Final Report: Results from Accessing Curriculum Through Technology Tools (ACTTT), A Model Development Project

by

Joyce Johanson, Letha Clark, Katrina Daytner, and Linda Robinson

Center for Best Practices in Early Childhood
Western Illinois University
Macomb, Illinois 61455

March 2009

Final Report: Results from Accessing Curriculum Through Technology Tools (ACTTT), a Model Development Project

by Joyce Johanson, Letha Clark, Katrina Daytner, and Linda Robinson

Executive Summary

Accessing Curriculum through Technology Tools (ACTTT), a model development project, was developed and tested by staff of the Center for Best Practices in Early Childhood (the Center), a research and development unit within the College of Education and Human Services at Western Illinois University. The major goal of ACTTT was to develop, demonstrate, and evaluate an innovative technology tool model that allowed children with disabilities in kindergarten, first and second grades to access, participate in, and benefit from activities in the general curriculum.

ACTTT's conceptual framework was based on the results of a series of related OSEP-funded Center projects focusing on technology and young children with disabilities or at risk, on the constructivist approach to teaching and learning, and on national and state standards. Technology tools used in ACTTT included hardware, such as computers, digital cameras, digital microscopes, video cameras, printers, scanners and adaptive devices; software used for writing, graphing, mapping, authoring, graphics, and concept development; and the Internet. Assistive technology devices enabled children with physical disabilities to participate in activities.

Kindergarten, first, and second grade classrooms in three elementary schools in Canton, Illinois, served as demonstration sites. Each school had six teachers participating, three (K, 1, 2) in the treatment group and three (K, 1, 2) in the comparison group. Teachers were randomly assigned to groups and stayed in those groups for the duration of the project. Of the 483 children in treatment classrooms, 222 (46%) were at risk or had disabilities. Of the 541 children in comparison classrooms, 170 (38%) were at risk or had disabilities. Disabilities included learning disabilities, cerebral palsy, behavior disorders, autism, Fragile X, speech and language disabilities, schizophrenia, and Other Health Impairments. All children in the treatment groups participated in ACTTT activities; however, data were collected on only those whose parents or guardians gave ACTTT permission to do so.

Participation in ACTTT's technology-based activities led to many learning opportunities for children in the treatment groups. They learned new skills, such as how to turn on and operate the

digital cameras, video cameras, and microscope; how to create music using *GarageBand*; and how to investigate the world using *Google Earth*. Working in pairs or teams, they honed their social and communication skills as they worked on various activities. They shared ideas and discussed pros and cons of each during the planning stages. They participated in planning, investigation, and problem-solving situations. They learned about organizing and concept mapping. They learned research skills by finding photos and information on the Internet. They used technology tools to create books, movies, and podcasts, participating in each step from planning to completion and gaining new knowledge and skills as they did so.

Children in treatment classrooms scored higher than children in comparison classrooms on over half of the technology skills assessed by the *Technology Assessment Based on Standards (TABS)* instrument. Furthermore, for 18 of the 22 items assessed, well over half of the children in treatment classrooms were able to complete the task independently. This trend was apparent for all three grade levels assessed.

All treatment teachers increased their technology skills, as well as their confidence with respect to technology over the course of the project. Teachers took ownership of the activities created by ACTTT staff members. They were excited about what the technology allowed them to do as well as by the changes they saw in their students, particularly the students who struggled when the content was presented with more conventional approaches.

ACTTT products include a DVD containing overview information about the project and samples of children's products, as well as a DVD containing the ACTTT Curriculum. Both are available from The Center for Best Practices in Early Childhood, 32 Horrabin Hall, Western Illinois University, Macomb, IL 61455. The ACTTT website can be accessed at www.wiu.edu/thecenter/acttt. A third DVD, "Tools of the Trade: Early Childhood Software," is available from STARNET, 32 Horrabin Hall, Western Illinois University, Macomb, IL 61455, and can be viewed online at www.wiu.edu/users/starnetv/apples01152004b.mov.

Table of Contents

Executive Summary 1
Table of Contents 3
Conceptual Framework 4
    ACTTT Foundations 4
    Constructive Approach to Learning 5
    Technology Integration 5
ACTTT Objectives 6
Objective 1 7
    Description of Sites 7
    Description of Participants 8
    Random Assignment of Classrooms 10
    Overview of ACTTT Procedures 11
        Frequency of Visits 11
        Teacher Participation 12
        Technology Equipment 13
Objective 2 14
    Training Teachers on the ACTTT Model 14
        Formal Training 14
        Informal Training 15
        Follow-up 16
Objective 3 17
    Measures 17
        Child 17
        Teachers 17
    Results from *TABS* 18
    Comments about Child Progress from Teacher Observations 23
    Results from Teachers' *Skill Attainment Survey* 25
        Teacher Exit Surveys 28
Objective 4 30
    Family Awareness 30
Objective 5 33
    The ACTTT Curriculum on DVD 33
    ACTTT Overview on DVD 34
Objective 6 35
    Website 35
    Satellite Broadcast 35
    Conference Presentations 36
Conclusions 38
    Unanticipated Difficulties 38
    Unanticipated Outcomes 39
References 41

Final Report: Results from Accessing Curriculum Through Technology Tools (ACTTT), a Model Development Project

by Joyce Johanson, Letha Clark, Katrina Daytner, and Linda Robinson

Accessing Curriculum through Technology Tools (ACTTT), an OSEP-funded Research and Innovation project, was developed by staff at the Center for Best Practices in Early Childhood (the Center) at Western Illinois University. ACTTT's goal was to develop, demonstrate, and evaluate an innovative technology tool model that allowed children with disabilities in kindergarten, first and second grades to access, participate in, and benefit from activities in the general curriculum.

Conceptual Framework

ACTTT's conceptual framework was based on the results of related Center projects, on the constructivist approach to teaching and learning, on assistive technology, and on national learning standards. All ACTTT curriculum activities utilized learning standards established by the National Council of Teachers of English and the International Reading Association, the National Council for Teachers of Math, the National Research Council, the National Council for the Social Studies, the Consortium of National Arts Education Associations, and the International Society for Technology in Education.

ACTTT Foundations

A variety of early childhood demonstration and training models funded by OSEP and developed at the Center provided the foundation for ACTTT. Activating Children Through Technology (ACTT) provided assistive technology experiences targeting independence, communication, and acquisition of developmental goals for children from birth to eight with moderate to severe disabilities (Hutinger, 1996b). Related projects included literacy research, model development, and outreach training (Hutinger, et al., 1998; Hutinger, Bell, Johanson, & McGruder, 2002; Hutinger, Robinson, Schneider, & Johanson, 2002); a math, science, and social studies model development project (Hutinger, Betz, Johanson, & Clark, 2003); a web-based learning community for preschool, kindergarten, and first grade (Hutinger, Clark, & Johanson, 2001); an early childhood comprehensive technology system study (Hutinger & Johanson, 2000; Hutinger, Johanson, & Rippey, 2000; Hutinger, Johanson, Bond, Clark, & Robinson, 2003); and expressive arts projects for young children with disabilities (Hutinger, 1998; Hutinger, Potter,

Schneider, Guzman, & Johanson, 2002). All projects successfully used technologies as components of their work to equalize learning opportunities for young children with disabilities.

Constructive Approach to Learning

Young learners constantly seek to make sense of the environment. Faced with new information or circumstances, they "construct" explanations that make sense based on their personal experiences, knowledge, and beliefs (Abbott & Ryan, 1999; Anderson, 1996; Bransford, Brown, & Cocking, 2000; Driver, 1995; Hutchinson, 1995; Kamii & Ewing, 1996; von Glasersfeld, 1995: Wilson & Lowry, 2000). By drawing upon young children's curiosity about the world around them, teachers and families can offer opportunities that allow children to construct meaning, confirm predictions, generate new questions, synthesize ideas, and make connections across content or subject matter areas.

