DOCUMENT RESUME

ED 454 680 EC 308 488

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TITLE Technology in Early Childhood: Planning and Learning about Community Environments (TEChPLACEs). Final Report.
INSTITUTION Western Illinois Univ., Macomb. Center for Best Practices in Early Childhood.
SPONS AGENCY Special Education Programs (ED/OSERS), Washington, DC.
PUB DATE 2001-06-01
NOTE 76p.
CONTRACT H180T70065
AVAILABLE FROM Center for Best Practices in Early Childhood, Western Illinois University, Macomb, IL 61455; Tel: 309-298-1634; Fax: 309-298-2305; e-mail: pl-hutinger@wiu.edu.
PUB TYPE Reports - Descriptive (141)
EDRS PRICE MF01/PC04 Plus Postage.
DESCRIPTORS *Computer Literacy; Computer Mediated Communication; *Disabilities; Early Childhood Education; Educational Strategies; Electronic Mail; Internet; Language Acquisition; *Program Design; *Program Effectiveness; Rural Schools; *Teaching Methods; Vocabulary Development; *World Wide Web
IDENTIFIERS Illinois

ABSTRACT

This final report discusses the outcomes of a 2-year project designed to provide an innovative tool process and a state-of-the-art instructional environment for children from 3 through 8 years of age with a wide range of disabilities across ages, classrooms, and locations as they constructed their own communities and participated in building a cooperative community on an Internet site. The TEChPLACEs' technology-based learning environment provided a potent learning tool that taught children and teachers to use communication technology as they learned about the varied content that comprises communities. TEChPLACEs involved collaboration among Macomb Projects at Western Illinois University, and teachers and children from four rural school districts (a preschool for children with disabilities, two inclusive kindergarten classrooms, and an inclusive first grade classroom). Through participation in the project, teachers gained confidence in the use of technology and familiarity with the Internet and Web construction applications. Teaching styles evolved into a more child-directed approach, and teachers used questioning techniques to guide children's thinking. Children demonstrated gains in language development and became fluent in the vocabulary associated with technology, development of Web pages, and visiting Web sites. They developed higher level thinking skills and wrote and sent e-mail messages. (Contains 37 references.) (CR)

Final Report: Technology in Early Childhood—Planning and Learning About Community Environments (TEChPLACEs)

by Patricia Hutinger, Letha Clark, and Joyce Johanson

Technology, Educational Media, and Materials
for Individuals with Disabilities Program
United States Department of Education
Office of Special Education and Rehabilitative Services
Office of Special Education Programs
Washington, DC

Projects that Create Innovative Tools for Students with Disabilities
CFDA 84.180T
Project Number: H180T70065

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June 1, 2001

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II. Executive Summary

Technology in Early Childhood-Planning and Learning about Community Environments (TEChPLACEs) was funded in 1997 by the U.S. Department of Education's Office of Special Education Technology, Educational Media, and Materials for Individuals with Disabilities Program. The major goal of the 2-year project was to provide an innovative tool process and a state-of-the-art instructional environment for children from 3 through 8 years of age with a wide range of disabilities across ages, classrooms, and locations, as they constructed their own communities and participated in building a cooperative community on an Internet site.

The TEChPLACEs' technology-based learning environment provided a potent learning tool that taught children and teachers to use communication technology as they learned about the varied content that comprises communities.

TEChPLACEs involved collaboration among Macomb Projects (now the Center for Best Practices in Early Childhood) at Western Illinois University, and teachers and children from four rural school districts (a preschool for children with disabilities, two inclusive kindergarten classrooms, and an inclusive first grade classroom). During Year 1, a graphics arts teacher and his students from the LaMoine Valley Vocational System (LVVS — a consortium of 13 school districts designed to prepare high school students for future careers) also participated.

Through participation in the project, teachers gained confidence in the use of technology and familiarity with the Internet and web construction applications. They involved administrators in the project and incorporated the computer into the daily curriculum more than they ever had

previously. Teaching styles evolved into a more child-directed approach, and teachers used questioning techniques to guide children's thinking. Teachers sought ways to access or acquire digital cameras, scanners, and to increase their computers' RAM memory.

Children increased their level of communication and demonstrated gains in language development. Children, including the 3 year olds, became fluent in the vocabulary associated with technology, development of web pages, and visiting teacher-selected web sites. Children in each of the four classrooms participated in the development of their web pages and developed a democratic procedure for making decisions that affected their group. They also developed higher level thinking skills and an understanding that everyone has good ideas to share. Children wrote and sent E-mail messages to children in other classrooms, administrators, community members, and family members, as well as to people across the United States and in other countries.

Families sent E-mail to their children or to the entire class, often suggesting projects the children could work on. Family input varied depending on individual access to and experience with computers and the Internet. Some families had home computers; others did not. Teachers provided time for parents to explore the Internet. During open houses and family nights, teachers made TEChPLACEs a part of the program. Some parents had their first opportunity to use a computer; others had their first chance to send E-mail messages.

The project's "All About Us" and collaborative "Our Community" web sites are available at <http://www.techplaces.wiu.edu/>. Another TEChPLACEs product, the CD-ROM *First Communities,* is available from The Center for Best Practices in Early Childhood at Western Illinois University, as is a construction kit. "TEChPLACEs: An Internet Community for Young Children, Their Teachers, and Their Families" (Hutinger & Clark, 2000) was published in the March/April 2000 issue of *Teaching Exceptional Children.*

III. Table of Contents

Final Report: Technology in Early Childhood Planning and Learning About Community Environments (TEChPLACEs)

by Patricia Hutinger, Letha Clark, and Joyce Johanson

Goals and Objectives of the Project

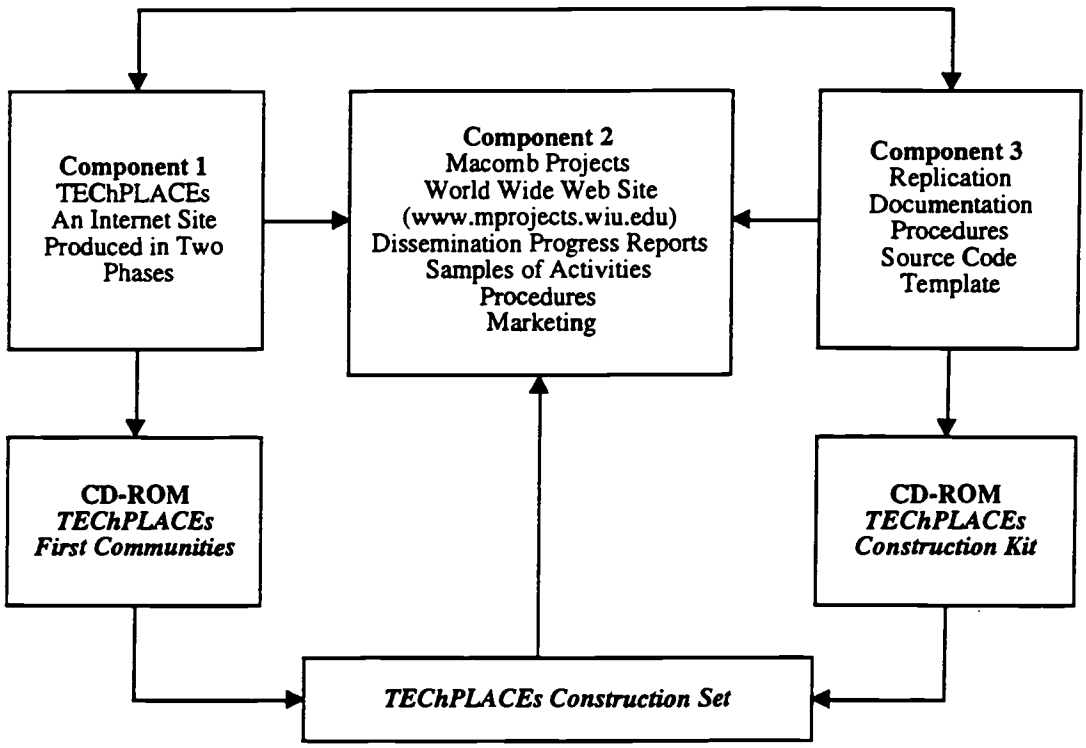
The major goal of TEChPLACEs, a 2-year project which began October 1, 1997, was to provide an innovative tool process and a state-of-the-art instructional environment for children from 3 through 8 years of age with a wide range of disabilities across ages, classrooms, and locations, as they constructed their own communities and participated in building a cooperative community on an Internet site. Nine objectives, broken into tasks, were established to meet the goal. Objectives included (1) Project Management, (2) Training and Technical Assistance to Participating Teachers, (3) Development of Phase 1 of Component 1: "All About Us," (4) Development of Phase 2 of Component 1: "Our Community," (5) Production of Component 3: "TEChPLACEs Construction Kit," (6) Production of "First Communities" on CD-ROM, (7) Procedures Documentation, (8) Dissemination, and (9) Evaluation.

Conceptual Framework

As the National Information Infrastructure provides access to the world outside schools, the federal and state emphases on Internet access in schools increases. However, Internet access is more than equipment, wiring, and software. Once schools have access to the Internet, a major question for educators becomes, *"what do we do with the technology?"*

TEChPLACEs' three major components, shown in Figure 1, were designed to provide a partial answer to this question, emphasizing thoughtful, planned, and collaborative use of the Internet to promote a learning environment that encompasses communication and interaction

Figure 1. Summary of TEChPLACEs Project Components



among young children, with and without disabilities, in a variety of locations across integrated content areas in preschool, kindergarten, and first grade. The TEChPLACEs' technology-based learning environment provided a potent learning tool that taught and permitted children and teachers (families, too) to use communication technology themselves as they learned about the varied content that comprises communities.

Technology plans and telecommunications focus on 'K-12,' suggesting the appropriateness of Internet use with kindergarten, first, and second graders, yet the bulk of applications address older children. However, legislation, research, and practice support access to technology by young children with disabilities. The need is great for the educational system to

include technology and make dramatic and timely changes so ALL children can keep pace with technological and societal changes (Ameritech, 1993; Gates, 1995; Thornburg, 1994, 1996). Children benefit when access to communications technology applications is equitable, but only when process tools and learning environments are developed will children with disabilities reap the benefits of the potential technology offers to expand life experiences and provide equity in opportunity to achieve the outcomes expected of all children.

Inclusion of children with disabilities in telecommunications and technology support is promising (Woronov,1994); therefore, access to and use of the World Wide Web by individuals with disabilities is an important issue. As Internet access burgeons, use of the Web is expanding at an amazing rate as the amount of information there increases exponentially. In order to make the most effective use of the Internet, we must strengthen dissemination and information exchange strategies that promote effective access to and use of effective educational practices related to special education and children with disabilities.

Benefits of Technology to Young Children

A review of relevant literature points to the important benefits of integrating technology into early childhood activities. Early childhood is typically defined as encompassing ages birth to (or through) 8 years of age. This was the rationale for the age range of 3 through 8 selected for TEChPLACEs. Evidence indicates that intervening with computers and other technologies produces changes in young children, even in infants. Moreover, younger children may benefit more from computer use than older children and computers may help children learn things in new ways. Young children with severe disabilities can use computer technology for a variety of purposes. The impressive positive effects of technology emphasizes the need to translate research into practice in order to increase the impact of projects such as TEChPLACEs. The

early childhood range for TEChPLACEs was selected because of Macomb Projects' (now the Center for Best Practices in Early Childhood) background experience in research, model development, and product development that has clearly demonstrated that children from 3 through 8 years of age with a wide range of disabilities can not only use technology, but many of them use it easily and effectively, and retain elements of software use over a period of time (Hutinger, 1987b; Hutinger, 1996; Hutinger & Bell, 1997, Hutinger & Rippey, 1996; Perry, Ward, & Hutinger, 1987). Adding the capabilities and opportunities of the Internet to the technologies children can use was a logical extension of the Center's prior work.

Early intervention activities are not just 'a good thing to do,' but rather are underpinned with the importance of early brain development. It is likely that a child's peak learning years occur before he or she reaches the eleventh birthday (Viadero, 1996). Although brain research does not directly address the instructional and educational benefits of children's use of technology, it does address windows of opportunity and the notion that "remedial education" may be more effective at 3 or 4 than at 9 or 10 (Nash, 1997). The Center's work with young children with disabilities supports the efficacy of intervening early in their lives.

Rationale for Children Using Internet

The many capabilities of Internet access can be used as a powerful tool for young children's development. The Internet permits both instant and delayed collaboration and communication opportunities never before available to children or adults. Social interaction, especially cooperative work and play, and interest in other children can be enhanced through the integration of technology, including Internet activities, into the curriculum (Char & Forman, 1994). When technology is used as a production and communication tool, children's social

perspective is enhanced. Social interactions and self-reflection about social behavior are fostered (Char & Forman, 1994).

The Internet bridges the different worlds and cultures within which children move, including homes, schools, libraries, museums, and places in the community. Additionally, the Internet provides a tool for sustained, collaborative work on topics of interest among children and teachers across locales. Networking can not only increase communication between children but also provide opportunities for collaboration and use of resources as well. Children can conduct projects that actively involve members and resources from local to international communities. The experience can help children bridge the different and varied worlds of the home, school, and community. The Internet can enable images and sounds, as well as written text, to be transmitted and received, a capability not available to most children ten years ago.

The Internet opens the window to a world children with physical limitations may not be able to reach or experience in body. Technology adaptations can be used in many ways to develop communication, understanding, and appreciation of diversity (Hutinger, 1996). The Internet can eliminate a classroom's physical limitations and expand students' experiences and interactions with people of different backgrounds (Wilson, 1995).

Children who are beginning to read and write can use the Internet to communicate with other children in experiences that combine their fascination with computers with an authentic motivation to read and write. Reading, writing, learning, and computing became integrated in TEChPLACEs experiences. Students' global interactions can arouse curiosity, bond cultures, and invite new directions for education. The Internet has the potential to make the global classroom possible by allowing children to communicate with others around the world.

A Constructivist Approach and Integrated Curriculum

The constructivist approach views knowledge as a learning process and leads to 'engaged learning.' Engaged learning *"involves more student interactions, more connections among schools, more collaboration among teachers and students, and more emphasis on technology as a tool for learning."* (Jones, Valdez, Nowakowski, and Rasmussen, 1995, p. 2).

Viewing knowledge acquisition as a learning process requires that attention be paid to the notion that learners constantly seek to make sense of the environment, to develop something that fits together in relation to what they already know. In order to do so, learners "construct" explanations that, based on personal experiences, make sense (Driver, 1995; von Glasersfeld, 1995). Children and adults construct models of the environment, then integrate and interpret new experiences (and information) in relation to existing mental models or schemes (Driver, 1995). Constructivism is based on the understanding that each individual and group constructs knowledge depending upon the user's pre-existing knowledge, beliefs, and experiences (Anderson, 1996; Hutchinson, 1995; Kamii & Ewing, 1996).

