At school I have access...		
		In my classroom	In the building	Not at all
	Disagree	12.3%	33.7%	25.9%
	Agree	87.7%	66.3%	74.1%
65.3% (n=254)	*Chi-square=.001*			

I can find an abundant amount of classroom information easily on the web.		At school I have access...		
		In my classroom	In the building	Not at all
	Disagree	14.9%	20.4%	12.8%
	Agree	85.1%	79.6%	87.2%
78.7% (n=306)	*Chi-square=.396*			

The Web helps me keep current on topics I teach		At school I have access...		
		In my classroom	In the building	Not at all
	Disagree	8.1%	22.6%	15.2%
	Agree	91.9%	77.4%	84.8%
76.1% (n=296)	*Chi-square=.004*			

The web enables me to cater to students needs and interests.		At school I have access...		
		In my classroom	In the building	Not at all
	Disagree	6.8%	12.8%	9.6%
	Agree	93.2%	87.2	90.4%
74.8% (n=291)	*Chi-square=.237*			

Table C-7: Navigation

There is too much information on the web for me to make sense of.		At school I have access...		
		In my classroom	In the building	Not at all
	Disagree	71.1%	67.8%	58.5%
	Agree	28.9%	32.2%	41.5%
76.6% (n=298)	*Chi-square=.312*			

I get frustrated when I get lost on the web.		At school I have access...		
		In my classroom	In the building	Not at all
	Disagree	58.0%	43.0%	60.0%
	Agree	42.0%	57.0%	40.0%
73.8% (n=287)	*Chi-square=.037*			

It is difficult to find what I need on the web		At school I have access...		
		In my classroom	In the building	Not at all
	Disagree	71.4%	55.2%	55.3%
	Agree	28.6%	44.8%	44.7%
79.2% (n=308)	*Chi-square=.013*			

Table C-8: Student Achievement

		At school I have access...		
The web helps expand student interests.		In my classroom	In the building	Not at all
	Disagree	3.9%	10.4%	5.1%
	Agree	96.1%	89.6%	94.9%
78.7% (n=306)	*Chi-square=.098*			

		At school I have access...		
The web 'gets through' to students in ways books cannot.		In my classroom	In the building	Not at all
	Disagree	10.6%	11.4%	5.6%
	Agree	89.4%	88.6%	94.4%
75.1% (n=292)	*Chi-square=.594*			

		At school I have access...		
Students learn when they use the web.		In my classroom	In the building	Not at all
	Disagree	2.6%	8.5%	8.6%
	Agree	97.4%	91.5%	91.4%
79.2% (n=308)	*Chi-square=.071*			

Table C-9: Content

		At school I have access…		
Students quickly get off topic when using the web for research.		In my classroom	In the building	Not at all
	Disagree	45.5%	51.5%	35.7%
	Agree	54.5%	48.5%	64.3%
49.4% (n=192)	*Chi-square=.505*			

		At school I have access…		
Web information is good for recreation, but inappropriate for education.		In my classroom	In the building	Not at all
	Disagree	95.7%	90.8%	95.7%
	Agree	4.3%	9.2%	4.3%
86.9% (n=338)	*Chi-square=.192*			

		At school I have access…		
The web is dangerous for student use due to the large amount of explicit material.		In my classroom	In the building	Not at all
	Disagree	24.3%	29.6%	24.4%
	Agree	75.7%	70.4%	75.6%
77.4% (n=301)	*Chi-square=.608*			

		At school I have access…		
Being able to connect to global resources is necessary in my classroom.		In my classroom	In the building	Not at all
	Disagree	12.8%	19.1%	20.6%
	Agree	87.2%	80.9%	79.4%
69.2% (n=269)	*Chi-square=.313*			

Table C-10: Environmental Effects

When I think of the web I get a headache, my day is already to busy.		At school I have access...		
		In my classroom	In the building	Not at all
	Disagree	84.0%	71.1%	72.1%
	Agree	16.0%	28.9%	27.9%
80.5% (n=313)	*Chi-square=.027*			

The web is just another distraction from teaching.		At school I have access...		
		In my classroom	In the building	Not at all
	Disagree	95.1%	93.3%	92.7%
	Agree	4.9%	6.7%	7.3%
83.0% (n=323)	*Chi-square=.747*			

Increased student use of the web will lead to decreased need for teachers.		At school I have access...		
		In my classroom	In the building	Not at all
	Disagree	93.2%	93.2%	90.7%
	Agree	6.8%	6.8%	9.3%
86.6% (n=337)	*Chi-square=.838*			

Using the web helps me become more comfortable using a computer.		At school I have access...		
		In my classroom	In the building	Not at all
	Disagree	8.5%	15.5%	11.8%
	Agree	91.5%	84.5%	88.2%
71.7% (n=279)	*Chi-square=.239*			

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