An integrated curricular approach connects diverse elements of study by cutting across subject-matter content and emphasizes unifying concepts in a natural, meaningful context. Children learn best when participating in an integrated curriculum that incorporates meaningful activities connecting their learning across traditional curricular areas (Campbell, 1992; Hohmann & Weikart, 1995; Katz, 1999; Rainer, Guyton, & Bowen, 2000; Roser, Hoffman, & Farest, 1990; Short, 1991; Sloane, 2000; Wakefield, 2000). Teaching methods become more facilitative, and children become more engaged in active learning, continually making sense of their world based on what they have already learned or constructed (Dever & Hobbs, 2000; Pappas, Kiefer, & Levstik, 1990; Wood & Bennett, 1999). Children with disabilities can be included within the context of a regular program (Gurganus, Janas, & Schmitt, 1995; Kataoka & Lock, 1995; Patton, 1995; Sawyer & Sawyer, 1993) and can experience growth in conceptual understandings and process skills (Barclay, Benelli, & Wolf, 1996; Barclay & Walwer, 1992; Manzo, 2001). Furthermore, through participation in theme-driven activities, children show increased capacities for risk-taking, problem-solving, cooperative learning, sharing, and decision-making (Clements, 2001; Katz & Chard, 2000). Guidelines for both special and regular education support the concept of an integrated curriculum (DEC, 1993; NAEYC, 1996; Sandall, McLean, & Smith, 2000). ACTTT activities emphasized an integrated curriculum approach incorporating technology tools.

Technology Integration

Both literature and practice point to the important benefits of integrating technology into the K-2 curriculum (Bickart & Pierrel, 1999; Brooker, 2003; Castellani & Jeffs, 2001; Clements,

1999b; Davis & Shade, 1999; Gordon & Brown, 1996; Haugland, 1992; Jonassen, 2000; Wright & Shade, 1994). A single computer can be used by an individual child, two or three children, or a larger group of children, thereby leading to increased positive social interactions (Brooker, 2003; Buckleitner, 1994; Haugland, 2000; Hutinger, 1987, 1998, 1999; Hutinger, et al., 1998; Hutinger, Betz, Johanson, & Clark, 2003; Hutinger & Clark, 2000; Hutinger, Johanson, & Rippey, 2000). Adding technology tool applications to an array of children's educational experiences enhances access, learning, attention, communication, and social skills (Hutinger, et al., 1998; Pressman, 1999). Using a computer and appropriate software can help children develop critical thinking, problem solving, creativity, and mathematical thinking (Clements, 1999a, 1999b; NAEYC, 1996).

Computers are an effective means of providing young children with disabilities access to learning activities (Behrmann & Lahm, 1994; Brett, 1997; Clements, Nastasi, & Swaminathan, 1993; Godt, Hutinger, Robinson, & Schneider, 1999; Hutinger, 1996a; Hutinger & Clark, 2000; Hutinger & Johanson, 1998; Hutinger & Johanson, 2000). Intervening with computers and other technologies, including adaptive devices or specialized software, produces positive changes in young children (Derer, Polsgrove & Reith, 1996; Hutinger, Johanson, & Stoneburner, 1996).

Computers, as well as other technology tools, may help children learn in new ways (Bransford, Brown, & Cocking, 2000). Computers, interactive software, digital cameras, digital microscopes, and the Internet offer children—including those with disabilities—the means to do things they have previously been unable to do. Technologies can assist children with moderate to severe disabilities function in inclusive settings and hold a key to promote active learning skills rather than passive attendance or absorption of knowledge (Higgins & Boone, 1997; Lewis, Graves, Ashton, & Kieley, 1998).

ACTTT Objectives

Six objectives guided the development and testing during the project:

- Develop, test, and demonstrate the ACTTT model in randomly-selected classrooms in elementary schools in Canton, Illinois.
- Provide training on the ACTTT model to site teachers.
- Collect data on participating children and teachers.
- Provide information to families.
- Develop ACTTT products based on tested classroom technology-based activities.
- Disseminate information about ACTTT.

The following sections of this report contain information related to the completion of each objective.

Objective 1

1.0 Develop, test, and demonstrate the ACTTT model in randomly selected classrooms in elementary schools in Canton, Illinois.

During a 4-year period, the ACTTT model was tested in Canton's Westview, Lincoln, and Eastview Elementary schools. Three kindergarten, first, and second grade teachers participated in each schools' treatment group and three kindergarten, first, and second grade teachers participated in each comparison group.

Description of Sites

Kindergarten, first, and second grade classrooms in three elementary schools in Canton, Illinois, served as demonstration sites for the ACTTT model. Canton, a rural community located in Fulton County, has a population of 15,288. According to the 2000 census, the median income for a family living in Canton was $39,910. Approximately 10.1% of families have incomes below the poverty line.

Canton is 42 miles from Western Illinois University in Macomb, where the ACTTT project was housed. ACTTT staff drove to Canton two to five times a week during each school year to work with teachers and children in Westview, Lincoln, and Eastview Elementary Schools. All three schools had up-to-date Macintosh computer labs located in the "computer lab" area of their libraries. Each classroom also had at least one computer. The computers were networked and had Internet access.

In the labs, children were allowed limited access to programs. *KidPix* was the only program ACTTT staff saw the majority of comparison classroom children using. The exceptions were one comparison teacher whose children used *Kidspiration* and another whose children used Starfall, an Internet site.

Computer lab time varied from 30 – 50 minutes one day a week. Treatment classrooms took advantage of the entire 50 minute period. Comparison classrooms' time varied depending on class (kindergarten children were given less time) and teacher attitude toward technology, with those who were intimidated by it giving their classroom less time in the lab.

ACTTT supplemented each school's existing technologies by bringing laptops, printers, and other technology tools such as digital cameras, video cameras, and digital microscopes to the treatment classrooms for children's use. ACTTT activities took place in the classrooms, the computer labs, as well as other places inside the school. The cameras, digital microscopes, and laptops were also taken outside as part of the learning activities.

Description of Participants

Table 1 shows each school that participated in ACTTT, the years of participation, as well as the numbers of teachers and children in the treatment and comparison groups. Each school had six teachers participating, three (K, 1, 2) in the treatment group and three (K, 1, 2) in the comparison group. Teachers were randomly assigned to groups and stayed in those groups for the duration of the project.

Of the 483 children in treatment classrooms, 222 (46%) were at risk or had disabilities. Of the 451 children in comparison classrooms, 170 (38%) were at risk or had disabilities. Disabilities included learning disabilities, cerebral palsy, behavior disorders, autism, Fragile X, speech and language disabilities, schizophrenia, and Other Health Impairments.

Fifty-seven (57) children participated in ACTTT treatment groups for 2 years, and three children participated for 3 years. Fifty-one (51) children participated in comparison groups for 3 years, and two children participated in comparison groups for 3 years. ACTTT had no input into children's placements with teachers. School administrators assigned children to teachers each school year without regard to whether the children had participated in the ACTTT treatment or comparison group the previous year.

All children in the treatment classrooms participated in ACTTT's activities. However, data were collected on only those children whose parents and guardians had given written consent. Teachers in treatment and comparison groups sent explanations of the project and consent forms for participation home with children at the beginning of each school year. Over the 4 years, signed permission forms were returned for 439 (91%) of the 483 children in treatment classrooms and for 361 (80%) of the 451 children in comparison classrooms.

Table 1. ACTTT Participants Years 1-4

Westview	**Year 1 (Spring Semester 2004) Participants**	Teachers		Children	
		Treatment	Comparison	Treatment	Comparison
	Total	3	3	56	46
	Total with Permission	3	3	56	45
	Total with Complete Data	3	1	0	0
Westview	**Year 2 (2004-05 School Year) Participants**	Teachers		Children	
		Treatment	Comparison	Treatment	Comparison
	Total	3	3	73	68
	Total with Permission	3	3	54	37
	Total with Complete Data	0	0	47	19
Westview Lincoln	**Year 3 (2005-06 School Year) Participants**	Teachers		Children	
		Treatment	Comparison	Treatment	Comparison
	Total	6	6	144	134
	Total with Permission	6	6	128	111
	Total with Complete Data	6	3	107	85
Westview Lincoln Eastview	**Year 4 (2006-07 School Year) Participants**	Teachers		Children	
		Treatment	Comparison	Treatment	Comparison
	Total	9	9	210	203
	Total with Permission	9	9	201	168
	Total with Complete Data	9	7	164	134

Random Assignment of Classrooms

Table 2 shows ACTTT's experimental design. Two kindergarten, two first grade, and two second grade teachers from each of the three schools were randomly assigned to either the treatment or the comparison group. Teachers remained in their assigned groups for the duration of the project.