If children 'construct their own learning' by interacting with the environment (Krogh, 1995), then integrating curriculum content in several subject matter areas encompassing the concepts and principles of 'communities,' will lead to meaningful learning. Teaching methods are less directive and become more facilitative, while children become more 'engaged in learning,' continually making sense of their world based on what they have already learned, on what they have already constructed (Pappas, Kiefer, & Levstik, 1990; Wood & Bennett, 1999). Children learn best when they participate in meaningful activities that connect their learning across traditional curricular areas (Hohmann & Weikart, 1995; Katz, 1999; Rainer, Guyton, & Bowen, 2000; Sloane, 2000). A well-designed integrated curriculum provides an educational

environment that meets the needs of a wide variety of young children (Bredekamp & Rosegrant, 1995; Krogh, 1995). Children identified as having disabilities do not need to be sent out to specialized programs but can be included within the context of a regular program (Sawyer & Sawyer, 1993). Through many and varied experiences related to a common theme, young children with and without disabilities can experience growth in conceptual understandings and process skills (Barclay, Benelli, & Wolf, 1996).

Teachers need to work side by side with children in the quest for knowledge. Changes in teaching style and the emphasis on student learning based in the real, technology-enriched world require a paradigm shift in the way we view education at all levels. As Thornburg (1996) reminds us, we must prepare children for their futures, not our past.

Since they live and will grow up in the Communication Age, children must learn to be lifelong learners, to frame questions, and to work with others in pursuing answers and developing products. This was the target of TEChPLACEs collaborative community building. Learner outcomes included becoming effective problem solvers, team players, and communicators.

Description of the Project

The design for TEChPLACEs is summarized in Figure 1 on 7. The Project was based on a review of literature, Macomb Projects' work with technology and young children with disabilities, their classroom staff, families, and related service providers; Macomb Projects' experiences with adaptive technologies, teacher training, and product development, including production of three multimedia CD-ROM titles and two web sites; and a participatory approach whereby a team composed of personnel from each participating entity is engaged in planning, implementing, and decision making. The team based approach was designed to offer the teachers

"chances to tailor innovations to their setting without sacrificing desired outcomes" (Cuban, 1997, p 12) because they are members of the development team from the onset of the project.

A team of staff members from each of the entities met regularly in a Participants Panel to review progress, to determine content and to guide the direction of the project. They also communicated regularly via E-mail, ICQ ("I seek you," an instant messaging application), and telephone. The participatory approach with teachers involved in decision making and development was designed to lead to a more credible, usable product than if TEChPLACEs had been developed entirely within Macomb Projects and project staff had directed teachers activities.

Components

One component of the project involved children and adults in creating Internet sites. It was completed in two phases, "All About Us" and "Our Community," which culminated as a CD-ROM—*TEChPLACEs First Communities*. The second component was a TEChPLACEs' home page on the Macomb Project's World Wide Web site <www.mprojects.wiu.edu> which contained continuously updated samples of TEChPLACEs' activities and procedures as well as reports of development experiences. This component served as a dissemination and marketing tool and contained a link <www.techplaces.wiu.edu> to take visitors to "All About Us" and "Our Community." Component 3, the construction kit, contains a set of procedures necessary to implement TEChPLACEs.

Participants

TEChPLACEs originally involved collaboration among six entities, led by Macomb Projects at Western Illinois University. Early childhood classrooms from four rural school districts near Macomb participated for both years. A graphics arts class from the LaMoine Valley

Vocational System (LVVS — a consortium of 13 school districts designed to prepare high school students for future careers) participated during Year 1 only. Figure 2 provides further information about the participants and the tasks for which each was responsible.

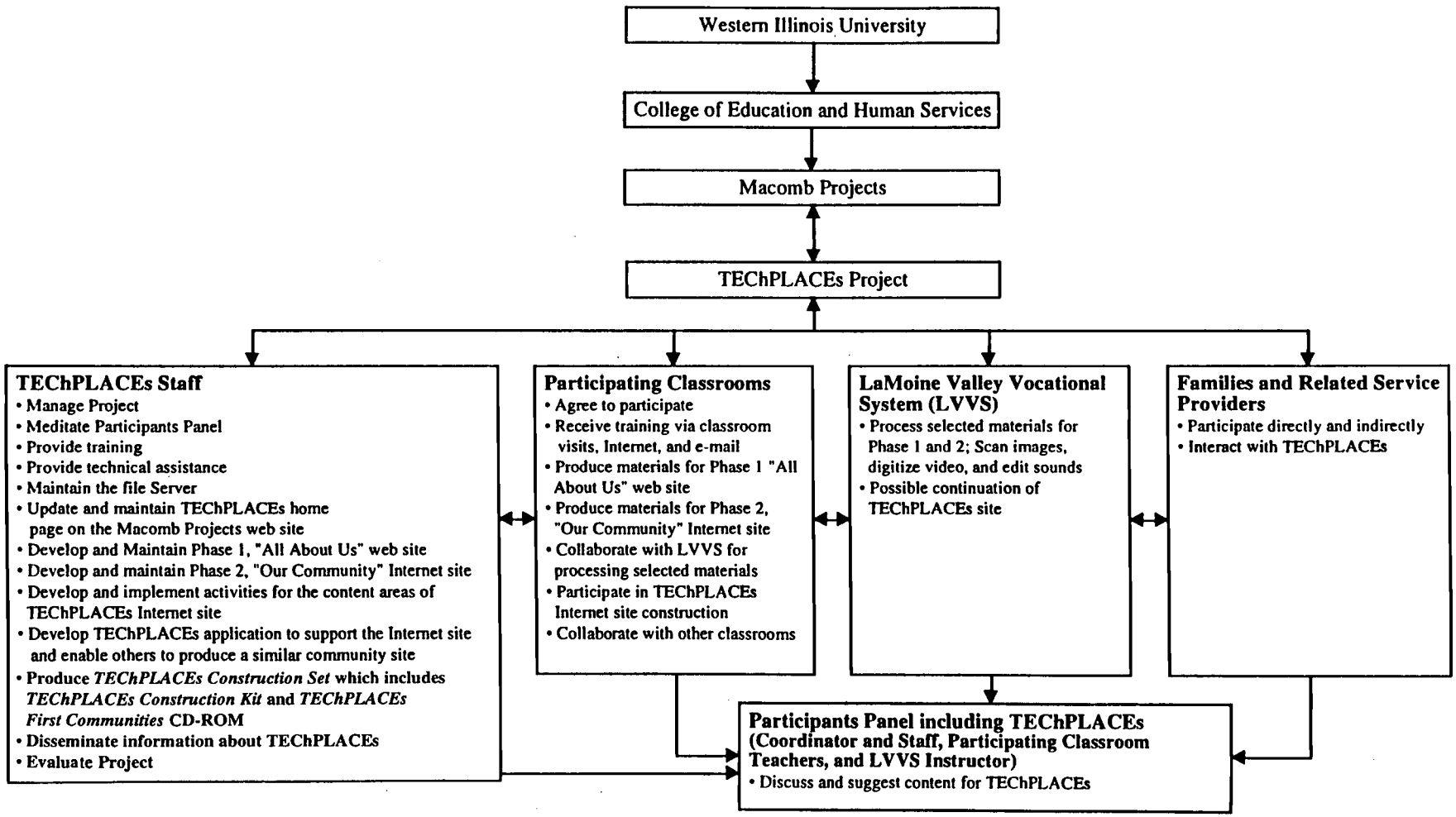
Four early childhood teachers participated in the project. These were Denita Clover, from a preschool for children with disabilities in Colchester; Pam Burnham and Carol Reed from inclusive kindergarten classrooms in Industry and Good Hope; and Amy Morris, from an inclusive first grade classroom in Macomb. Teachers had from 4 to 20 years teaching experience.

Participating teachers were proficient (in varying degrees) in technology use with children prior to their involvement with TEChPLACEs. Proficiency included working knowledge and skills related to basic computer assembly, operation, simple utility operations (i.e., initializing disks and copying files), and proper procedures to install and use software on disk or CD-ROM. Teachers were able to launch and quit applications and use key combinations required for operating programs. They knew how to run software from the hard drive (including installation), how to use the open/close, lock feature, and how to shut down the system. TEChPLACEs staff provided any training necessary to ensure that teachers had these capabilities and to provide them with the more complex skills necessary for TEChPLACEs development. All four early childhood teachers organized and managed their computer centers appropriately for children's ease of use according to criteria designed by Macomb Projects for Activating Children Through Technology (Project ACTT)[1], the Technology Inservice Project (Project TIP)[2],

[1]Project ACTT was funded by USDE's Early Education Program for Children with Disabilities, PR #H024D20044.

[2]Project TIP was funded by USDE's Early Education Program for Children with Disabilities, PR #H024P10077.

Figure 2. Overview of TEChPLACEs Participants and Tasks



the Early Childhood Emergent Literacy Technology Project[3], and the Early Childhood Comprehensive Technology System.[4] As the project progressed, classroom teachers conducted curricular activities related to developing communities and maintained a class log or journal of ongoing activities.

One hundred sixty seven children participated in TEChPLACEs activities over the 2-year period. Of these, 102 (61%) had mild to moderate disabilities, 51 (30.5%) were identified as "as risk," and 14 (8.3%) had no disabilities. The school districts used state criteria for disabilities and "at risk" to place children and to provide special services. Each of the four participating classrooms served children who received speech and language services. Other disabling conditions, spread across classrooms, included motor impairments, visual impairments, hearing impairments, cerebral palsy, learning disabilities, attention deficit disorder and attention deficit hyperactive disorder.

Descriptions of Participating Classrooms

Participating classrooms included a preschool for children with disabilities, two inclusive kindergartens, and an inclusive first grade. All served children from rural areas. Descriptions of each classroom follow.

Colchester. Colchester is a rural community of 1,620 persons located in McDonough County, Illinois. Colchester Community Unit District 180 is a small district located in West Central Illinois which provides educational opportunities to more than 500 pre-kindergarten

[3]The Early Childhood Emergent Literacy Technology Project was funded by USDE's Technology, Educational Media, and Materials for Individuals with Disabilities Program, PR# H180G40078.

[4]The Early Childhood Comprehensive Technology System was funded by USDE's Technology, Educational Media, and Materials for Individuals with Disabilities Program, PR#H180U50039.

through grade twelve students. The district serves children from the towns and outlying areas of Colchester and Tennessee as well as the unincorporated village of Fandon.

Clover had 19 years experience teaching early childhood special education and other elementary grades. The children in her early childhood special education classroom were children with mild to moderate disabilities who had Individual Education Plans (IEPs). The class was divided into two sessions, morning and afternoon, with ten children in each session during both years of the project.

The computer was on a child-sized cart on wheels with several child-sized chairs, and a bookshelf. The software was organized in pocket file folders. The front of the software box was glued to the outside with the CD-ROM, instruction booklet, and/or book related to the software inside. At the beginning of the project, TEChPLACEs purchased a modem and provided the Internet service to this classroom. By the beginning of the second year, the classroom had a direct Internet connection.

The writing area was located at a round table in the center of the room. The table had writing materials and supplies (stamps, stencils, paper, glue, staplers, hole punches, scraps of color paper) arranged in the center.

The reading area, which included the listening center (tape player, head phones, cassettes, and book sets), was next to the computer center. Circle time activities were conducted in the reading area. Also located in the center were assorted chairs and pillows. A cart holding a television and VCR were available in this area for use by the teacher.

Low shelving separated the reading center from the art area and sensory table. The art area was bordered by built-in cabinets, counters, and sink area. The sensory table was located along a wall. In the art area, materials and supplies were available to the children for exploration.

Cooking activities were also conducted in this area where recipes and rebus charts were displayed. A fish aquarium and other science discovery materials were on the counter near the art area and close to the sink.

The housekeeping area had a wooden stove, sink, and refrigerator along with baby dolls, doll clothes, blankets, stuffed animals, and a cradle. Also provided for dramatic play were plastic foods, kitchen materials, and utensils.

In the middle of the room were open shelves containing manipulatives, math concept materials, blocks, and puzzles. A round table and chairs were located in this area for small group work. The shelves were within easy reach of the children. Toys were in plastic baskets and other containers. Each container was labeled with a picture and a corresponding picture was on the shelf. The block area was enclosed on two sides by shelves containing blocks and related toys.

Industry. Burnham's kindergarten classroom was located in Industry, a rural village with a population of 580. The classroom was in a structure which housed preschool age children to high school seniors. Total enrollment for the community unit district was 248 (1997-98 school year) and 235 (1998-99 school year) students.

Burnham had 4 years experience teaching kindergarten, with additional experience teaching in a private preschool. Twelve kindergartners were involved in the project during Year 1 and 13 during Year 2. During the first year of the project, three children received services related to speech and language, and during the second year two children received speech and language services. The cultural make-up of the classroom was primarily Euro-American. One child of Hispanic origin participated in the project during the 1997-98 school year.

Centers were designated in the classroom. The technology area included two computers, one of which was connected to the Internet, and a printer shared by the computers. The

computers were arranged on a table, at a height suitable for children, with child-size chairs. In this area the children had access to a collection of software titles. This classroom was connected to the Internet from the beginning of the project.

An old bathtub with its side cut away was filled with pillows and cushions and was identified as the reading and listening center. Books, cassette players, books on tape, and audio tapes were displayed in this area. Located nearby was the writing center in which pens, pencils, markers, scissors, glue, paper, envelopes, hole punches, staplers, note cards, "stamps" (stickers), and other items were provided.

The dramatic play area contained a wooden stove, refrigerator, and sink and had an assortment of dishes, pots, pans, cooking utensils, play food, empty dry food packages, dolls and dress up clothes. Also in the dramatic play area was a structure that was a stage, or a shoe store, a restaurant, or a bakery.

The art center was situated near the sink for easy access water to facilitate clean up. The aquarium was the focal point of the science center. Also part of the center were bugs, caterpillars, incubating eggs, sprouting seedlings, growing bulbs, rotting logs, measuring sticks, magnifying glasses and scales.

Wooden and plastic building blocks, vehicles, and figures surrounded the carpeted area in the block and manipulative center. Tabletop activities were conducted at tables arranged in the middle of the classroom. During open center time, the children moved freely from one center to another as they were motivated by their interests.

Good Hope. Reed's kindergarten classroom for the Northwest School District was located in a one level building in Good Hope, a small village with a population of 400. The consolidated district serves children from the three rural communities of Good Hope,

Blandinsville, and Sciota. The district maintains two buildings. Pre-kindergarten age children through sixth grade attend school in the Good Hope elementary building. Students in seventh through twelfth grade attend classes in the school building in Sciota. Total enrollment for the district was 447 students during Year 1 of the project and 439 students during Year 2.

Reed had more than 20 years experience working with young children. During the first year of the project, the kindergarten was a half-day program that provided educational opportunities for 43 children. Twenty-four of the children were children with mild disabilities, and 17 were considered children at risk of academic failure. In the second year of the project, the kindergarten was an all-day program with 17 children in the classroom. Twelve were children with mild disabilities, and 3 were at risk.

The classroom was a large room with east facing windows. Learning centers were defined around the perimeter of the room, and tables and chairs were situated in the center of the room. Set up along a wall, the computer center included two computers and a printer. The equipment was on a child-size table with appropriate size chairs. At the beginning of the project, TEChPLACEs purchased a modem and provided the Internet service to this classroom. By the beginning of the second year, the classroom had a direct Internet connection.

The writing center contained assorted tools for writing, rubber stamps and stamp pads, hole punches, tape, paper clips, post-it notes, paper, envelopes, and scissors. The housekeeping center had sturdy wooden appliances and sink. The area also included cooking equipment, play food, dishes, dolls, doll beds, and dress-up clothes. Small manipulatives, cars, trucks, farm equipment and trains were contained in baskets and tubs and stored on low shelving. Blocks were stacked on shelves along a wall. A loft had been erected to accommodate the reading center and located in that area were books and books with audio cassettes. The sensory table and art

easel, located in an area that allowed for easy clean up, were also situated away from the computer. All centers were open and easily accessible to all the children.

Macomb. Morris' first grade classroom was part of the Macomb school district. Macomb is a small town with a population of 20,250. Children from the neighboring villages of Adair and Bardolph and the surrounding rural areas also attend school in the Macomb district. The district maintains four attendance centers: an early childhood center, a kindergarten through grade three building (Lincoln school), a grade four through grade six building, and a junior-senior high school. Total enrollment for 1997-98 school year was 2,097, and for the 1998-99 school year was 2,047.

Morris had 7 years experience teaching first and second grades. During Year 1 of the project, 25 children were in the first grade class. Eleven were children with mild disabilities, and seven of the 25 were children at risk of academic failure. During Year 2, 17 children were in the first grade classroom, with ten identified as children with mild disabilities and four identified at risk.

The classroom had three computers arranged along a wall in the area adjacent to the classroom library. The computers and printer were on child-size computer desks with two small chairs at each desk. Software was stored near the computers. At the beginning of the project, TEChPLACEs purchased a modem and provided the Internet service to this classroom. By the beginning of the second year, the classroom had a direct Internet connection.

A bookshelf was used to define the area as the computer center. The open side of the shelf (away from the computer area) contained manipulatives, puzzles, and table top activities.

The large group area was near the computer center, midway along the side of the room. An easel was used to support items for viewing. Large paper for writing daily reports and

composing letters was available near the easel. A television, which was connected to the computer, was on a cart in the area. Nearby were small tables for various center activities. In the corner was the science center and the art center which contained a tabletop easel, markers, crayons, paints, scissors, glue, tape, and paper.

The teacher's desk was midway along the windowed wall of the classroom. An older computer, which received little use, was next to a supply cabinet. Near the cabinet was a kitchen area that included a sink, refrigerator, counter, and cabinets. A half-circle table was in this area. The children's desks were in the middle of the classroom, grouped together in clusters of four or five.

A coat rack where the children kept jackets, boots, and book bags was located just inside the classroom, hidden from view by a row of bookshelves which held a large number of books organized by subject and level of difficulty.

LaMoine Valley Vocational System. The classroom for the LVVS graphics class was housed in the Macomb High School. The majority of 11th and 12th grade students in the class were Euro-American.

The physical arrangement of the classroom included computers along two sides of the classroom. Drafting tables and light tables were along the third wall and the remaining wall was windows. Tables and chairs for student use were arranged in the center of the room and the teacher's desk and his computer were located in a corner of the classroom. The students took their basic instruction while seated at the tables and moved to the other areas for projects and assigned work.

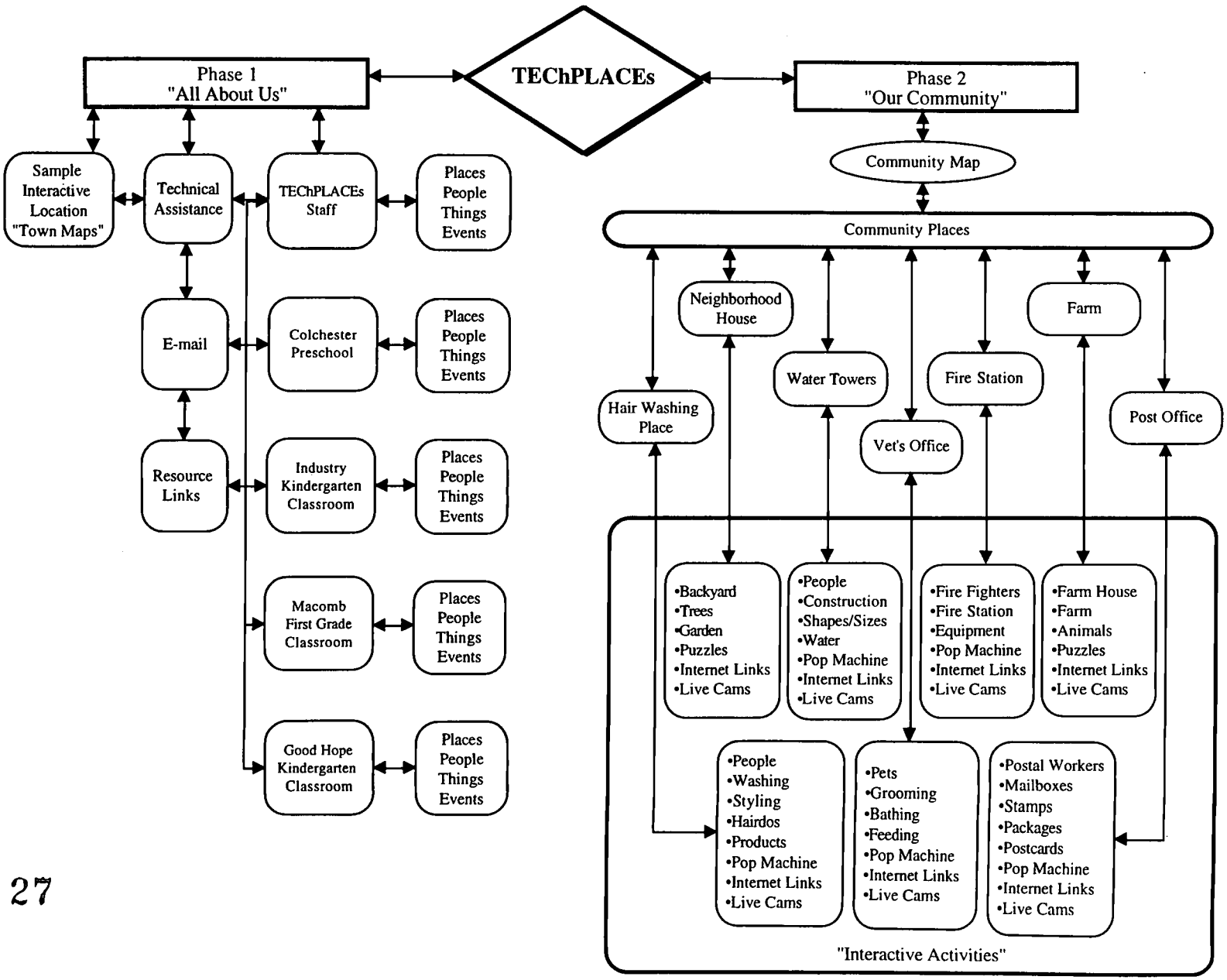
Component 1

Overview. Component 1, the Internet site, encompassed information shared among all entities about the nature of their location (places), work, people, objects, and events. The site included still images (drawings, paintings, and photographs), animation, objects from a 'default community' framework, video, text, sound, E-mail, resources for further knowledge, 'Help' functions, and other features determined by the participants. These elements were incorporated into the design as classes constructed their web sites and developed ideas for communities. A map of *TEChPLACEs First Communities* is shown in Figure 3.

During Phase 1 development, the site began with examples of community elements and activities together with an overview of the Macomb Projects' community (*'All About Us'*), then proceeded to a similar overview of the vocational classroom, then to 'Our Community,' descriptions constructed in each of the four classroom for young children. Finally, in Phase 2, the site included 'Our Community,' a cooperative community derived from ideas supplied by the four classes from their different locations. Component 1 resulted in a CD-ROM, *TEChPLACEs First Communities.*

Content. Content and learners' outcomes during the sites' community development experiences reflected technology and integrated curricular elements of mathematics, social studies, science, communication, literacy, art, music, and dramatics. The framework for content and children's outcomes was based on standards or recommendations developed by national professional organizations such as the National Center for Improving Science Education, National Council for Teachers of Mathematics, Geography for Life, National Center for History in the Schools, Consortium of National Arts Education, Music Educators National Conference, Division of Early Childhood (DEC), and National Association for the Education of Young Children (NAEYC).

Figure 3. Map of TEChPLACEs *First Communities*



All About Us

The first component uploaded to the web site was "All About Us." This component involved using classroom-produced web pages to introduce the participating classrooms to each other. Teachers and children in each classroom worked together to construct their "All About Us" sites. Teachers explored the Internet and found sites that contained free graphics and animations they could use for their classroom pages. Children discussed the pros and cons of various features important to their basic web site (e.g., backgrounds and colors, text color and font). They also decided content for each page, connections between pages, and other sites to which their pages might be linked. After the pages were produced, the children reviewed, and suggested revisions that were made. Then their pages were uploaded. Children visited their home pages often and recommended changes and additions. Once a teacher made additions to a page, and when the children reviewed it, they discovered the names were wrong. They pointed out the errors and the teacher corrected them.

As the project progressed, teachers became more adept at capturing and preparing images and more comfortable producing and uploading web pages. The preschool class web site showed pictures of both the morning and afternoon classes, pictures of children involved in classroom activities, favorite web sites, and *HyperStudio* stacks the classes had created. One kindergarten site contained pages titled "Meet our Class," "Our Family Album," "Fall Fun," "Apples," and "Pumpkins." The other kindergarten site included "Centers in our Class," "Our Playground," "Winter Activities," and "Building Houses." First graders' "About Our School" site included the subsections "People," "Rooms," and "What They Do." "Fun Things We Do," "About Our Playground," "About Our Class," and "Web Pages Made by Us" were also features of the first grade's web site.

The Year 2 sites for each of the classrooms also included the entire web site or pictures of the Year 1 class. However, the new children wanted their web site to be their own. For example, their teacher (Morris) told project staff that after the Year 2's first grade class viewed the web site developed by the Year 1 class, they knew they wanted to change it. She said, *"They wanted it to be totally their own. Every time we had a guest, they wanted him/her on our pages (which didn't always happen)...They were adamant about not using a lot of words under the pictures because they didn't want it to be too many words for the 'little kids'—however we did get carried away at times."*

Web resources. The information included in the resources section provided on the TEChPLACEs site was carefully screened for content and suitability for children, families, and teachers. Sites included in the resource list (a) were easy to use, (i.e., navigation through the site was uncomplicated and intuitive), (b) were pleasing to the eye and well planned,(c) did not contain links to other sites that contained inappropriate material, (d) did not require reading ability (sites for children), (e) contained colorful graphics, (f) offered interactive opportunities, (g) contributed "usable" information for families and teachers, (h) contained parenting information and tips for families, (i) provided current information that was updated regularly, (j) reflected best practices for families and teachers, and (k) presented information that had professional value for teachers.

The National Association for the Education of Young Children, the Illinois State Board of Education, the Department of Justice for Children, *Education Week*, and *Parents* magazine were among the state and national resource links. Resources for families included Interactive Mom, *Parenting* magazine, *Exceptional Parent,* Map Quest, *Children's Software Revue,* and the American Library Association. Products included software publishers and equipment sources.

"Kid Picks" included children's favorite software and literature, while "Just for Fun" included links to URL sites for children (e.g., Winnie the Pooh, Berenstain Bears, a Disney site, greeting card sites, a virtual florist, and Dr. Seuss).

Our Community Site

The original design of the web site called for the classrooms to create and build an Internet community from their classrooms. The site was to be established and maintained by Macomb Projects' staff. The community was to be built by the children, constructed from the classroom, and supported by the TEChPLACEs' server. However, the computers in the classrooms lacked sufficient hard drive capacity and RAM memory to produce the images and content for the community site. In addition, the schools did not own the software needed and the software was too costly to be provided by project funds. As a result, the "Our Community" component was a product of the four teachers, children, and development team working together to create a collaborative community that included elements from each of the local sites' web pages.

In the beginning, children in each of the classrooms discussed their ideas of what a community really was and how to define their own community. Conversations began with children suggesting names of people they thought of as part of their community then moved on to local eateries, stores, shops, businesses, and finally, maps.

The classrooms were each asked to create a large map representing their specific community. The classrooms used various ways to explore and research their community, voting on the content to include on their map. They worked as a group to articulate what was important to them within their community and decided how to make a representation of the community establishments and environments on the map.

Each classroom teacher and her children worked together to decide on the materials to use in constructing their community map. Three of the teachers involved people outside of their classroom in the discussion. All the classrooms researched and explored their communities through field trips, discussions, and community input. All the teachers reported that their children worked as group to decide what to include on their map.

Each group was asked to choose three places from its map to contribute to the shared community that would be the "Our Community" part of TEChPLACEs. Children decided together which places from their community map would be part of the new map. Buildings and accompanying activities that were suggested by children and their teachers included a house, a water tower, a fire department, a post office, a beauty salon, a farm house, and a veterinarian's office.

The children also suggested activities they wanted to see included in their "chosen" places. Results from this activity were E-mailed to the TEChPLACEs staff who discussed and expanded on the activity ideas. The resulting activity ideas were discussed further at Participant Panel meetings. The TEChPLACEs staff used the suggestions from the children in the four classrooms as the starting point for the activities found in "Our Community."

Beauty salon. The preschoolers determined that a beauty salon was a necessary part of a community, and they named it the "Hair Washing Place." The Hair Washing Place contains two activities, 'cutting and styling' and 'hairdos.' To reach the activities in the 'hair washing place,' users gain access by clicking on the 'hair washing place' building on the community map.