Table 2. ACTTT Experimental Design with Random Selection of K, 1, 2 Classes

	Treatment Sites	Comparison Sites
Year 1 Sp 04	Develop, Pilot Test, Revise Westview K, 1, 2	
Year 2 04-05	Field Test/Demonstrate, Revise Westview K, 1, 2	Compare Westview K, 1, 2
Year 3 05-06	Demonstrate, Revise Westview K, 1, 2 | Lincoln K, 1, 2	Compare Westview K, 1, 2 | Lincoln K, 1, 2
Year 4 06-07	Demonstrate, Revise Westview K, 1, 2 | Lincoln K, 1, 2 Replicate Eastview K, 1, 2	Compare Westview K, 1, 2 | Lincoln K, 1, 2 Compare Eastview K, 1, 2

At the beginning of each school's involvement, ACTTT staff met with kindergarten, first and second grade teachers to explain the project and its components and to describe what would be expected of teacher participants. Westview Elementary participated all 4 years, Lincoln Elementary 2 years, and Eastview Elementary 1 year. Westview and Eastview schools had 3 teachers at each grade level; Lincoln had 2. All were eligible to participate. Two names from the teachers at each grade level were randomly drawn for assignment to either the treatment or comparison group. Teachers stayed in those groups for the duration of the project.

Teachers in the comparison group taught their classroom curriculum as they normally would. Teachers in the treatment group, with the assistance of ACTTT staff, supplemented and enhanced their curriculum using ACTTT's technology-based activities. All children had access to the school's computer lab during their classes' regularly-scheduled computer lab time. Students in the comparison group worked primarily with *Kid Pix* software during their computer lab time. During their time in the computer lab, students in the treatment group used a variety of software to support and enhance their

curriculum activities (e.g., *GarageBand, Google Earth, iMovie, iPhoto, Keynote, Kid Pix, Kidspiration,* and *Photo Kit Junior*).

Overview of ACTTT procedures

ACTTT began December 1, 2003, and used the spring 2004 semester at Westview to pilot test data collection instruments and procedures and to begin testing technology-based activities. During the summer of 2004, data collection instruments were revised, treatment teachers were trained so they would be familiar with the software applications and the technology tools ACTTT would use in their classrooms, and technology-based activities were prepared for testing in the fall. The project's first full school year was the 2004-05 school year.

Frequency of visits. Each year ACTTT staff began making regular visits to treatment classrooms in mid-September. Their visits concluded by mid-to-late April. To accomplish all the tasks to meet project goals, ACTTT staff adhered to a strict schedule, disrupted only by school closings, field trips (each class got one each year), holidays, and school breaks (i.e., Thanksgiving week, Winter Break from mid-December through the first week of January, and a week-long Spring Break) or by staff illness.

During the 2004-05 school year, two to three ACTTT staff made five trips to Canton's Westview school each week. Staff worked with each treatment K-2 class during its computer lab time. One ACTTT staff member was in the kindergarten classroom, working in small groups, 4 days a week. Staff also worked one full day with 2nd graders and one full day with 1st graders.

A typical week during the 2005-06 school year found ACTTT staff members in Canton four days a week. They worked in one Westview and one Lincoln classroom on Tuesdays, one Lincoln classroom on Wednesdays, one Lincoln classroom on Thursdays, and two Westview classrooms on Fridays. During this year, the Westview teachers incorporated some or parts of some of the ACTTT activities done in their classrooms the previous year. Most often the activities were adapted versions of the originals. Lincoln teachers were excited to be part of the ACTTT project, demonstrating a great deal of enthusiasm for the activities, offering suggestions for activities, and requesting that any visits that had to be cancelled due to weather or other unforeseen circumstances be rescheduled.

During the 2006-07 school year, staff were able to make their trips to Canton in 2 days. They were at Lincoln school on Tuesdays and at Eastview school on Fridays. Once each quarter they returned to Westview to conduct activities and consult with teachers to discuss what technology activities were being used in their classrooms, how the technology was being integrated, and how successful the

activities were. Lincoln teachers' interest in the project continued, and ACTTT staff worked with them to implement their ideas for integrating technology into their curriculum.

Teacher participation. ACTTT's success hinged on treatment teachers' willingness to cooperate, participate, and allow their students to experiment with the technology ACTTT used. Teachers had to learn new ways of doing things, implement new ideas, and become risk takers. ACTTT was fortunate in its choice of sites and teachers. Without their cooperation the project could not have had the success it had.

During the first year at Westview (2004-05), the teachers let ACTTT staff initiate most of the activities. The teachers were totally cooperative and always ready to give every activity a try. As time passed, they also began offering suggestions about better approaches. It was in their classrooms that activities were first tested and revised. As their years of participation increased, Westview teachers became more independent and selected activities to use from among those ACTTT offered. The ProScope digital microscope was a popular tool for investigation that was used in several curriculum activities. The kindergarten teacher recognized the value of this tool and was determined to purchase one for her classroom, even at her own expense.

Lincoln treatment teachers were excited about technology integration and eager to participate. They worked with ACTTT during the 2005-06 and 2006-07 school years to coordinate activities, often suggesting specific ideas for what they'd like to do. During ACTTT's second year with them, the teachers had ideas for activities and needed ACTTT staff to create a template, review websites, guide them to learn new software or a new process, to suggest software that they might use, or to furnish technology tools for an activity. During the 2006-07 year, the Lincoln kindergarten and first grade teachers developed a cooperative and collaborative project for their children. They used an activity that had been done during the previous year in both classes. Their idea was that the first grade children, who had done the activity as kindergartners, would pair up with a kindergartner and serve as the guide for the project. Digital cameras, digital microscopes, and laptops were used in each group. The first graders demonstrated the use of the devices and helped the kindergartners during the process. They offered instructions and encouragement in the use of the equipment, helped download photographs, and assisted with word processing. The resulting "guess what this is" book included magnified images captured with a digital microscope, a picture of the same object taken with a digital camera, and text on each page. The first graders demonstrated considerable expertise during the process. The production of the book led to yet another activity for the first graders. Since they had

displayed their ability to talk through a process, it was decided that they could work together with a partner, select a topic they knew about, were familiar with or would like to learn about, and then produce a podcast showcasing their expertise or knowledge. The results of their efforts can be seen at http://www.wiu.edu/thecenter/acttt/products/podcasts/

Eastview treatment teachers (2006-07) were not as skilled using the technology as either the Westview or Lincoln teachers were. However, they saw value in the activities and were interested in trying the technology and learning to use it to support the curriculum. Together, they and the ACTTT staff discussed their plans and curriculum. ACTTT staff then suggested technology-based activities to complement curricular goals.

By the time the project moved to Eastview in the fall of 2006, the activities had been tested, revised if needed and retested. During the 2006-07 school year at Eastview and Lincoln, the activities were perfected. For example, the Eastview teachers redesigned an existing activity so it involved both the kindergarten and first grade classes. This activity incorporating riddles took on new life, with first graders writing the riddles and kindergarten children providing the answers. Using the book option in *Photo Kit Junior,* the first graders wrote a riddle on one page, set up the following page with a variation of the phrase "Kindergarten Answer" and the kindergartners added their answer to that page, doing their own keyboarding or narrating their answers for an adult to enter.

Technology equipment. While all three schools had basic technologies—a computer lab and at least one computer and printer in each classroom—ACTTT introduced teachers to using digital video cameras, digital cameras, and digital microscopes. Equipment was purchased, loaned to each school to use during ACTTT activities, and rotated among schools, depending on which activities were being used. ACTTT staff demonstrated equipment and software use during formal and informal training sessions. Participating treatment teachers received funds each year through ACTTT for purchasing technology-related items for their classrooms. Most purchased digital cameras, printers, and printer ink. Some purchased jump drives. One purchased an external hard drive for storing children's work and photos. Another purchased a ProScope digital microscope.