The cutting and styling activities were developed using video gathered of individuals familiar to the children in the classrooms. In both activities, digital and video images were used of individuals getting their hair cut or styled A click on the image of a boy getting a hair cut

begins the cutting activity, while a click on the woman under the hairdryer begins the styling activity, The voice narrative for both activities was generated by children from the participating classrooms. Their recorded voices provide instruction and suggestions for the activity.

The cutting activity presents five different *QuickTime* movies, and the styling activity six different *QuickTime* movies, in random order. Each video clip is framed in a computer monitor, window, or picture frame. After each *QuickTime* movie, a question asked by a child is posed about the tools used in the process, and a decision is made about which tools were used. In the styling activity, tools are dragged to the mirror and in the cutting activity the tools are dragged to the hydraulic chair. Items chosen and not used during the process will not stay in the sink or on the chair but are returned to their starting place. The *QuickTime* movies can be replayed in their entirety or one frame at a time to help in the decision making process. When all the tools used are selected, a "cameo" of the person with his or her final 'do' is presented. The styling activity is connected to the main menu of the 'hair washing place' so play can resume.

The "hair do" activity is accessed from the main menu of the 'hair washing place' by clicking on the little girl getting her hair cut. It provides the opportunity to modify the hair styles of different individuals, including the teachers from each of the classrooms. In random order, a teacher or another individual's image is displayed in a frame. Combinations of wigs, hats, and hair ornaments are also presented in random order and can be placed on the image. The adorned image can be printed by clicking on the printer icon. As the image prints, printer sounds can be heard. If the user wants to repeat the activity, he/she clicks on the "play again" button, which has a roll over feature. When the cursor is passed over the button, the user hears the words "play again." A different image and different wigs, hats, and hair ornaments appears.

Fire station. The fire station is accessed by clicking on the fire station on the community map. The main menu for the fire station shows the fire truck, a Dalmatian, and a pile of fire fighter gear. One activity at the fire station incorporates the interior of a fire truck and the other activity dresses a firefighter. From inside the fire truck, activities are controlled from the dash board. Hot spots on the dash trigger various activities. Users click on the CB mike for radio contact with the dispatcher and hear one of five different messages. The hot spot on the hood starts the siren. The large red button on the lower dash starts one of many *QuickTime* movies of fires to which fire fighters are responding. A click on the radio results in one of six weather broadcasts. And a click on the ignition key results in one of several movies shown in random order. These *QuickTime* movies show various episodes of driving a fire truck. Outside the cab of the truck is a mailbox. Clicking on the mailbox reveals an assortment of fire-related postcards that can be sent via E-mail.

At the main screen of the fire station, access to the "fire fighter Craig" activity can be gained by clicking on the pile of turnout gear. The activity pictures a fire fighter in his street clothes. The user is encouraged to choose the piece of gear needed by the fire fighter to dress for fighting a fire. The recorded voices of some of the children in the participating classrooms provide clues about what article is needed next. As each piece of gear is selected from three choices, the image of the firefighter shows the addition of the new piece and the current stage of dress. If a choice is dragged to the fire fighter and it is not the next item of dress, the piece is returned to its original position and the activity resumes. When the fire fighter is dressed in full turnout gear, a *QuickTime* movie of a fire truck pulling out of the station plays.

Farmhouse. The farmhouse is accessed by clicking on the image of a farmhouse on the community map. At the farmhouse, the user can choose a puzzle or barnyard activity. Clicking

on the small image of a puzzle begins the puzzle activity. When the nine pieces are fit together, the puzzle shows an image from the yard. When a puzzle piece is placed incorrectly, it is returned to its original location. When all the pieces are positioned correctly, the entire image is viewed and chirping birds can be heard.

Clicking on the barnyard starts an activity that asks the user to sort the animals from the other farm-related objects and put them in the pen. If objects other than animals are selected and moved to the pen, the objects automatically return to their original location. Once the animals are sorted from the other items, the gate is closed. When the activity is completed, the user is returned to the farmhouse scene.

Water tower. A user reaches the water tower activities by clicking on the water tower on the community map. At the water tower, a user can select one of four activities that cause water to move in some way. For instance, clicking on the fountain image begins an activity in which the user can create, decorate, name, and print his or her own water tower. If the pump is selected, the underside of a water tower, with it cables and metal support, is shown and the player clicks on a picture of the whole water tower. The photographs of the water towers were taken in each town of the four participating schools. Choosing the water machine from a grocery store starts a puzzle activity. Pieces that are placed incorrectly return to their original location. When completed, the puzzle shows the image of a water tower taken from one of the classroom maps. Clicking on the lawn sprinkler initiates an activity that contains video segments and descriptions of maintenance and repair work on a water tower. By clicking on a section of the water tower, the user starts the video and audio related to the work on that part of the tower.

Post office. Clicking on the post office on the community map takes the user to a screen that shows images of the post offices in the towns of each of the four schools. A click anywhere

on the image produces a screen that shows a collage of scenes found in and around post offices. Clicking on the postal store produces an activity that makes available items a user can use to produce postcards which can be printed. With an active Internet connection, a click on the two boys at the post office boxes causes a variety of postcards to appear. Each postcard represents an Internet site for E-mail cards. A click on any one card connects the user to an Internet site and the opportunity to select and send an E-mail card. The remaining activity is represented by the blue postal service mailboxes and provides a way for web site visitors to E-mail the children in the classrooms.

Veterinarian's office. The veterinarian's office can be visited by clicking on the white building on the community map. The clinic is the site of four different activities. Clicking on the grooming products leads to a path which connects the office to the grooming facility. A click on the door results in an activity that displays video of different pets being groomed. Discussion by the groomers or music accompanies the video. The remote control provides a way to select a different video segment. To meet the veterinarians, the user clicks in the patient registration window then clicks on one of the doors to see the vets and hear them introduce themselves. Another option will show video of a "well pet check-up," and another will show a video of a pet being weighed. A click on the video camera returns the user to the waiting room. By clicking on the door in the waiting room, the user begins an activity for dressing pets. The pets appear in random order, as do the articles of apparel which include (but are not limited to) hats, jewelry, eye-glasses, and neckties. The dressed pet can also be printed. The activity can be repeated by clicking on the "play again" button.

The pet food activity is accessed by clicking on the shelves of pet food. This activity has three levels of difficulty. After clicking on the pet food, the user selects a level of play and the

activity begins. At the least complicated level, small, medium, and large pets are presented in random order and the user is asked to feed the pet the right amount of food. At the mid-level of difficulty, the user is told how much the pet weighs and then feeds the pet according to weight . The measurement is in whole cups. At the most complicated level, the user is also given the weight of the pet and feeds the pet according to weight. However, at this level, the measurement includes whole and half cup measurements. At all three levels, the pets are presented in random order; however, there is a button, that when clicked will present a different pet. The user also determines when the pet has been fed. Clicking on the "Done" button reveals results of the feeding process. Feedback indicates if the pet has been fed too much, has been fed the right amount and has eaten, or needs more food.

House. The house that sits at the edge of the community map is a child's drawing of the home of one of the children's aunts. By clicking on the house, the user is offered a puzzle to complete. As each puzzle piece is put in place, auditory feedback provides construction noises such as hammering and sawing. If a piece is put in the wrong place, it moves back to its starting point.

Other activities. As a part of the activities which made up "Our Community," each classroom was assigned a "drink" flavor (e.g., Northwest Nectar, Lincoln Lemonade, Colchester Cola, and Industry Iceade). Soda cans were decorated to match each classroom's pop flavor and each classroom produced a jingle to advertise its brand of soda. The children decided on the lyrics, rhythm and tune, costumes, location, and props. After a few rehearsals, they were videotaped while performing their jingle. The video was converted to *QuickTime* movies and incorporated into the "Our Community" web site as an activity. The soda can was a consistent icon located in several places (e.g., the veterinarian's office, the beauty salon) in "Our

Community." When the soda can icon was clicked, the user went to one of three soda machine activities, for example, depositing the correct change and selecting a brand of soda. The soda can then rolled out of the machine, and the video playing the jingle for that brand played.

Navigating the Site

The bar at the top of each screen was similar for all activities. Clip art, such as combs, brushes, fire hats, stamped envelopes, water drops, pop cans, and other images from the community maps were embedded in the top bars to help children distinguish between activities. A button bar was located at the bottom of the screen in all activities. One button moved the user to another location within the file or to an Internet site. A Liv Cam button was linked to sites with continuously or frequently refreshed video related to the site. Another button moved users to the previous site. A button, with a graphic indicating the current activity, returned the user to the first screen for that collection of activities. The community button, represented by vehicles, returned to the map screen of the community site.

Adaptations for Children with Disabilities

Touch tablets and screens, trackballs, and trackpads all provide a means of access for those with mild to moderate disabilities as do alternative keyboards. The *All About Us* site and the *Our Community* site were developed so children using touch screens, touch tablets, trackballs, and trackpads could access them. The children in the classrooms participating in the project accessed either site using a mouse or a touch screen.

E-mail Communication

Teachers, children, and classrooms communicated with each other, administrators, parents, the development team, and a variety of individuals through E-mail. The Macomb Schools superintendent, recipient of messages from the first graders in Morris' classroom, was

impressed with the children's use of current and correct terminology. He liked their comfort level and familiarity with the equipment. Pleased that the children were learning to function in a technological world, he expressed the belief that the experiences from their involvement with TEChPLACEs would have positive effects on their future.

Purpose. The purpose of some messages was to get acquainted with children in other classrooms. Other messages shared information about classroom activities. For example, one class constructed a paper chain then E-mailed the other classes to tell them about it. That prompted another class to begin its own paper chain. Via E-mail that class reported that its chain was as long as the classroom, bringing a measurement concept into the simple activity.

Messages compared numbers of children in the classrooms, numbers of boys and girls, and birthday dates. Books, authors, illustrators and other favorites were also discussed.

Another purpose of using E-mail was to communicate with people other than those in the TEChPLACEs classrooms. Parents, administrators, and people in far away places received messages from the TEChPLACEs classrooms. Figure 4 gives examples of children's messages.

Frequency. Three classes sent and received E-mail daily, and one kindergarten class scheduled E-mail three times a week. Sometimes daily schedules made it easier to read and reply to a portion of the messages as a large group, while smaller groups responded to the remaining correspondence. Sometimes teachers generated outgoing messages and read the incoming mail with the entire group, then designated a smaller group that changed frequently to answer the messages. Morris, the first grade teacher, reported that her students introduced the "Ta Ta For Now" (TTFN) sign-off to the other TEChPLACEs classrooms. Children became fond of using "TTFN" and included it in nearly all their messages.

Figure 4. Sample TEChPLACEs E-mail Messages and Relationship to Curriculum

Purpose of Message	Content Area	Sample Messages
Getting to know the children in the other classrooms.	Science Social Studies Literacy Art	Dear Kindergarten, Our room is blue. The ceiling is white. This carpet is blue. There is popcorn on our floor. We are having Homeward Bound movie. Mrs. Lutz gave us the movie because we got Brag grams. No we do not have take home bags. We take backpacks here. Afternoon Preschool (E-mail message from preschool children to kindergarten children)
Sharing information about classroom activities.	Science Social Studies Literacy Mathematics Art	Dear Preschool, Today is our 100 day too! We each popped a balloon and there was a number inside. We made 100 stew. We counted to 100. We built structures with 100 blocks or cups. Made necklaces with 100 Fruit Loops. Jumped rope 100 times and a lot more. We had fun!! Ashley, Beau, and the class. (E-mail message from kindergarten children to preschool children)
Writing to people other than those in the TEChPLACEs classrooms.	Science Social Studies Literacy Mathematics	Dear Dr. Evans, We have a new student teacher. We got an E-mail from our friends in Colchester. Can you change the font on your computer? We are talking about snow. Have you ever been in time out before? Thank you for the E-mail. Do you like the Rams? Have you ever been to a Packer's game? What is your favorite football team? Do you know what TTFN stands for? Have you ever been a teacher before? Do you have any kids? We have a new student in our class. He is from India. TTFN! Miss Morris' Class (E-mail message from first grade children to their school's superintendent)

Adaptation. Morris connected the computer to a large television monitor so all children in the class could view the incoming mail and help compose outgoing messages. Her first graders decided that if they used a bigger font (24 point) everyone could see the messages easier. They were quick to remind the classroom that forgot to use the larger font by sending a 'You forgot to make it big enough' message. Although none of the children involved in the project were visually impaired, both the large monitor and the larger font are useful adaptations to consider, depending on the degree of impairment.

Evaluation

Data sources. The following sources of data provided information on the project's impact on the teachers and children who participated in the project, as well as on families. Sources included Teacher Reflections Questionnaire, Teacher Competencies, copies of E-mail messages, Teacher Journals, Participant Panel Meeting Minutes, Teachers' Steps and Processes Form, Phone Survey, informal interviews and observations, an incident database, and staff meeting minutes.

Formative evaluation. TEChPLACEs staff entered all objectives and tasks in a database, then recorded dates of completion and tasks achieved. Weekly staff meetings were conducted for planning and revising activities and evaluating Project progress. The meetings also helped Project staff make immediate schedule adjustments to better fulfill project obligations in the classrooms and to meet the specific needs of the participating teachers. The project staff used weekly meetings to compare products, collaboration, and interaction among and within classrooms. Notes were recorded in an Incident database (see Figure 5). Participating classroom teachers and TEChPLACEs staff collected data related to procedures, questions, comments, conversations, and products which was entered into an Incident database. The participant panel, which included participating teachers and TEChPLACEs staff, met to determine content for the

Figure 5. Sample Incident Database Entries (4 of 733)

Type of contact
- ○ Email
- ○ Telephone support
- ○ Telephone contact
- ○ Participants panel
- ◉ Staff meeting
- ○ Classroom visit
- ○ Classroom support
- ○ Participant training
- ○ Contact outside classroom
- ○ Other

Contact with:
- ○ Good Hope
- ○ Lincoln
- ○ Colchester
- ○ Industry
- ○ LVVS
- ◉ TEChPLACEs staff
- ○ Participant panel

Date
Oct 1, 1997

Project person involved:
- ☑ Clare
- ☑ Janet
- ☑ Letha
- ☑ Marisa
- ☐ Scott
- ☑ Terry

Comments

First staff meeting. Discussed initial meeting with the teachers-that it needs to be immediately. Very important that we decide soon what equipment needs to be purchased and what platform will be in the classrooms. Clare setting an agenda for the participants panel, Letha arranging the meeting with the teachers, Marisa getting an email account for the project. More details in Terry's notes.

Entry made by: Letha

Type of contact
- ○ Email
- ○ Telephone support
- ○ Telephone contact
- ○ Participants panel
- ○ Staff meeting
- ○ Classroom visit
- ○ Classroom support
- ○ Participant training
- ○ Contact outside classroom
- ◉ Other

Contact with:
- ○ Good Hope
- ◉ Lincoln
- ○ Colchester
- ○ Industry
- ○ LVVS
- ○ TEChPLACEs staff
- ○ Participant panel

Date
Oct 1, 1997

Project person involved:
- ☑ Clare
- ☐ Janet
- ☐ Letha
- ☐ Marisa
- ☐ Scott
- ☐ Terry

Comments

Prepared agenda for first TEChPLACEs meeting with teachers and staff. Copied information from the grant for each teacher to review. Made an equipment inventory for each teacher and prepared competencies. Delivered materials to Morris at her home. Each teacher received a packet of information prior to the first meeting.

Entry made by: Clare

Type of contact
- ○ Email
- ○ Telephone support
- ○ Telephone contact
- ○ Participants panel
- ○ Staff meeting
- ○ Classroom visit
- ○ Classroom support
- ◉ Participant training
- ○ Contact outside classroom
- ○ Other

Contact with:
- ○ Good Hope
- ○ Lincoln
- ○ Colchester
- ○ Industry
- ○ LVVS
- ○ TEChPLACEs staff
- ◉ Participant panel

Date
Feb 6, 1998

Project person involved:
- ☐ Clare
- ☐ Janet
- ☑ Letha
- ☐ Marisa
- ☐ Scott
- ☐ Terry

Comments

All the teachers came to the training. We discussed file format and image format with the teachers—what they should use and what they should target for the size of the file and/or image. P. seemed the most confused by this information. Each teacher had the chance to experiment with uploading and downloading data. Ideally, this should make the transfer of scanned images much faster.

Entry made by: Letha

Type of contact
- ○ Email
- ○ Telephone support
- ○ Telephone contact
- ○ Participants panel
- ○ Staff meeting
- ○ Classroom visit
- ○ Classroom support
- ◉ Participant training
- ○ Contact outside classroom
- ○ Other

Contact with:
- ○ Good Hope
- ○ Lincoln
- ○ Colchester
- ○ Industry
- ○ LVVS
- ○ TEChPLACEs staff
- ◉ Participant panel

Date
Feb 6, 1998

Project person involved:
- ☑ Clare
- ☑ Janet
- ☑ Letha
- ☑ Marisa
- ☐ Scott
- ☑ Terry

Comments

Training session meeting in room 4A. Session was videotaped, using AlphaSmart transfering later to computer to be printed for database. On file notes taken.
Had problems getting computer to share Janet's computer. Started a little later than planned. We had some good interaction with teachers talking with each other about what is going on in classrooms. They were very excited and were making plans for future things to do together.

Entry made by: Terry

Internet community ("Our Community") and review and evaluate the process and progress of the project. The panel met monthly during the school year over the project period. The Incident database recorded the steps and processes used to achieve project objectives and tasks. Entries served to identify and analyze any changes needed for implementation.

Summative evaluation. Teacher journals were collected at the end of each school year and information was entered into a database. Each teacher documented interesting incidents and anecdotes and child participation in their journals. The teachers also completed a detailed report related to the steps and processes they accomplished and the date each was completed in order to implement TEChPLACEs in the classrooms. TEChPLACEs staff completed a similar, but more detailed, report of the steps and processes they accomplished to train the teachers, prepare and develop the "All About Us" web site for the teachers and the children in the classrooms, produce the activities for the "Our Community" site, and prepare the content for the "First Community" CD-ROM.

With the exception of Reed, as teachers observed the children in their classrooms, they completed the TEChPLACEs Developmental Checklist for each child. These observations were done at the beginning and end of each school year. Because of the large numbers of children in her classroom, Reed selected 10 children from the morning session and 10 from the afternoon session and gathered data on those children.

Teacher competencies were completed by teachers at the first TEChPLACEs training. The competency forms were updated as teachers gained new skills. Selected elements from the database were included in the Macomb Projects' web site and updated regularly.

VII. Problems

The project faced unexpected problems, some large, some small, that caused frustrations and delays. False information about the Internet connections in the sites, backorders on necessary equipment, incompatible software, collaboration difficulties, and hackers disrupting the TEChPLACEs site were among the major problems project personnel faced.

Internet Service

Prior to the beginning of the project, the schools' administrators told project staff that each classroom selected to participate had access to the Internet. However, when the project began, staff learned that an active Internet connection in each classroom *did not* exist. Internet service was contracted for three of the classrooms and modems were purchased and installed and connected to the computers in each of the three. The capability for a 56K connection existed for the fourth classroom in October, but the wiring was not completed until mid-December. It was not until January, 3 months after project start-up, that all classrooms had access to the Internet and were able to get on-line.

Software and Equipment

At the beginning of the project, a Macintosh 7100 was programmed as a temporary TEChPLACEs server. During these months, Sun Microsystems server models were researched to determine which model would best suit our needs and also fall within our project budget constraints. A Sun system, which was used as the server, was ordered early in January 1998; however, it was not delivered until more than two months later.

Difficulties were encountered with the license manager for the Sun system. After designing a "workaround" for the system, the Sun server was up and running by August 1998. As the programmer and programming assistant started to work with Java Studio and Java Workshop,

they detected incompatibilities between the Java software on the Sun server and the Macintosh operating system. Java 1.1 at the time had thread deadlocks that would cause Java development under Java Studio and Java Workshop to stop working.

The TEChPLACEs web site was originally planned as a Java-based Intranet site. The problems that resulted from using Java in conjunction with the Macintosh and Solaris systems necessitated a change in plans. Alternative methods were explored to support the Intranet site. Time and budget constraints made it necessary to use the Sun Microsystems machine as the web site server which was accessed via the Internet using a web browser. The Sun Microsystems server was programmed to support the TEChPLACEs "All About Us" web site and the interactive *First Community*. Participating teachers were provided with access to the server which enabled them to create, upload, download, and update their classroom's web pages.

During the development of the TEChPLACEs' *First Community* CD-ROM, project personnel decided to produce a crossplatform product. The use of Java with multiple operating systems was not updated and supported by Apple Computer. Five months of struggling with Java code on the Solaris and the Macintosh platforms led to the decision to use alternate programs. Project personnel decided to develop the *TEChPLACEs First Community* using Macromedia's *Authorware 4* and *Shockwave* software programs. It was particularly difficult to find software programs that recognized the needs of a crossplatform project and also had Internet capabilities. These programs required specific data and server specific locations to function properly. The two programs worked remarkably well to produce the activities for the web site, "Our Community" and the CD-ROM, *First Community*. Intense staff self-training and persistence resulted in an interactive web site and CD-ROM.

Collaboration

During the first year, the teacher and 11th and 12th grade students in the LVVS Graphic Communications class were to assist project staff in scanning images, digitizing video, and performing other production tasks required to put children's community products online. As the project began, staff worked closely with the LVVS teacher. Four staff people made at least one trip each week for three months to the LVVS classroom to assist in setting up and maintaining equipment. The LVVS teacher chose not to participate in the project during the second year.

Project staff worked with the four early childhood teachers and provided them with the training needed to incorporate digital and scanned images into their web sites and to upload and retrieve material. Because of their developing skills, the teachers were able to accomplish much of what had originally been planned for the LVVS teacher and his students. What teachers could not accomplish with their newly-learned skills was done by the TEChPLACEs staff.

Hackers

An unexpected problem arose when the TEChPLACEs Sun Microsystems server was compromised in May 2000. One morning, Reed, the kindergarten teacher from Good Hope who always used the TEChPLACEs site as her home page, noticed some unusual typing across the middle of the TEChPLACEs screen. She notified the technology staff at The Center for Best Practices (formerly Macomb Projects). Our programmer investigated and discovered that hackers had left a "ha ha - gotcha" message to inform us the site had been compromised. The site was taken off line immediately. Our programmer then spent several months investigating, reprogramming, and re-installing the system. He reviewed different software that would block access to the server and eventually found software that could offer the site more protection. TEChPLACEs is once again on line and available at <www.techplaces.wiu.edu>. While this

experience may have been new to us, we expect that more educational sites will experience the hacking phenomenon in the future and will need new tools and fiscal resources to deal with the problem. This will directly affect the work of some researchers who do not plan for such an event in their workscope or their budget. Hacking ruins a carefully planned timeline.

VIII. Findings

Project findings resulted from evaluation efforts targeting teachers, children, and families. As indicated in the section entitled Evaluation, numerous data sources were used.

Teachers

Data sources. Information regarding benefits and changes for teachers and their classrooms included adjustments to teaching styles, technology comfort level, integration of technology, and expectations for children. This information was gathered from Teacher Journals, Teacher Reflections Questionnaire, Teachers' Steps and Process Form, Technology Competencies, Participant Panel Meeting Minutes, Informal Interviews, and Phone Survey.

Increased comfort, confidence, and competencies. When the teachers were initially contacted to participate in the TEChPLACEs project, their level of knowledge and degree of comfort using technology were discussed. Within that small group of four individuals, three of the teachers thought their skills were those of a neophyte (possessing ten or fewer of 47 technology skills targeted in the Teacher Competencies) and one considered her abilities to be close to expert (possessing 29 of the 47 technology skills). After two years of participation, all four teachers, even the expert, had become more confident and competent.

Examples of journal entries from the beginning of the project demonstrate teachers' apprehension about participating:

"Impressions from the first meeting. Wow, this is exciting--but can I do this? Can I understand all this and do what they want? Having no background or experience, I feel I'm at a definite disadvantage. Even the terms are unfamiliar to me. It's hard for me to visualize doing a home page when I've never seen one. I'm not sure what I need to do even after being told, listening to directions and asking questions. Even the equipment sound foreign - scanners, digital cameras, etc. The staff at TEChPLACEs is great, very friendly and helpful. Feel I must understand this better myself before presenting it to my parents and students." (Reed, Journal Entry, October 1997)

"After the first few TEChPLACEs meetings, I am very nervous and confused. There are several things that seem so abstract to me. I hope that the staff will be patient with me. I feel so frustrated because all of the other participants have been on line for quite awhile. I don't know when Jim will have me hooked up. When I do get hooked up, I will have to work hard to get caught up." (Burnham, Journal Entry, November 1997)

At the end of the first year of training and involvement in the project, each teacher reviewed her Technology Competencies and identified new skills gained. All four teachers acquired new technology skills. During participation in the project, the expert teacher acquired 16 new skills and the other teachers each acquired at least 28 new technology skills, an increase of 60%. According to Technology Competencies, the teachers' journals, Steps and Processes, and Participant Panel meetings, the teachers became more comfortable using technology. Their level of comfort increased when they used Netscape Composer (the web design feature of *Netscape Communicator*) to construct their classroom web pages.

The teachers gained "can do" confidence in the use of technology and familiarity with the Internet and web construction applications. They recognized the need for more equipment

that would ease the process for them and successfully sought ways to access or acquire digital cameras, scanners, and to increase RAM memory in their computers. They also increased contact with administrators and involved them in the project. By her own account, participation in the project motivated Reed to purchase a computer for home use, get private tutoring for word processing and graphics applications, and connect to the Internet. Another teacher, Clover, noted in her Teachers Reflections Questionnaire during Year 2: *"I feel much more competent using the computer and composing (web) pages."*

Hesitant and reluctant at the beginning of the project, all the teachers became more willing to try and more adept at troubleshooting their own hardware and software problems. In their responses to question 102 in the Teachers' Steps and Processes Form three of the four teachers pinpointed the exact date they felt confident troubleshooting and problem solving web page problems. Open lines of communication between the TEChPLACEs staff and the teachers involved in the project supported the teachers' attempts to solve their own problems. Burnham reported, *"The staff made me feel like I knew a lot even though I didn't feel that way. I was relieved to know that the staff were very helpful and were available for me to call on."* The teachers indicated that knowing the TEChPLACEs staff could be at their site in less than 30 minutes provided a "safety net" if they became too frustrated or if their own attempts proved futile. Burnham wrote on the Teacher Reflections Questionnaire: *"During year two, my skills were slightly stronger which enabled me to do more on my own."* Their skills at troubleshooting improved to the point where fewer and fewer visits to the classrooms were necessary during the second year and most problems were dealt with via E-mail, ICQ, or by telephone.

Increased integration of technology into the curriculum. The four teachers indicated that they had incorporated the computer more into the daily curriculum than they would have had

it not been for their participation in TEChPLACEs. According to Morris, *"I was also amazed at how easy it was to incorporate TEChPLACEs in the curriculum. It fit in so naturally. Nothing had to be taken out of the curriculum in order to fit it in. In fact, just the opposite occurred. Many skills were much easier to teach due to our participation in TEChPLACEs! For instance: complete sentences, proof reading skills, oral reading skills, fiction vs. nonfiction, and on and on!"*

Burnham wrote in her journal: *"We received a letter from Macomb today that sparked something in the students...When we told them about our shoe store, my children wanted to know what sizes they all wore. This lead to a discussion about what sizes we wear. I hadn't even begun to add this to my unit but it was perfect."*

Morris also said, *"Participation in TEChPLACEs made the computer an "active member" of our class. The computer is no longer looked at as a special place to go as a reward or at recess. Both the students and myself now look at the computer in this way. The computer is integrated into all areas of the curriculum. The most encouraging benefit is that using the computer in all areas allows all students to be successful no matter what their ability."*

Changes in teaching styles. An unanticipated outcome of the project was the way in which the teachers adjusted their teaching styles. Once the teachers saw how the children worked with the TEChPLACEs web site, they recognized that their children were capable of much more than they had anticipated. In her Teacher's Reflection Questionnaire, Morris commented about her plans for the classroom web site: *"I was totally scared to get started. I had ideas in my head, but after I talked to the kids their ideas were better."*

The teachers began to step back from direct instruction and provide opportunities for the children to control events. In her journal, Reed wrote, *"This has been a good experience for the*

children and myself. We spend a lot more time discussing and agreeing on things than ever before. It's good for me to let the children take the lead and assist, not totally direct." Because of the spontaneity often exhibited during the development of the web sites, the teachers became more flexible during other classroom activities, not just those related to the computer and the use of technology. Reed also said, *"During the second year, E-mail was a routine part of our class schedule. We still got behind but we did much more individual E-mail and less large group."* To a person, the teaching styles of the teachers evolved into a more child-directed approach in which they took advantage of questioning techniques to guide children's thinking. The four teachers willingly relinquished some control and increased the opportunities for children to make their own choices.

Children

Data sources. Information regarding benefits and changes for children included copies of E-mail, Teacher Journals, Participant Panel Meetings, Informal Observations and Interviews, and Phone Survey.