Objective 2

2.0 Provide training on ACTTT model to site teachers.

Teachers in the treatment groups received both formal and informal training on the ACTTT model. Training took place at school facilities in Canton.

Training Teachers on the ACTTT Model

Formal training. Formal training sessions took place during the school year and summers, with the majority of teachers opting for summer training. At their first training session, treatment teachers filled out the *ACTTT Skill Attainment Survey*, described on pages 17-18. During formal training sessions, teachers learned information related to the hardware and software ACTTT would use in their classrooms. They familiarized themselves with features of *Kid Pix Deluxe 4, Photo Kit Junior, iPhoto, Kidspiration 2,* and *iMovie*, practiced using digital cameras, and learned to use the ProScope microscope. Training sessions gave them time to brainstorm many ways they could implement technology to support the general curriculum. Although from different grade levels, teachers shared ideas with one another and built upon each other's suggestions.

Westview teachers' training during 2004-05 took place in the school's conference room. These sessions were conducted three times during the school year and focused on software and hardware children would use during the coming weeks. Release time provided by the administration and willingness of teachers to extend their days allowed time for teachers to know the software, become familiar with digital cameras and digital microscopes, and ask related questions. Training sessions offered adequate time to ask and answer questions concerning technology tools ACTTT planned to use, as well as opportunities to discuss curriculum and potential activities to support it.

During summer 2005 Westview treatment teachers participated in a refresher training to prepare and plan for the 2005-06 school year. ACTTT staff introduced new software that would be used and also trained teachers to use Palm Pilots to collect child data. That effort turned out to be futile. While teachers thought they would collect data using the Palms and really intended to do so, the reality was that they did not. Only one teacher attempted data collection using the Palm. She found it was just too difficult to manage that and also help the children.

Lincoln and Eastview treatment teachers received formal training during the summers of 2005 and 2006. A middle school computer lab served as a training site. During those trainings, scheduling for the coming school year was discussed, permissions for children and adults were reviewed, data collection was explained, and questions were asked and answered. The short list of software teachers

were familiar with was reviewed, and they were introduced to new titles such as *Kidspiration, iPhoto, Photo Kit Junior, iMovie, Garageband*, and *Classroom Photo Publisher*. Internet sites that could be used were also introduced. In addition, teachers familiarized themselves with the digital camera each would have in her classroom for children's use and experimented with the ProScope digital microscope.

Informal training. Informal training occurred on an "as needed" basis for all teachers. While after school was the most common time for additional training, some teachers preferred training a short time before the activity started. Because no two teachers in a building would be doing the same activity, informal training was specific and individualized for each teacher. In some cases, all that was needed was a quick refresher and that was best done prior to the beginning of an activity. When necessary, written instructions were provided with hands-on training.

Informal trainings occurred at the convenience of the teachers and dealt with components of the software that would be used during an activity. If teachers indicated familiarity with the software, further training was unnecessary. If, however, they were unfamiliar with the software, a brief training was conducted. Table 3 contains numbers of training activities, formal and informal, conducted at each school.

Table 3. Formal and Informal Training Events Conducted for Each School's Treatment Teachers

School	Year	Formal Training	Informal Training (individualized for each teacher)
Westview	2004-2005	3	18
	2005-2006	1	8
	2006-2007	0	0
Lincoln	2005-2006	1	18
	2006-2007	0	6
Eastview	2006-2007	1	13

Follow-up. Follow-up training was conducted either on-site as an informal training event or via email if teachers had questions for ACTTT staff when staff were not available in their classrooms. Email between staff and teachers occurred as activities were planned. Table 4 shows the numbers of emails between ACTTT staff and treatment teachers for each school year.

Table 4. Numbers of Emails Between ACTTT Staff and Treatment Teachers

School Year	Number of Email Messages
2004- 05	47
2005-06	118
2006-07	147

Objective 3

3.0 Collect data on participating children and teachers.

Data collection instruments for use in ACTTT were developed, tested, and revised. Instruments for teachers and children were based on International Society for Technology in Education (ISTE) standards

Measures

Child. The main source used to assess children's technology skills was *Technology Assessment Based on Standards* (*TABS)*, an observation instrument based on the K-12 standards developed from the ISTE (1998) and the Illinois Early Learning Standards (ISBE, 2002). The instrument was developed at the Center and tested during the first year of the project. At that time, it was a 45-item instrument containing six parts:

- Section I, Basic Operations and Concepts;
- Section II, Social, Ethical, and Human Issues;
- Section III, Technology Productivity Tools;
- Section IV, Technology Communication Tools;
- Section V, Technology Research Tools; and
- Section VI, Technology Problem-solving and Decision-making Tools.

Content validity was established since the *TABS* was based on the K-12 standards developed from the ISTE. *TABS* was tested and revised during ACTTT. Children in treatment and comparison classrooms were tested in the fall and spring of school years 2004-05, 2005-06, and 2006-07.

Children were rated with a Likert scale from 0 (opportunity not available to child) to 5 (child does independently). After the first year of use, revisions were made when the instrument was found to be ineffective. Revisions to the instrument included regrouping items so that the instrument became a 28-item instrument and revising the Likert scale from 0 (opportunity not available to child) to 3 (child does independently). In addition, a 4-page administration manual was added to the *TABS* to help prepare staff for administering the instrument.

Teachers. The main data source used to determine increases in teacher knowledge and skills was the *ACTTT Skill Attainment Survey*, which treatment and comparison teachers completed at the beginning and end of their participation. The 35-item survey is a self-report instrument designed to assess teachers' perceptions of their technology-related skills. Teachers ranked various technology skills on a scale from 1-5, with *1* meaning "I can’t do this" or "I do not know much about this" and *5*

meaning "I can perform all basic functions on my own and more advanced functions successfully." Items were based on the 2004 ISTE standards for K-12 teachers and related to:

- Basic Skills (e.g., word processing, databases, Email, web searches, etc.);
- File management and using operating systems;
- Incorporating technology into learning activities;
- Locating technology resources and evaluating for accuracy and suitability;
- Using technology that addresses content standards and diverse needs of students;
- Designing developmentally appropriate learning opportunities;
- Using technology to develop students' higher order skills and creativity;
- Applying technology in assessing student learning
- Using technology resources to collect and analyze data, interpret results, and communicate findings;
- Using technology resources to engage in professional development and lifelong learning;
- Applying technology to increase productivity;
- Promoting safe and healthy use of technology resources; and
- Facilitating equitable access to technology resources for all students.

Results from TABS

At the beginning and end of each participation cycle, ACTTT staff members collected *TABS* data for every treatment and comparison child (for whom there was permission). Because of *TABS*' complete revision, data was analyzed only for Years 2 – 4 (school years 2004-05, 2005-06, and 2006-07). During those 3 years, ACTTT staff collected data for 363 children in the treatment group and 220 children in the comparison group. However, the data reported in the analyses described below are based upon smaller sample sizes, for two reasons. First, ACTTT staff members were unable to obtain complete data sets on all children; some children were only available for part of the study (i.e., they left the school before the end of the school year or they came to the school after the pretest administration). In addition, ACTTT staff struggled throughout the entire study to create a testing situation where children would have the opportunity to engage in all of the technology tasks/skills assessed by the *TABS*. For example, children had no opportunity to complete the tasks on the pretest or the posttest for *TABS* Items 23-28 (Sections IV, V, and VI). Staff members were constrained by the time teachers would allow for testing and by the technology available at the school. Sample sizes, which are reported for every analysis, reflect these constraints. The 22 *TABS* items that were analyzed and are reported here are listed in Table 5.