Increased communication and language development. The children participating in the project increased their level of communication and also demonstrated gains in language development. That these things occurred was not a surprise, but what was amazing was the children's acquisition of a "second language." The preschool children learned to use "TTFN" (Ta Ta For Now) in every E-mail letter as an ending. The teacher said they even used "TTFN" as an ending for other things in their classroom. Children of all ages and in every classroom became fluent in the vocabulary associated with technology, development of web pages, and visiting teacher-selected web sites on the Internet. In a message dictated by a first grader to his teacher and sent to a local veterinarian (who was also a pen pal for the class), a young boy demonstrated

his understanding of communicating via E-mail: *"Yes, I am fine today. I want some sun. I'm bored of the winter stuff. I'm going to Florida on Spring Vacation. My dad said I might get a skateboard before we go to Florida. We are talking about the Olympics. We are building with Legos and Lincoln Logs for our web site. If you want to see our web site go to http://www.techplaces.wiu.edu. When you get to the site click on "All About Us." Then click "Macomb School." Then it will say "Click on our picture." Then there will be a lot of other stuff to see, and it will tell you how to get there. TTFN---"*

Children demonstrated their fluency in both the spoken and printed word. They also wrote and composed letters; they E-mailed back and forth with parents, grandparents, aunts and uncles, TEChPLACEs staff and other adults. In her Teacher Reflections, Burnham wrote: *"The most beneficial part for my class has been exposing the students to the form of a letter (address, welcome, body, closing). Even though I don't use those terms they have learned how to begin and end any letter."*

The first graders were learning composition features and applying them to their E-mail messages. Often when they received letters from adults, they noticed errors in construction and spelling and were quick to respond not only with the information about what was going on in the classroom, but also that capital letters and periods are important features found in sentences. First graders responded to an E-mail from the principal, *"Dear Mrs. Sallee, Happy 100 day to you! We liked your E-mail. The letter that you wrote was not right. You should put capital letters and periods. You were supposed to capitalize Miss Morris and your name and put periods. You forgot to capitalize MacArthur Early Childhood Center. How are you doing in MacArthur? Do you know what TTFN stands for? TTFN, Miss Morris' 1st Grade."*

Children "flaunted" their expertise in their communications with school administrators. In personal communication with a TEChPLACEs staff member, Dr. Evans, Superintendent, remarked about the first graders' knowledge and use of correct terminology. He mentioned his awareness of the way the children had included their families and members of their school community in their active involvement with TEChPLACEs.

Clover's preschool children benefited from the project in letter and word recognition. Instances of children recognizing and using letters and words during interaction with E-mail were recorded by the teacher in her journal. The following examples demonstrate the ways her preschool children increased their skills.

- January 1998- *"After receiving the E-mail from Northwestern kindergarten, I showed the students a letter V and said they could make one if they wanted to. Andrea did after snack. She said,* "Look, Mrs. Clover! The best V in the world." (The kindergarten class had written the preschool about the letter people and that they were meeting Mr. V.)
- February 1998 – *"Zachary used different colors. He told me what colors to use when I was typing and he clicked on the color wheel. When he got to type he changed the colors by himself."*
- April 1998 – *"Steven answered an E-mail. With his dictation I typed. When we were done he typed his name."*
- April 1998 – *"Jesse got E-mail at school and he answered it. He recognized some letters and numbers and changed the colors by himself. Jesse demonstrates a longer attention span at the computer."*
- November 1998 – *"I asked Kylyn if she wanted to send a Thanksgiving card to someone. She said yes, ran the mouse and made the choices. I let her type too. I noticed she started with her*

K for Kylyn. I typed the address. I asked her if she wanted to say anything else. She said TTFN which I typed. Then I let her type. She typed TTFFF NNN. She got all the letters of TTFN then she did her own typing and sent the card."

The older children involved in the project realized that some of the children in the project were younger and "don't know as much as we do." As a group, they discussed the differences between what they could do and what the preschoolers could do, and they decided that the E-mail messages to the youngest children should be uncomplicated and short. It became an intentional step in the process that they phrased their messages in the way they thought appropriate for the preschoolers. In her summary comments, Morris noted, *"I liked that there were different age levels involved. It gave the children the perspective to see what different age groups can and cannot do, as well as gave them the opportunity to write to a variety of audiences. The children especially enjoyed reading the E-mails that the preschoolers 'typed' themselves!"* A similar journal entry demonstrated the first graders' ability to recognize the different abilities among the children in the other classrooms: *"One child remembered that the preschoolers were included in this letter and said, 'even though we are writing to a lot of people, we still need to keep our E-mail short for the little kids, and we need to ask them a question.'"* Figure 4 on page 36 contains three sample E-mail messages sent from preschool, kindergarten, and first grade classes on the TEChPLACEs site indicating knowledge of conventions of written communicative 'conversations.' Children gave focused information and responded appropriately to information from others, rather than ignoring the content of another's communication and going on with information important only to the sender which tends to be regarded as an expected and somewhat immutable developmental characteristic of young children's egocentrism.

E-mail communication with people not associated with TEChPLACEs. Not only were the children involved in writing and sending E-mail messages to the children in other classrooms, community members, and family members, they sent messages across the United States and internationally as well. The preschool children received a message from a fifth grade class in Nova Scotia. Before responding, the preschoolers put a pin on a map where Nova Scotia was located and one where they lived. In her Teacher Journal, dated April 1999 Clover indicates that in their response, the preschoolers told the fifth graders that *"they were preschoolers, read lots of books, talked about jobs, watched the firemen, and learned about fire."* She goes on to say, *"They signed the message TTFN and put their address, town, and state."*

One kindergarten class also responded to the E-mail from the fifth graders in Nova Scotia. The entry from the teacher says, *"They told us they had seven girls and ten boys in their class. They asked us to write back to them and tell them where we are from. We got out our map and found Illinois on it. When we wrote back to them we told them we are from the United States of America, Illinois, and our town is called Industry."* Reed's kindergarten class corresponded with one of their teacher's former students who lived in Antarctica. Reed wrote, *"Our biggest and most exciting use of the Internet has been ongoing correspondence with Brian Sundberg in Antarctica. The class can readily identify the McMurdon Station on the Ross Ice Shelf where Brian is. They have never met him, but talk about Brian like they know him personally. In our last E-mail, we gave Brian our TEChPLACEs address so he can see us in Antarctica."*

Involvement in designing classroom web pages. In each of the four classrooms, the children were involved in the development of their web pages. The teachers reported (in the Steps and Processes Form and Teacher Journals) that their children were involved in planning the class web pages. They discussed the background, color and font for the text, text and graphic

content for each page, connections between pages and any sites to which they might link. The children put a significant amount of time and effort into the planning process and included images and information they found meaningful. It follows then, that they liked what they did and did not tire of reviewing the results, returning again and again to view their web pages and make suggestions for changes and additions. Having been involved in the process, they were extremely proud of their product. In her Teacher Reflections Questionnaire, Morris commented, *"Everyone was proud of it, had a part in designing it, and was successful."* Reed reflected that the class web pages *"helped to instill pride in our school, our class, and as individuals."* Clover, the preschool teacher, shared that *"the kids feel proud of our web site."* Each teacher shared (recorded in Participant Panel Meeting Minutes) how the children in her class wanted to "meet" the children from the other classrooms. As a result, they became acquainted as they navigated through the web site and explored the pages the other groups produced. Of course, the children returned to the safety of their own pages, but it was with greater frequency that they became curious about the activities of the other children. One teacher stated, *"I notice they [the children] always want to see themselves. As the year goes on they usually choose to see the other schools. Especially the ones they get a lot of E-mail from."*

Positive social interactions. Before TEChPLACEs was introduced, the children in the four classrooms were familiar with computers and the software in their library. Even though this was true, changed attitudes among the children when using technology emerged, which the teachers attribute largely to the children's involvement with TEChPLACEs. All the teachers indicated they saw children more involved in the process of negotiating. Instances where the children reached a consensus outnumbered the occasions when a child made demands. During a discussion among the teachers, Reed indicated that she saw more cooperation within groups of

five or more kindergarten children, both at the computer and in activities away from the computer. Teachers Burnham, Morris, and Reed thought that the incorporation of TEChPLACEs into the curriculum helped many children self-regulate their computer use. As the different classes of children made determinations about their web site, they developed a democratic procedure for making decisions that affected their group. The development of their web site demonstrated to the first graders that the majority rules and that working as a team is important. They also developed higher level thinking skills and developed an understanding that everyone has good ideas to share. In her Reflections Questionnaire, Morris commented that the project helped the class work together and have a sense of group ownership. In her Reflections Questionnaire, Burnham said she watched her children learn to compromise on some issues and that they *"learned to listen to the ideas of other children and began to understand the democracy and how the majority vote rules."* In her classroom, this tendency carried over into other areas in the classroom where most decisions were a result of a majority vote.

Children's interest with TEChPLACEs classrooms spurred a chain of events that affected activities in other classrooms. These events were documented through E-mail and teacher journals. One classroom that had a shoe store in the dramatic play area shared information with another classroom asking them to respond and give shoe sizes. A classroom that was making a paper chain relayed the information to the other classrooms and received an immediate response. The children in the responding classroom began their own paper chain and via E-mail the children compared features, including sizes of their paper chains. Each teacher reported in her Steps and Processes Form that children sent and received E-mail that was connected to curricular content and classroom activities.

Results based on the *Developmental Checklist.* The *TEChPLACEs Developmental Checklist* is a 57-item checklist based on sets of norms from national professional organizations' standards[5] for outcomes targeting children from 3 to 8. The *Checklist* was administered to the children in each of the four classrooms. Categories included TEChPLACEs and the Internet (9 items), TEChPLACEs and Technology (8 items), TEChPLACEs and Mathematics (7 items), TEChPLACEs and Science (6 items), TEChPLACEs and Social Studies (7 items), TEChPLACEs and Expressive Arts (5 items), TEChPLACEs and Literacy (7 items), and TEChPLACEs and Social Interaction (8 items).

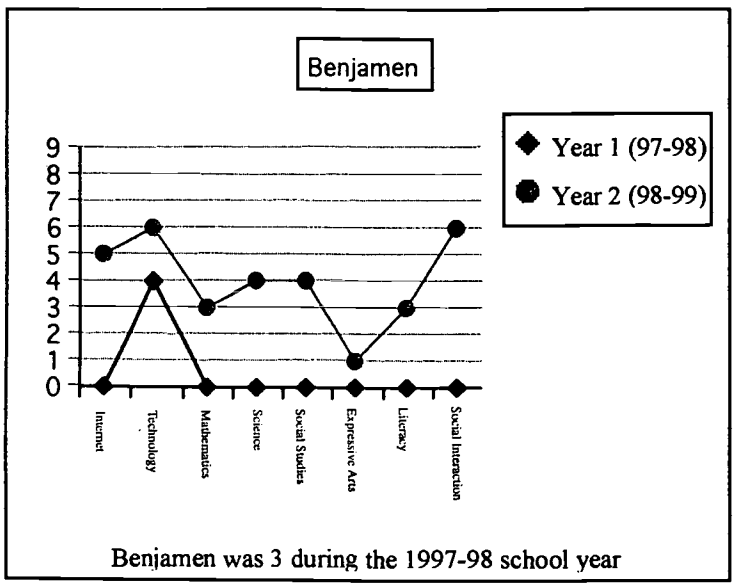
The *Developmental Checklist* was administered at the end of the first year to 62 children. It was also administered at the beginning and end of the second year to 55 children. The children in each classroom, except the preschool classroom, were different each year. The preschool classroom had nine children in Year 1 who remained in Year 2.

Checklist results were tabulated using the statistical program JMP, version 3.1.5. As expected, results indicated definite developmental differences among classrooms, with older children scoring higher than younger children. Significance levels ranged from p=.0001 on Internet use, mathematics, science, social studies, expressive arts, literacy, and social interaction, to p=.0207 on technology skills.

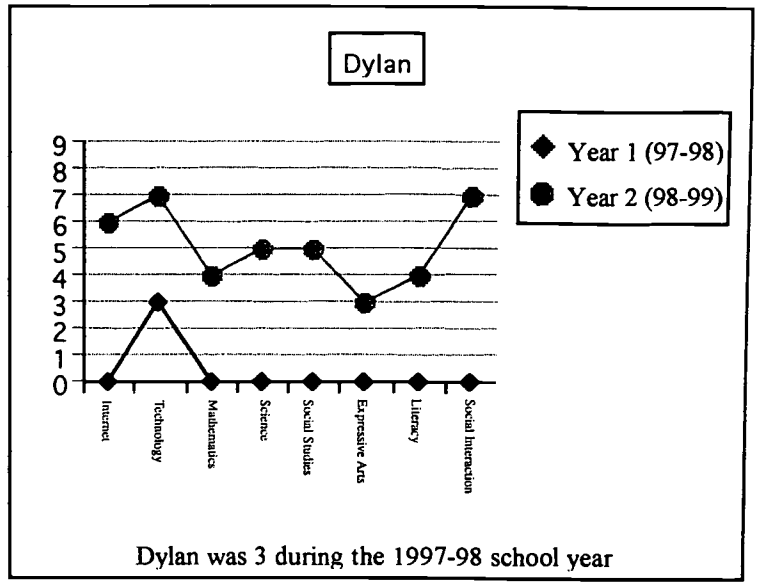
Table 1 on the following pages represents the pre- and post-test results of nine preschool children's *Developmental Checklists*. These nine were the only children who participated in TEChPLACEs activities both years of the project. The bottom line in each graph represents results at the end of the 1997-1998 school year. The top line represents the results at the end of

[5] Items on the checklist were derived from the National Center for Improving Science Education, National Council for Teachers of Mathematics, Geography for Life, National Center for History in the Schools, Consortium of National Arts Education, and Music Educators National Conference.

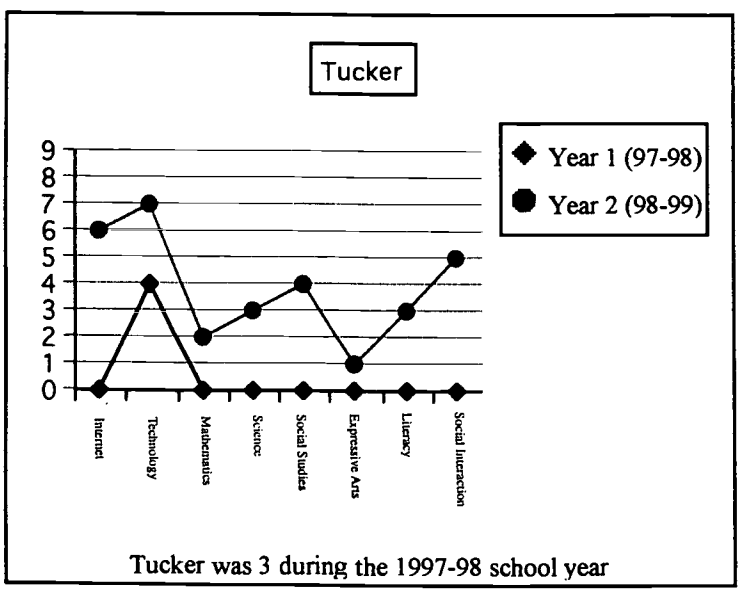
Table 1. Results from the *TEChPLACEs Developmental Checklist* for Nine Preschool Children Who Participated in TEChPLACEs for 2 Years



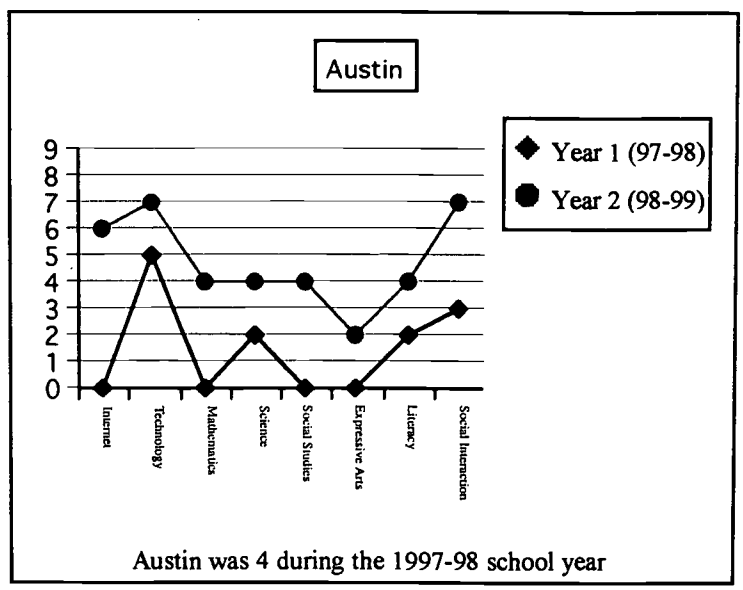
Benjamen was 3 during the 1997-98 school year



Dylan was 3 during the 1997-98 school year

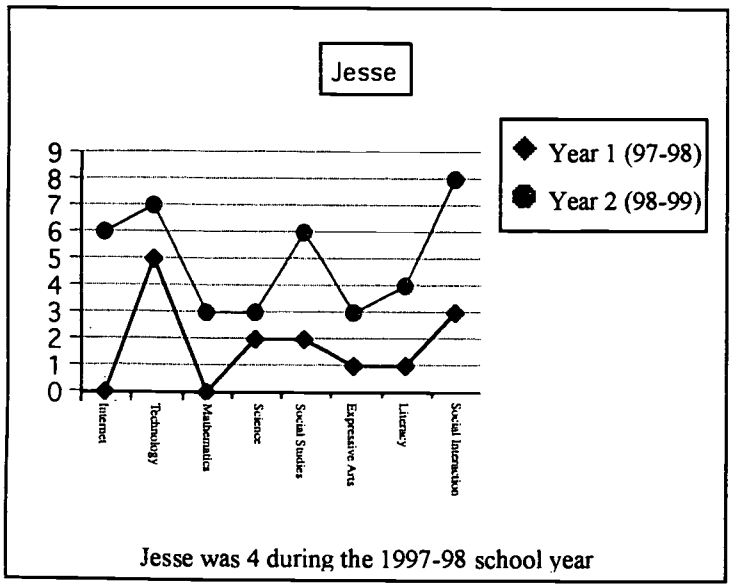


Tucker was 3 during the 1997-98 school year

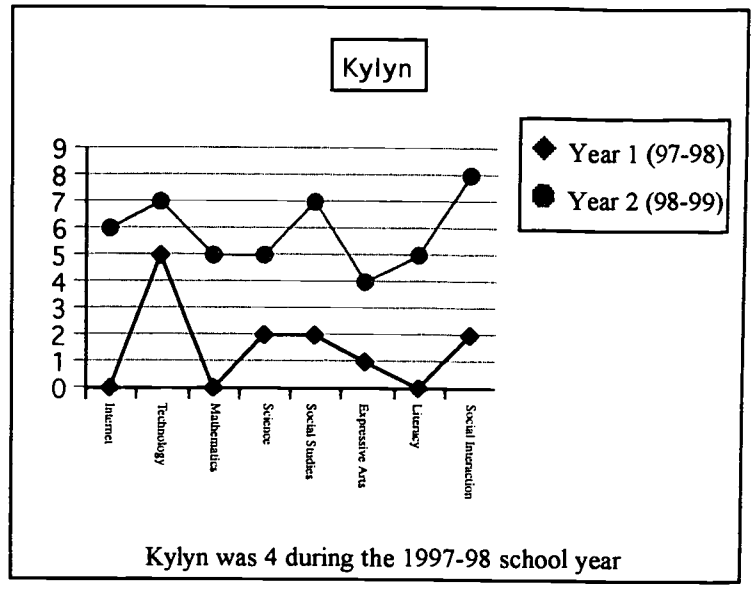


Austin was 4 during the 1997-98 school year

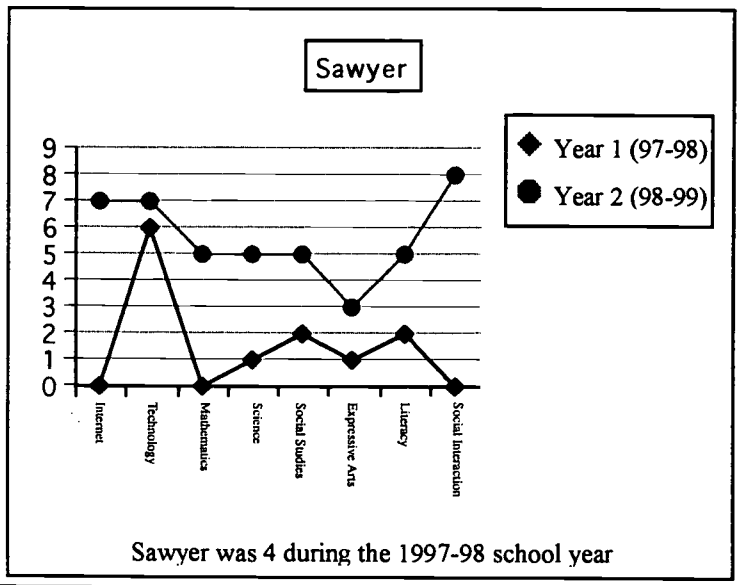
Table 1. Results from the *TEChPLACEs Developmental Checklist* for Nine Preschool Children Who Participated in TEChPLACEs for 2 Years (continued)



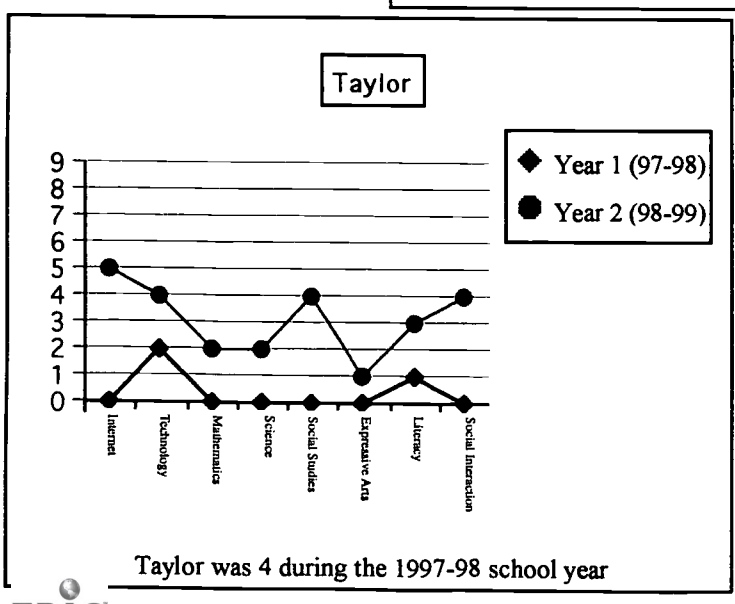
Jesse was 4 during the 1997-98 school year



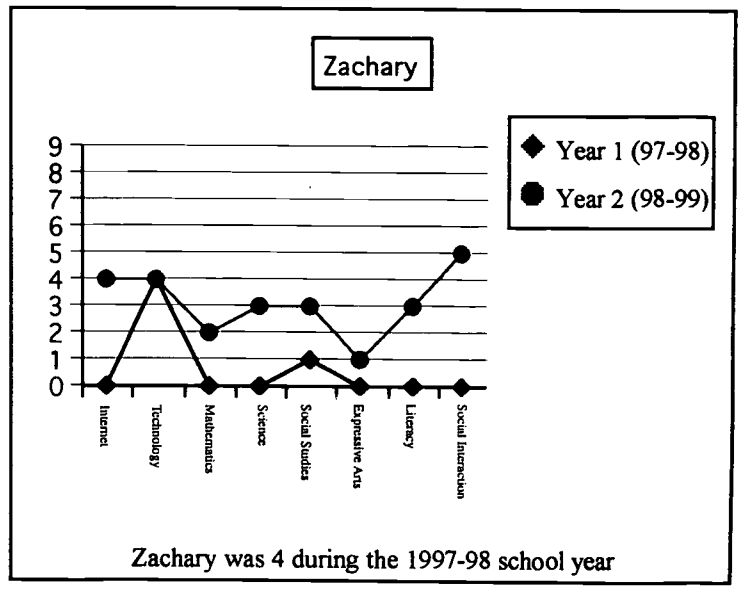
Kylyn was 4 during the 1997-98 school year



Sawyer was 4 during the 1997-98 school year



Taylor was 4 during the 1997-98 school year



Zachary was 4 during the 1997-98 school year

the 1998-1999 school year (Year 2). Eight of the nine children improved in all eight categories of the *Checklist*. One child (Zachary) improved in seven of the categories and remained the same in the TEChPLACEs and Technology category. Three children (Tucker, Benjamin, and Dylan were 3 years old during the project's first year (1997-98). Their Year 2 (1998-99) scores as 4 year olds not only show improvement over their own Year 1 scores but also are better than the pre-test results of the six 4 year olds who participated in Year 1, indicating a positive impact from project participation on skills related to Internet use, technology use, math, science, social studies, art, literacy, and social interaction.

TEChPLACEs and the general curriculum. Evidence indicates that when youngsters use the TEChPLACEs processes, learning expands by giving children access to the regular curriculum (and perhaps beyond it) and experience using a potent set of learning tools. In fact, these are tools that have not been available in times past and, contrary to what some believe, young children *are* able to incorporate technology into their learning experiences and demonstrate its benefits in surprising ways.

Figure 6 pinpoints the relationship between components of TEChPLACEs and content in the general curriculum, including math, science, social studies, expressive arts, literacy, and technology. For instance, activities involved in creating "All About Us" are designed to promote spatial awareness (math); predict outcomes (science); demonstrate awareness of family and community (social studies); use rhymes, stories, and music (expressive arts); recognize that icons, pictures, and words have meaning (literacy), access and use computer hardware (technology).

Figure 7 shows the relationship between TEChPLACEs and the recommendations of the National Research Council's research in Snow, Burns, and Griffin's (1998) *Preventing Reading*

Figure 6. The Relationship of TEChPLACEs Features to Curricular Areas

Features	Technology	Math	Science	Social Studies	Expressive Arts	Literacy
E-mail	•Accesses and uses computer hardware •Accesses and uses computer peripherals, if needed •Works cooperatively with other children about computer operation •Uses scanner or digital camera to transfer images •Explains or demonstrates computer operation to other children •Takes action to reach desired goal with the computer	•Develops/solves problems from everyday situations •Uses problem solving approaches for investigating •Gains spatial sense •Recognizes patterns •Sequences message responses and events •Predicts and estimates events	•Predicts outcomes during participation •Identifies own thought process in solving problems •Shares results of classroom experiments	•Demonstrates awareness of family and community •Compares communities •Develops an awareness of different roles in the community •Classifies people, places, objects •Acquires knowledge of business and related occupations	•Uses a variety of ideas to select colorful fonts and graphics •Shares stories and poems	•Recognizes that icons, pictures, and words have meaning •Recognizes concepts of story •Tells or writes stories about people, places, or things •Demonstrates awareness of relationship between written and spoken words •Communicates through pictures and words •Recognizes conventions of print
All About Us	•Accesses and uses computer hardware •Accesses and uses computer peripherals, if needed •Works cooperatively with other children about computer operation •Uses scanner or digital camera to create images •Explains and/or demonstrates computer operation to other children •Takes action to reach desired goal with the computer •Gains spatial sense	•Demonstrates spatial sense •Recognizes a wide range of patterns •Draws logical conclusions •Relates mathematical ideas through pictures, diagrams, and physical materials •Solves problems •Uses strategies to solve problems	•Recognizes patterns and relationships •Identifies and classifies people, objects, and events Describes physical attributes of materials during •Predicts outcomes during participation •Draws conclusions Identifies own thought process in solving problems	•Demonstrates knowledge of change during construction •Uses chronological thinking during construction and use •Uses negotiating skills during construction and use •Demonstrates awareness of family and community during construction	•Uses a variety of materials, subject matter, and ideas •Makes connections between arts and other content areas •Identifies a variety of sound sources •Demonstrates use of rhymes, stories, and music as a part of daily living •Develops an awareness of different roles of people in the community	•Recognizes that icons, pictures, and words have meaning •Recognizes concepts of story, tells, or writes stories about people, places, or events
Web Site Activities	•Accesses and uses computer hardware •Accesses and uses computer peripherals, if needed •Works cooperatively with other children about computer operation •Uses scanner or digital camera to create images •Explains and/or demonstrates computer operation to other children •Takes action to reach desired goal with the computer •Gains spatial sense	•Demonstrates spatial sense •Recognizes a wide range of patterns •Draws logical conclusions •Relates mathematical ideas through pictures, diagrams, and physical materials •Solves problems from everyday situations •Uses strategies to solve problems	•Recognizes patterns and relationships during construction •Identifies and classifies people, building, or objects •Describes physical attributes of materials during construction activities •Predicts outcomes during participation •Draws conclusions •Identifies own thought process in solving problems	•Demonstrates knowledge of change •Uses chronological thinking •Uses negotiating skills •Demonstrates awareness and families and community •Uses symbols (icons) to locate and identify features of activities	•Uses a variety of materials, subject matter, and ideas •Makes connections between arts and other content areas •Identifies a variety of sound sources •Demonstrates use of music as a part of daily living •Develops an awareness of different roles of people in the community	•Demonstrates awareness of relationship between written and spoken words •Communicates through pictures and words •Recognizes conventions of print •Writes stories for use on web page
C U See Me	•Accesses and uses computer hardware •Accesses and uses video camera and software •Works cooperatively with other children about computer operation •Explains and/or demonstrates computer operation to other children •Takes action to reach desired goal with the computer and camera	•Uses problem solving approaches for investigating •Gains spatial sense •Draws logical conclusions about activities •Develops problems from everyday situations	•Predicts outcomes during participation •Identifies own thought process in solving problems •Participates in experiments through "real-time" video •Share "real-time" results of experiments	•Classifies people, events, and objects •Demonstrates awareness of communities outside the classroom •Compares communities •Develops an awareness of different roles in the community	•Performs stories, poems, and songs to share •Identifies a variety of sound sources •Uses a variety of materials, object matter, and ideas	•Recognizes that icons, pictures, and words have meaning •Recognizes concepts of story, tells stories about people, events, places or things •Demonstrates awareness of relationship between written and spoken words •Writes stories and skits for sharing