Table 5. TABS Items 1 – 22

Section I. Basic Operations and Concepts	
Item 1	Initiates process for launching software application
Item 2	**Launches a software application**
Item 3	**Navigates a software program**
Item 4	Uses input device(s) effectively
Item 5	Saves document
Item 6	Executes print command
Item 7	**Troubleshoots hardware and/or software problems**
Item 8	Exits the program
Item 9	Logs out or removes C-ROM from drive
Section II. Social, Ethical, and Human Issues	
Item 10	Handles equipment and software responsively
Item 11	Takes turns with peer(s) when using technology
Item 12	**Shares ideas with peer(s) when using technology**
Item 13	**Verbally assists a peer with a program or device**
Item 14	**Physically assists a peer with a program or device**
Item 15	**Works collaboratively with peers when using technology**
Item 16	**Expresses enthusiasm when using technology**
Item 17	Questions peer about an activity when using technology
Item 18	Asks peer or adult for help with a technology problem or process
Item 19	**Explains a process to a peer or adult when using technology**
Section III. Technology Productivity Tools	
Item 20	Productivity software was used for (choose one): mapping concepts, drawing, writing, illustrating a story. authoring a story, not applicable
Item 21	Hardware devices used included (choose all that apply): digital camera, digital video camera, scanner, microphone, printer, MIDI keyboard, graphics tablet, not applicable
Item 22	Connects productivity hardware devices to the computer

To determine if there were significant differences in children's technology skills prior to the implementation of ACTTT, an independent samples t-test (comparing treatment to comparison children) was computed for each item on the measure. The results of these analyses indicated an advantage for children in comparison classrooms (at a significant level) for two items. In addition, for item 19, *Explains a process to peer or adult when using technology*, (t = -3.274, df = 374, p = .001), children in the treatment classrooms scored higher (M = 2.04) compared to children in the comparison classrooms (M = 1.70). Overall, these results suggest the two samples were relatively similar prior to the intervention.

To determine if there were significant differences in children's technology skills after the implementation of ACTTT, an independent samples t-test (comparing treatment to comparison children) was computed for each item on the measure. The results of these analyses indicated significant differences for 9 of the 22 items. These items are boldfaced in Tables 5 and 6. Results show that *by posttest, children in treatment classrooms were outperforming children in comparison*

classrooms on almost half of the items. Table 6 compares the results for the 22 *TABS* items.

Table 6. Independent Samples T-Tests Comparing Children in Treatment and Comparison Classrooms

			Pretest				Posttest			
			M	*t*	*df*	*p*	*M*	*t*	*df*	*p*
Section I	Item 1	Treat. (*N* = 201)	2.45	2.370	335	.018	2.98	-1.382	335	.168
		Comp. (*N* = 136)	2.61				2.94			
	Item 2	**Treat. (*N* = 307)**	**2.45**	**2.288**	**491**	**.023**	**2.98**	**-4.320**	**491**	**.000**
		Comp. (*N* = 186)	**2.56**				**2.88**			
	Item 3	**Treat. (*N* = 307)**	**2.69**	**.665**	**492**	**.506**	**2.90**	**-3.065**	**492**	**.002**
		Comp. (*N* = 187)	**2.72**				**2.97**			
	Item 4	Treat. (*N* = 314)	2.85	1.420	509	.156	2.99	-.809	509	.419
		Comp. (*N* = 197)	2.89				2.98			
	Item 5	Treat. (*N* = 34)	2.06	-1.037	41	.306	2.06	-1.037	41	.306
		Comp. (*N* = 9)	1.78				1.78			
	Item 6	Treat. (*N* = 102)	1.97	-1.314	143	.191	2.58	.700	143	.485
		Comp. (*N* = 42)	1.81				2.65			
	Item 7	Treat. (*N* = 101)	1.76	1.344	150	.181	2.53	-3.127	150	.002
		Comp. (*N* = 51)	1.90				2.12			
	Item 8	Treat. (*N* = 266)	2.39	1.533	441	.126	2.93	-1.677	441	.094
		Comp. (*N* = 177)	2.48				2.88			
	Item 9	Treat. (*N* = 126)	2.54	1.022	207	.308	2.90	-.110	207	.913
		Comp. (*N* = 83)	2.63				2.89			
Section II	Item 10	Treat. (*N* = 296)	2.94	-1.737	490	.083	2.99	-.748	490	.455
		Comp. (*N* = 196)	2.89				2.98			
	Item 11	Treat. (*N* = 17)	1.35	-.315	23	.756	1.35	-1.256	23	.222
		Comp. (*N* = 8)	1.25				1.00			
	Item 12	**Treat. (*N* = 286)**	**2.64**	**-.568**	**449**	**.570**	**2.83**	**-2.943**	**449**	**.003**
		Comp. (*N* = 165)	**2.59**				**2.64**			
	Item 13	**Treat. (*N* = 247)**	**2.12**	**-.722**	**402**	**.471**	**2.41**	**-3.994**	**402**	**.000**
		Comp. (*N* = 157)	**2.04**				**2.03**			
	Item 14	**Treat. (*N* = 205)**	**1.59**	**-1.233**	**341**	**.210**	**2.08**	**-5.362**	**341**	**.000**
		Comp. (*N* = 138)	**1.46**				**1.52**			
	Item 15	**Treat. (*N* = 81)**	**2.28**	**-.090**	**120**	**.928**	**2.37**	**-2.297**	**120**	**.023**
		Comp. (*N* = 41)	**2.27**				**1.95**			
	Item 16	**Treat. (*N* = 285)**	**2.49**	**-.934**	**446**	**.351**	**2.73**	**-4.585**	**446**	**.000**
		Comp. (*N* = 163)	**2.41**				**2.38**			
	Item 17	Treat. (*N* = 257)	1.96	-1.641	418	.102	2.23	-.557	418	.578
		Comp. (*N* = 163)	1.80				2.17			
	Item 18	Treat. (*N* = 244)	2.46	-1.116	398	.265	2.39	-.807	398	.420
		Comp. (*N* = 156)	2.36				2.31			
	Item 19	**Treat. (*N* = 238)**	**2.04**	**-3.274**	**374**	**.001**	**2.30**	**-5.443**	**374**	**.000**
		Comp. (*N* = 138)	**1.70**				**1.75**			
Section III	Item 20	Treat. (*N* = 214)	2.82	-1.000	339	.318	2.97	-1.190	339	.235
		Comp. (*N* = 127)	2.77				2.94			
	Item 21	Treat. (*N* = 24)	2.08	1.272	31	.213	2.71	1.064	31	.296
		Comp. (*N* = 9)	2.33				2.89			
	Item 22	Treat. (*N* = 14)	1.86	-1.528	14	.149	1.86	-1.528	14	.149
		Comp. (*N* = 2)	1.00				1.00			

Note: Children had no opportunity to complete the tasks on the pretest or the posttest for TABS Items 23-28 (Sections IV, V, and VI).

Target*: By post-test, 80% of all children in the treatment group will increase their TABS score.*

When this Target was created, ACTTT staff had not anticipated the number of children who would have no opportunity to complete one or more tasks on the *TABS*. With so many children who had no opportunity to demonstrate a skill, it became clear that the data was skewed. Furthermore, this Target assumed an increase meant more skills, but in fact this was not always the case because students who could do something independently at pretest would be unable to show an increase at posttest because they had already reached the maximum score. Therefore, it seemed more realistic and valuable to look at how the students progressed towards independence.

To determine how much progress children in the treatment classrooms made towards independence, a crosstabs analysis was run comparing the number of children for each group at pretest to the number of children for each group at posttest. As Table 7 reveals, children showed improvement (i.e., more children were able to complete the task independently and fewer children were unable to do the task or needed assistance) for 18 of the 22 items. For several of the items, twice as many children were able to complete the task at posttest. See Table 5, page 19, for a description of each item.