Figure 7. The Relationship between TEChPLACEs Reading Research Recommendations

Reading Research Recommendations for Early Childhood Professionals*	Promoting Emergent Literacy through the use of TEChPLACEs
1. Provide rich conceptual experiences that promote growth in vocabulary and reasoning skills.	A. A literacy-rich environment • labels throughout the web pages • displays images with words • displays icons with words and/or phrases B. E-mail • views messages sent through E-mail which encourage written and verbal language • offers classroom E-mail messages which require planning, discussion, reasoning, as well as written and verbal participation • illustrates relationship between electronic message and stamped mail
2. Encourage lexical development, from early referential (naming) abilities to relational and abstract terms and finer-shaded meanings	A. Meaningful experiences for children related to words and their meanings through use of E-mail and web pages • learns name ◊"signs" own name to E-mail messages ◊views own name with picture on the web pages • learns classmates names ◊participates in group E-mail messages ◊views classmates pictures with names on the web pages • learns participating school names ◊sends E-mail to other classrooms ◊views school names on E-mail and on the schools' web pages • learns children's names from the other participating sites ◊sends E-mail messages to specific children ◊views school names on E-mail and on the schools' web pages • learns everything has a name ◊learns names can be spoken and written ◊realizes the written word represents an object on web pages ◊views objects which are labeled throughout the TEChPLACEs environment B. E-mail • offers opportunities for children to socialize both verbally and through the written word • offers opportunities for children to discuss objects, events, and people named in letters, name the objects, events, and people, and discuss their purposes in the letter C. TEChPLACEs Web Pages • offers opportunities for children to socialize and discuss objects, people, and events located on web pages when viewed in a large or small group • offers opportunities for children to discuss objects, events, and people named on web pages and name the objects, events, and people in the pictures
3. Encourage development of listening comprehension skills, and the kinds of syntactic and prose structures that young children may not yet have mastered.	A. E-mail • provides reading of E-mail to children during group and/or center time ◊provides questioning for children about content of letters ◊offers opportunities for children to predict who letters are from ◊invites children to participate as a group and read along when a letter has repeating salutations and/or closings (e.g., Dear, TTFN [Ta ta for now], From) • offers children opportunities to compose their own E-mail • offers opportunities for children to hear letters read, listen to and read along with the letter, and play with words (e.g., ROFL[rolls on floor laughing], LOL [Laughing Out Loud]) • helps children understand letter content and structure B. Web Pages • reads web page text to children during group and/or center time ◊questions children about content of web pages ◊asks children to predict what is happening on the web pages • offers children opportunities to compose their own web pages • offers opportunities for children to hear words read, listen to, and read along with the text, and play with words
4. Encourage development of children's sense of story.	A. Print and E-mail • introduces letter components and content (e.g., salutation, body, closing, and signature) through having E-mail read to them or by reading it themselves • interacts with the browser's mail program; children are introduced to sequence, terminology, and procedure (font, font size, color, cursor, delete, return, space bar, shift key, address book, E-mail address, BCC, CC, and send) B. Web Pages • plans and creates the items to be displayed on their web pages (e.g., Lego structures, drawings, paintings, clay models, block constructions, and collages) • plans and acts out skits and/or plays to be videotaped and shown on web pages • creates images for their web pages using digital cameras, scanners, and/or QuickCams • tells stories about their web pages through images and text • uses the expressive arts to tell about themselves and their classroom
5. Encourage children's sensitivity to the sounds of language.	A. Sounds and Language • reads letters and text aloud • offers children opportunities to hear words and phrases over and over (E-mail and Internet terminology) • offers experiences for children to predict and discuss objects, events, and people in E-mail and on web pages • provides opportunities for children to record, listen, and replay sounds on web pages
6. Encourage development of children's concepts of print	A. Print-rich environment with E-mail • opportunities for using E-mail are available to encourage children's writing • reads E-mail messages displayed in large print to enable groups of children to view print • supports concepts of print; reading E-mail messages print left to right and top to bottom • promotes understanding that E-mail is made up of words which are made up of letters and sounds and have meaning • displays E-mail messages in a book for children to read B. Print-rich environment with the TEChPLACEs Internet site • labels objects, events, and people throughout web pages • displays environmental print on web pages and Internet • bookmarks a variety of web sites on many subjects; web sites organized that relate to software children are using • promotes understanding of left to right; top to bottom • promotes understanding that words have meaning

*Based on information from: Snow, C., Burns, M., & Griffin, P. (1998). *Preventing reading difficulties in young children.* Washington, DC: National Academy Press.

Figure 7. (continued)

Reading Research Recommendations for Early Childhood Professionals*	Promoting Emergent Literacy through the use of TEChPLACEs
7. Encourage development of children's concepts of space, including directionality.	A. E-mail • demonstrates that letters make words • demonstrates that words are separated by spaces • promotes understanding that writing and reading are done from left to right and from top to bottom B. Web pages • demonstrates that letters make words • demonstrates that words are separated by spaces • promotes understanding that writing and reading are done from left to right and from top to bottom C. Variety of input devices • mouse, touch tablet, alternate keyboard ◊ allows children exploration of the concept of space as they use the devices to maneuver through the web brower software and interact with the variety of activities associated D. Variety of peripherals • digital camera, 35 mm camera and flatbed scanner, and QuickCam ◊ offers children opportunities to explore concepts of space and directionality as they work to capture images in a wide range of positions, locations, and depths
8. Encourage development of children's fine motor skills.	A. Provides drawing, writing, and keyboarding opportunities when involved with TEChPLACEs activities B. Allows opportunities to handle E-mail messages and turning pages for longer messages C. Input devices for computer use • mouse, touch tablet, alternate keyboard ◊ encourages eye/hand coordination (visual tracking on monitor, pressing pictures on an overlay) D. Peripherals for acquiring images • digital camera, 35 mm camera and flatbed scanner, and QuickCam ◊ encourages eye/hand coordination, pressing with fingers, balancing, and holding steady
9. Motivate children to read.	TEChPLACEs environment • offers opportunities for reading aloud to children daily • offers a wide variety of information via web sites and E-mail on a variety of subjects • encourages children to read aloud or to read along with teacher when reading E-mail, home pages, and text of web sites • allows children to share E-mail from home and/or with other classrooms • allows children to share favorite sites discovered at home or school with classmates or other classrooms • encourages children's storytelling, letter writing, and desire to read messages • provides opportunities for children to prepare, send, and receive E-mail messages • provides opportunities for children to print E-mail messages

Difficulties in Young Children. One recommendation was "encourage development of children's concepts of print." TEChPLACEs participation did that through E-mail (reading and writing from left to right) and through a print-rich Internet site (labeling objects, events, and people).

Families

Strengthening the home-to-school connection through E-mail. During Year 1 of the project, Reed's kindergarten was a half-day program with more than 20 children in each session. In her Teacher Reflection Questionnaire, Reed explained that she was determined to involve both groups in the project because of the interest and involvement of the children and their parents.

For the children and their families in her classes, as well as in the other classrooms, the project became an important mechanism to strengthen the home to school connection. Children

in all of the classrooms received E-mail messages from parents and families, some of which were addressed to individual children and some addressed to the group. TEChPLACEs staff also received "carbon copies" of most E-mail correspondence to and from the four classrooms via a TEChPLACEs E-mail address.

Some messages contained information about the parent's workplace, which brought a new level of awareness to children about various careers. Other messages asked questions such as *"How many children have pets at home?"* Questions such as this frequently resulted in an activity in which the children estimated the group's response and then graphed each child's actual response. Each classroom received "problems" of some type from parents or family members that needed solving. The result was an effort that engaged the children in the dynamics of solving a problem as a group.

In her 1998 Teacher Journal, kindergarten teacher Burnham referred to an E-mail from one child's parents in which they posed a problem. The solution required a mathematical computation that was solved by the kindergartners using Unifix® cubes. The mother had been in the classroom and knew the children had established a shoe store. She sent an E-mail message to the class and asked how many of the children had Velcro fastened shoes, tie shoes, buckle shoes, or slip-on shoes. In response to the E-mail message, the children and their teacher first examined each others shoes and estimated the number of pairs of shoes in each category. They estimated that there were more tie shoes than any other kind. Next they used the Unifix® cubes and assigned different color cubes to each type of shoe. Each child with Velcro shoes got a cube for his or her shoe style, and those cubes were connected in a row. The process was repeated for the other shoe styles, resulting in a row of single color cubes for each. The lengths of the four rows were compared, and the children discovered that there were more tie shoes, just as they had

estimated. They made some determinations about the differences between the styles and responded to the parent's query with information about the most popular and least popular style of shoe.

This interaction among the kindergarten children sparked their interest and caused them to E-mail the preschoolers, first graders, and other kindergartners. They asked each group questions about the type of shoes they wore. This then evolved into a sharing of information between the classrooms of sizes, colors, and types (Velcro, tie, buckle, slip-on) of shoes.

The involvement and influence of family was also apparent in the classroom that determined a veterinary clinic was an important location in their community. A member of that particular class had a father who was a veterinarian. The father/veterinarian provided opportunities for the TEChPLACEs staff to interview, video tape, and photograph his veterinary clinic. The results of his cooperation and collaboration were incorporated into the web site and the TEChPLACEs CD-ROM.

Families and technology at home. While some children in each of the classrooms had computers at home, most did not. In their teacher journals and informal interviews, teachers explained that some parents saw the value and importance of investing in technology for their home. A practical use of the technology was demonstrated by the parent of a first grader. The first grade teacher wrote in her journal that *"A parent came to spend the day with us. She really enjoyed getting to see us use the computer, the next day, her child wasn't at school, however, we did have an E-mail from her. She had E-mailed us to say that Andrea wouldn't be back at school until the following week. Her mom added a "PS" at the bottom. She wanted to know if Andrea's spelling test could be sent and completed by E-mail. We E-mailed back as a class and told her that she could. The class added things like, don't peek at the words while your mom reads them*

to you, don't forget to put your name and the date on your paper, and remember your period at the end of the sentence! When the day of our test came, Andrea's test arrived in the morning! The kids thought that was cool!"

Parents attributed their willingness to invest in technology as an effort to extend the opportunities for learning into the home. Even though several families had computers in the home, they did not necessarily have access to the Internet. The teachers made the classroom computers available and provided time for parents to use the Internet, experience the vastness, and explore the possibilities it holds. All four teachers reported that during their school's open houses and family nights they made TEChPLACEs a part of the program. Some parents had their first opportunity to use a computer; others had their first chance to send E-mail messages.

IX. Impact

Products

Products resulting from the TEChPLACEs project include two web sites. The first <http://www.wiu.edu/users/mimacp/wiu/techplac.html> offers general information about the project and offers links to information about the children's E-mail participation and to the second web site <http://techplaces.wiu.edu>. That site contains links to the "All about Us" and "Our Community" web sites that were constructed by the teachers, children, and TEChPLACEs staff. Another product is a CD-ROM, *TEChPLACEs First Communities*, which contains the information and activities found on the "Our Community" web site. This product is available from The Center for Best Practices in Early Childhood, 27 Horrabin Hall, Western Illinois University, Macomb, Illinois 61455. The Construction Kit includes *First Communities* and a set of procedures necessary to implement TEChPLACEs.

Dissemination Activities

Conferences. During the 2 years, project staff presented conference sessions on a variety of topics related to TEChPLACEs. Sessions focused on teacher training and how young children use the Internet and E-mail. Other sessions provided an overview of the project. In 1998, project staff presented at three conferences. On March 20, 1998, staff conducted three sessions at the Early Childhood Technology Conference held in Macomb, Illinois. In July, a poster session was conducted at the OSEP Research Project Directors' Meeting in Washington, DC. Conference activities in 1998 ended with a session at Closing the Gap in Minneapolis, Minnesota, on October 16.

Conference presentations in 1999 included two sessions at the Early Childhood Technology Conference in Macomb, Illinois on March 16, as well as a session at the Technology and Persons with Disabilities Conference, California State University-Northridge on March 18. Presentations in the fall of 1999 included one session at the Illinois Education and Technology Conference on September 30; two sessions at Sharing a Vision on November 2 and 3 in Springfield, Illinois; and a poster session at the Division of Early Childhood Conference (DEC) on December 10 in Washington, DC.

Publications. *Teaching Exceptional Children* published "TEChPLACEs: An Internet Community for Young Children, Their Teachers, and Their Families" (Hutinger & Clark, 2000), which provided readers information about the project's purpose, practices, and findings. Other publications about aspects of TEChPLACEs include "What a Difference a Year Makes" (Clark, 1999), "Young Children and Internet FAQs" (1998a, 1998b), "Internet Offers Benefits to Teachers and Students" (Beard, 1998), and "When Young Children Use the Internet: A Report of

Benefits for Families, Children, and Teachers" (Clark, 1998). The 1998 articles are also available on line at the following URLs:<http://www.wiu.edu/users/mimacp/wiu/faq.html>, <http://www.wiu.edu/users/mimacp/wiu/benefits.html>, and <http://www.wiu.edu/users/mimacp/wiu/internet.html>.

X. Future Activities

Results from TEChPLACEs work from 1997 - 1999 show great promise for similar collaborative activities. The Center for Best Practices in Early Childhood submitted a Steppingstones of Technology Innovation for Students with Disabilities, Phase 2, proposal to study the effects of TEChPLACEs across ages, classrooms, locations. The proposal was not funded. We continue to seek ongoing support for the project.

XI. Assurance Statement

As directed by the Office of Special Education Programs, an original and two copies of this report have been sent to Rose Sayer, Office of Special Education. A full copy of the report has been sent to the ERIC Clearinghouse. A copy of the title page and abstract have been sent to Peggy Hensley at NEC*TAS.

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U.S. Office of Special
Education Programs

Final Report: Technology in Early Childhood—Planning and Learning About Community Environments
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