Table 7. Pre- to Posttest Comparison of Number of Children in Treatment Classrooms Who Scored at Each of the Three TABS Levels

	N	Pretest			Posttest		
		Unable to do	Able to do with assistance	Able to do independently	Unable to do	Able to do with assistance	Able to do independently
Item 1	201	8	94	99	2	1	198
Item 2	307	8	153	146	2	3	302
Item 3	307	8	79	220	3	3	301
Item 4	314	0	48	266	1	1	312
Item 5	34	7	18	9	7	18	9
Item 6	102	25	55	22	4	35	63
Item 7	101	34	57	10	17	13	71
Item 8	266	13	135	118	2	14	250
Item 9	126	10	38	78	1	11	114
Item 10	296	6	5	285	1	1	294
Item 11	17	14	0	3	14	0	3
Item 12	286	47	10	229	24	2	260
Item 13	247	105	8	134	71	4	172
Item 14	205	143	4	58	93	2	110
Item 15	81	22	14	45	25	1	55
Item 16	285	70	5	210	38	1	246
Item 17	257	130	8	119	96	7	154
Item 18	244	59	14	171	70	9	165
Item 19	238	110	8	120	82	3	153
Item 20	214	7	24	183	2	2	210
Item 21	24	0	22	2	0	7	17
Item 22	14	5	6	3	5	6	3

Note: For Items 23-28 on the *TABS*, children had no opportunity to complete the tasks on the pretest or the posttest.

Target*: By post-test, 75% of kindergarten children in the treatment group will be able to do 6 of the 9 TABS section 1 items independently.*

As pointed out with the previous Target, ACTTT staff had not anticipated the number of children who would have no opportunity to complete a task and who would, therefore, have an inaccurate Section I score. In order to determine whether this Target was met, each of the nine Section I items was analyzed separately. A crosstabs analysis was run comparing children from the three grade levels (see information for first and second grade children under the Targets below) for each group at posttest. As Table 8 reveals, the 75% threshold for kindergarten children completing the task independently was met for 6 of the 9 items. This meets the target. In fact, for all but one of the six items, more than 90% of the students reached independence.

Table 8. Percentage of Kindergarten Children for Section I of the Post TABS

	N	Child unable to do task	Child able to do task with assistance	Child able to do task independently
Item 1	71	0% (0)	2.8% (2)	97.2% (69)
Item 2	104	0% (0)	1.0% (1)	99.0% (103)
Item 3	104	0% (0)	1.9% (2)	98.1% (102)
Item 4	103	0% (0)	0% (0)	100% (103)
Item 5	8	100% (8)	0% (0)	0% (0)
Item 6	93	20.4% (19)	29.0% (27)	50.5% (47)
Item 7	54	42.6% (23)	5.6% (3)	51.9% (28)
Item 8	89	1.1% (1)	6.7% (6)	92.1% (82)
Item 9	59	3.4% (2)	13.6% (8)	83.1% (49)

Target*: By post-test, 80% of first grade children in the treatment group will be able to do 7 of the 9 TABS Section I items independently.*

Table 9 reveals that the 80% threshold for first grade children completing the task independently was met for 6 of the 9 items. While this falls just short of the Target, it should be noted that two additional items were above 50% and one of those items (Item 7) was approaching the 80% threshold. Furthermore, with Item 5 having so many children with no opportunity to complete the task, it is difficult to determine if and how well children can actually accomplish this task on their own.

Table 9. Percentage of First Grade Children for Section I of the Post TABS

	N	Child unable to do task	Child able to do task with assistance	Child able to do task independently
Item 1	66	3.0% (2)	0% (0)	97.0% (64)
Item 2	107	1.9% (2)	.9% (1)	97.2% (104)
Item 3	107	2.8% (3)	0% (0)	97.2% (104)
Item 4	107	.9% (1)	.9% (1)	98.1% (105)
Item 5	12	0% (0)	58.3% (7)	41.7% (5)
Item 6	93	21.5% (20)	17.2% (16)	61.3% (57)
Item 7	58	17.2% (10)	6.9% (4)	75.9% (44)
Item 8	87	1.1% (1)	3.4% (3)	95.4% (83)
Item 9	65	3.1% (2)	9.2% (6)	87.7% (57)

Target*: By post-test, 85% of second grade children in the treatment group will be able to do 7 of the 9 TABS Section I items independently.*

Table 10 reveals that the 85% threshold for second grade children completing the task independently was met for 6 of the 9 items. These results fall just short of the Target. While Item 6 approaches the 85% threshold at 71%, the other two items fall below 50%. However, these items also have very small sample sizes due to a lack of opportunity and thus may not be accurate reflections of the students' abilities.

Table 10. Percentage of Second Grade Children for Section I of the Post TABS

	N	Child unable to do task	Child able to do task with assistance	Child able to do task independently
Item 1	78	0% (0)	1.3% (1)	98.7% (77)
Item 2	111	0% (0)	2.7% (3)	97.3% (108)
Item 3	111	0% (0)	1.8% (2)	98.2% (109)
Item 4	111	0% (0)	0% (0)	100% (111)
Item 5	16	6.3% (1)	68.8% (11)	25.0% (4)
Item 6	100	8.0% (8)	21.0% (21)	71% (71)
Item 7	43	18.6% (8)	32.6% (14)	48.8% (21)
Item 8	109	.9% (1)	7.3% (8)	91.7% (100)
Item 9	70	0% (0)	2.9% (2)	97.1% (68)

Comments about Child Progress from Teacher Observations

To gain additional information about ACTTT's impact on children, teachers in the treatment group were asked how they thought ACTTT's technology activities impacted their students. Representative comments are listed below.

- *Computer activities helped the children connect to the real world. Taking a digital picture of a flower and talking about how the word 'flower' started with 'f' – made it more real. It wasn't just a picture or word in a text book.* (Kindergarten Teacher)

- *Children who are occasionally off task respond to the computer. The technology activities grasped their attention; it was something different than paper and pencil. Some children who were immature during other activities found a place when using technology.* (Kindergarten Teacher)
- *The technology activities enabled my children with disabilities to shine and increased their confidence. In other activities, children know who doesn't do well in class; they also know who is good at it. With the computer activities they are more equal.* (Kindergarten Teacher)
- *It's become part of the curriculum. Children get more involved. The children took pictures of each other doing an action. We then put together a slideshow on verbs. During our unit on Columbus, the children labeled and scanned pictures of the ships. We also went on a walk in the fall and the children took pictures of the colorful leaves and other things in nature. We came back and used the digital pictures to make a book related to their experience.* (First Grade Teacher)
- *Children gained a sense of empowerment at the computer.* (First Grade Teacher)
- *Children gained confidence in knowing how to work the computer and completing an activity.* (First Grade Teacher)
- *I've seen increased cooperation among the children, since many times they have to share computers because some of the computers in the lab don't work. Children ask each other for help. This leads to increased self-esteem for some of them.* (First Grade Teacher)
- *Children looked forward to computer time. Some children took leadership roles in the computer lab – especially children who don't shine in other areas.* (Second Grade Teacher)
- *Technology really brought Stephanie out of her shell. During first semester, she was one of those "invisible children" who always sat at the back of a group, who seldom spoke unless spoken to, and who never asked questions. At the computer, she rarely interacted with her classmates. Later in the year, she began jockeying for a position near the ACTTT staff, volunteering to be first to use the digital camera, and showing classmates how to find things in the Kid Pix software. One day she helped a classmate log on and then kept up a constant chatter while adding text to some digital photos.* (Second Grade Teacher)

Results from Teachers' *Skill Attainment Survey*

Target: 100% of treatment teachers will increase their *ACTTT Skill Attainment Survey* scores by May 2007.

As indicated on their exit surveys (See Item 1 in Table 13, page 28), all treatment teachers agreed or strongly agreed that their personal knowledge of and skill using technology increased as a result of participating in ACTTT. The results of their *ACTTT Skill Attainment Survey* scores support their belief.

Nine teachers served as treatment teachers and 11 teachers served as comparison teachers in the 4-year study. One comparison teacher retired; another opted out of the project; both were replaced. All treatment teachers completed their pre and post *ACTTT Skill Attainment Survey,* while only eight of the comparison teachers completed both surveys. Therefore, the following information is based upon 17 teachers.

To determine if there were significant differences in teachers' technology skills prior to the implementation of ACTTT, an independent samples t-test (comparing treatment to comparison teachers) was computed for each item on the measure. The results of this analysis indicated no significant differences at the .01 level for the 35 items compared. Three items were significant at the .05 level, all of which favored the comparison teachers. For item 9, related to *file management*, (t = 2.24, df = 17, p = .039), comparison teachers scored higher (M = 3.90) compared to treatment teachers (M = 2.56). For item 26, *using technology resources to collect and analyze data, interpret results, and communicate findings to improve instructional practice and maximize student learning* (t = 2.17, df = 17, p = .045), comparison teachers scored higher (M = 3.50) compared to treatment teachers (M = 2.22). For item 28, *using technology resources to engage in ongoing professional development and lifelong learning* (t = 2.36, df = 17, p = .03), comparison teachers scored higher (M = 4.00) compared to treatment teachers (M = 2.78). Overall, these results suggest the two samples were relatively similar prior to the intervention.

The maximum total score each teacher could receive was 175. On the pretest administration of the *ACTTT Skill Attainment Survey*, treatment teachers' total scores ranged from 55 to 157. On the posttest administration of the survey, treatment teachers' total scores ranged from 87 to 160. In comparing the difference scores (posttest-pretest score) for each treatment teacher, results revealed that all 9 teachers increased their *ACTTT Skill Attainment Survey* total scores. The increase ranged from 3 to 41. These results indicate the target was met.

At the end of the study, paired samples t-tests, comparing pretest scores to posttest scores, were calculated for both the treatment and comparison teachers to analyze changes over time. Table 11 provides descriptions of the items while Table 12 shows the results of these analyses. For treatment teachers, statistical significance was found for 19 of the 35 items as well as for the total score. Effect sizes ranged from .58 to 1.88. For comparison teachers, statistical significance was found for only two of the 35 items (Items 27 and 28) and was not found for the total score. These results reveal *greater change for treatment teachers* than for comparison teachers.

Table 11. Descriptions of 19 Items for which Statistical Significance was Found for Treatment Teachers

Item	Description
Item 5	Attach files to E-mail
Item 9	File Management (Finding, Sorting, Organizing)
Item 10	Troubleshooting Software Problems
Item 13	Technology Concepts
Item 15	Technology-enhanced Instructional Strategies
Item 16	Using Current Technology Research in Planning Strategies
Item 17	Locating Technology Resources and Evaluating for Accuracy and Suitability
Item 18	Planning for Management of Technology Resources
Item 19	Planning Strategies to Manage Student Learning in a Technology-enhanced Environment
Item 20	Using Technology that Addresses Content Standards and Student Technology Standards
Item 21	Using Technology that Addresses the Diverse Needs of Students
Item 22	Designing Developmentally Appropriate Learning Opportunities that Apply Technology-enhanced Instructional Strategies to Support the Diverse Needs of Learners
Item 23	Applying Technology to Empower Learners with Diverse Backgrounds
Item 25	Applying Technology in Assessing Student Learning of Subject Matter Using a Variety of Assessment Techniques
Item 27	Applying Multiple Methods of Evaluation to Determine Students' Appropriate Use of Technology Resources for Learning, Communication, and Productivity
Item 28	Using Technology Resources to Engage in Ongoing Professional Development and Lifelong Learning
Item 29	Evaluating and Reflecting on Professional Practice to Make Informed Decisions Regarding Use of Technology in Support of Student Learning
Item 31	Use Technology to Communicate and Collaborate with Peers, Parents, and the Larger Community in Order to Nurture Student Learning
Item 33	Identifying and Using Technology Resources that Affirm Diversity

Table 12. Posttest ACTTT Skill Attainment Survey Comparisons

		Pretest Mean	Posttest Mean	*t*	*p*	Effect Size	Confidence Interval
Total Score	Treatment	89.00	114.88	-6.286	.000	.97	(-.11, 1.95)
	Comparison	105.40	107.80	-.867	.435	.07	(-1.17, 1.31)
Item 5	Treatment	2.56	4.11	-3.500	.008	1.05	(.02, 1.98)
	Comparison	3.50	3.67	-1.000	.363	.09	(-1.05, 1.22)
Item 9	Treatment	2.56	3.67	-4.264	.003	.94	(-.07, 1.87)
	Comparison	4.00	4.14	-1.000	.356	.11	(-.94, 1.15)
Item 10	Treatment	1.56	2.22	-2.309	.050	.77	(-.22, 1.69)
	Comparison	2.33	2.67	-1.000	.363	.26	(-.89, 1.38)
Item 13	Treatment	2.78	3.89	-3.592	.007	1.17	(.12, 2.11)
	Comparison	3.00	3.57	-1.333	.231	.41	(-.68, 1.43)
Item 15	Treatment	2.44	3.78	-4.00	.004	1.35	(.27, 2.30)
	Comparison	2.71	3.14	-2.121	.078	.39	(-.69, 1.42)
Item 16	Treatment	2.11	3.22	-4.264	.003	1.26	(.20, 2.20)
	Comparison	3.14	3.00	.548	.604	-.22	(-1.25, .85)
Item 17	Treatment	2.22	3.33	-5.547	.001	1.88	(.7, 2.88)
	Comparison	3.57	3.14	2.121	.078	-.51	(-1.53, .59)
Item 18	Treatment	2.89	3.56	-2.309	.050	.58	(-.38, 1.50)
	Comparison	3.00	3.29	-1.549	.172	.30	(-.78, 1.33)
Item 19	Treatment	2.44	3.56	-4.264	.003	1.11	(.07, 2.04)
	Comparison	3.14	3.43	-1.000	.356	.40	(-.61, 1.38)
Item 20	Treatment	2.44	3.33	-3.411	.009	.88	(-.12, 1.80)
	Comparison	3.00	2.71	1.549	.172	-.23	(-1.26, .84)
Item 21	Treatment	2.67	3.33	-2.309	.050	.62	(-.35, 1.54)
	Comparison	2.86	2.57	1.549	.172	-.26	(-1.30, .81)
Item 22	Treatment	2.22	3.33	-4.264	.003	1.21	(.15, 2.14)
	Comparison	2.86	3.00	-.548	.604	.10	(-.95, 1.14)
Item 23	Treatment	2.22	3.11	-2.874	.021	.84	(-.16, 1.76)
	Comparison	2.71	2.71	.000	1.00	0	(-1.05, 1.05)
Item 25	Treatment	2.33	3.44	-3.592	.007	.98	(-.04, 1.91)
	Comparison	3.14	3.00	1.000	.356	-.13	(-1.17, .93)
Item 27	Treatment	2.00	2.67	-2.309	.050	.70	(-.28, 1.62)
	Comparison	2.29	3.00	-2.500	.047	.67	(-.45, 1.70)
Item 28	Treatment	2.22	2.89	-2.828	.022	.82	(-.18, 1.74)
	Comparison	4.00	3.00	2.646	.038	-1.09	(-2.13, .10)
Item 29	Treatment	2.56	3.56	-4.243	.003	.77	(-.22, 1.69)
	Comparison	3.86	3.43	1.441	.200	-.42	(-1.45, .67)
Item 31	Treatment	3.25	4.38	-3.211	.015	1.38	(.23, 2.38)
	Comparison	3.71	4.00	-.795	.457	.23	(-.84, 1.26)
Item 33	Treatment	1.75	2.63	-3.862	.006	.68	(-.36, 1.65)
	Comparison	2.29	2.14	.354	.736	-.12	(-1.16, .94)

Teacher exit surveys. Exit surveys with the nine treatment teachers and three principals from the participating Canton schools indicated that all teachers and all principals saw positive results from the ACTTT model. Table 13 shows teachers' responses.

Table 13. Results from ACTTT's 5-Item Teacher Exit Survey

Item	Strongly Agree	Agree	Neutral
1. My personal knowledge of and skill using technology has increased as a result of participating in the ACTTT project	6 (67%)	3 (33%)	
2. Project personnel have responded to my needs concerning the use of technology tools to support and enhance the curriculum.	7 (78%)	2 (22%)	
3. The ACTTT activities are coordinated with classroom events and aligned with the curriculum.	8 (89%)		1 (11%)
4. As a result of participating in the project, children in my class are able to use a variety of technology tools to access and participate in the curriculum.	6 (67%)	3 (33%)	
5. All children in my class, including those with disabilities, have benefited from the ACTTT activities.	7 (78%)	2 (22%)	

When asked to comment on their experiences with ACTTT, teachers wrote:

- *This has been a wonderful experience for me and my students! I feel very privileged to be involved in this project.*
- *All of the projects we've done have integrated technology into my curriculum and have helped educate my students in a fun and exciting way.*
- *I feel this project is great. [ACTTT staff] are a wonderful group. They are very willing to help and also willing to teach me.*
- *The kids learn a great deal about technology from this program.*
- *It has been a wonderful opportunity to enhance technology skills at my level.*
- *ACTTT staff have been an asset to our program in so many ways. They were informative, helpful, and patient.*

One kindergarten teacher became so confident in her skill using GarageBand that she co-presented a hands-on workshop on podcasting with an ACTTT staff member. Her excitement and positive attitude about technology tools in the classroom and the outcomes she saw when children engaged in the podcast activity helped convince workshop attendees that they and their students could also have similar results.

The Westview, Lincoln, and Eastview principals were asked to respond to a 4-item exit survey. Each of the three strongly agreed with each survey item: (1) Participation in the ACTTT project has

increased the teachers' knowledge of and skills using technology tools. (2) The children involved in the project, including those with disabilities, have benefited from the ACTTT activities, (3) The ACTTT activities are designed to address and meet state learning standards. (4) Overall, participation in ACTTT has been a positive experience for the students, teachers, and the school.

Objective 4

4.0 Provide information to families.

Families received information about ACTTT from a variety of sources. Perhaps the most effective was that children's products resulting from ACTTT activities were sent home.

Awareness Activities Targeting Families

Each fall, ACTTT staff created a newsletter and gave copies to each treatment teacher to send home with the children in her classroom. Newsletters included pictures of children using technology tools, information about the ACTTT project and staff members who would be working in the classroom, brief descriptions of technology activities children had participated in, and an overview of some of the new skills learned as a result of those activities.

One kindergarten teacher included ACTTT information in every classroom newsletter she sent home during the year. A few brief sentences kept families aware of children's technology activities. Examples included,

- *The children have been taking digital pictures and typing sentences using the keyboard. They have also explored many objects and insects up close with the use of a digital microscope.*
- *We will be making a class alphabet book…children will be taking the pictures, downloading the picture to the book, and typing the caption. They have learned so much this year!*

Another teacher had her own website. She added a link to the ACTTT website to help inform families about the project. The ACTTT website contains examples of children's work and classroom projects supported by technology tools.

During the 2006-07 school year, a .mac account was purchased and a website created that showcased children's projects. Family members who lived at a distance or who were deployed accessed the site to view children's work. In the 8 months the site was active, it received 342 hits.

Awareness of classroom technology activities was high among treatment families. Throughout the school year, all computer-generated books, movies, and podcasts children created using technology tools were either printed or burned to CDs or DVDs and sent home to share with family members. Children were able to print results of their Internet fact-finding searches (i.e., the Internet Safari, Black History Research Project, and Penguin Quest) and take the printouts home to share with their families.

Family Surveys

In May 2005, 69 *Family Surveys* were sent to homes of children in the treatment groups. The surveys contained 12 items ranging from questions about how families received information from the school to types of technology the children used at home to choices of workshops in which families were interested in participating. Only seven surveys (14%) were returned. All seven respondents said they received information about school from newsletters, six said from teacher notes, and four said from children. Computers were available in six (86%) of the seven homes, and children used them for both educational and entertainment game playing. Computer access was via mouse and keyboard in all cases. In addition to using computers, children also used the Leap Pad (43%), video game consoles (43%), and handheld game players (71%). Four respondents (57%) were interested in attending technology workshops related to curricular areas (e.g., reading, math, science, art) while only two (29%) were interested in workshops related to digital cameras or scanners.

During the summer 2005, ACTTT staff revised the *Family Survey,* shortening it to only five questions. The revision was done for two reasons: (1) to focus on items of particular interest to ACTTT staff and (2) to make responding less of a chore for families. The surveys were sent to 75 families with children in the treatment groups at Lincoln School in early fall 2005. Return rates continued to be disappointing, with only 16 families (21%) returning the surveys, 8 each from the kindergarten and first grade classrooms and none from the second grade classroom. In spite of the low return rate, results were encouraging. Fifteen (94%) reported their children talked at home about the computers and other technologies used at school, and eight (50%) respondents reported their children talked about using a digital camera and creating books with the resulting pictures. Fifteen (94%) reported having computers at home. All 15 said their children used it to play games. Three (19%) said their children used the computer to send and receive email. Only one parent reported a child using the computer to do school work. An open-ended question asking parents to describe ways their children benefited from using computers at home or at school yielded a wide variety of responses. Six (38%) said it enhanced educational opportunities by helping children recognize shapes, numbers, colors, pattern, and letters. Three (19%) said it helped children understand time, money, math, reading, phonics, and spelling. Three (19%) said the technology led to greater eye-hand coordination; three (19%) said it was an outlet for artwork and creativity; and three (19%) referred to improved thinking skills, memory, and problem solving skills. One mother commented that she believed the computer had made her child more self-

sufficient. Another wrote that it was more likely for her first grade son to "*sit at a computer and write out sentences than to [write] on a piece of paper*."

Objective 5

5.0 Develop ACTTT products based on tested classroom technology-based activities.

ACTTT's primary products, discussed in this section, were two DVD's, one containing the ACTTT Curriculum and the other providing an overview and demonstration of ACTTT's work and children's products. Other ACTTT products include its website and a satellite television broadcast. Both were used for dissemination purposes and are described on pages 35-36.

The ACTTT Curriculum on DVD

ACTTT staff made a concerted effort to create interesting and unique technology-based activities that were aligned with the K-2 curricula and supported by learning standards. By the end of the project, the ACTTT curriculum contained 33 activities. Each of the 33 activities was tested and demonstrated success in one or more of the treatment classrooms between January 2004 and May 2007.

Interestingly, no activity tested was a failure. Each tested activity became part of the curriculum product. Input from the teachers and ACTTT staff's strict coordination with the classroom curriculum helped guarantee each activity's success. Discussions that followed activity testing most often resulted in minor (if any) changes. Often revisions were the result of children surprising both teachers and ACTTT staff by being able to do more on their own than anticipated.

The movie and podcast activities are examples of multiple processes that resulted in a single activity and a final product. For example, during the 2004-05 school year, one activity had children work as a class to establish an interview process. They then divided into small groups to determine interview questions. Once questions had been decided, each child performed an interview, served as a recorder for the interview, photographed the interviewee, and was interviewed him/herself. The recorded information and photographs were combined into a slideshow presentation. This activity was revised and became "Making a Movie About Friends."

The ACTTT target that **100% of ACTTT curriculum activities will be aligned with national education and technology standards** was met. All ACTTT curriculum activities are aligned with learning standards developed by the National Council of Teachers of English and the International Reading Association, the National Council for Teachers of Math, the National Research Council, the National Council for the Social Studies, the Consortium of National Arts Education Associations, and the International Society for Technology in Education.

Each ACTTT activity addresses multiple learning standards. For example, in an activity that focuses on position words, kindergarten children will *gain an understanding of spatial concepts* and *demonstrate their knowledge of position words*. When children use visual discrimination to create drawings that visually describe concept words, they *increase their communication skills, participate in society, solve problems,* and *use technology based problem-solving and decision-making tools*. When they use a software application to demonstrate their knowledge of position words they *apply knowledge and language skills* and *show their ability to choose and evaluate a range of subject matter, symbols, and ideas*. They also *use technology applications effectively and productively, interact and collaborate with their peers, and communicate ideas effectively*.

The ACTTT curriculum is available on a DVD. The following information is included in each activity: (1) an overall objective for the activity; (2) curricular areas of focus; (3) learner outcomes and learning standards (national learning standards, rather than Illinois state standards, were used to give the curriculum broader application for a national audience); (4) time needed to complete the activity; (5) software used during the activity and system requirements for that software; (6) supporting software that can be used to produce similar results; (7) at least two additional activities to extend learning opportunities, and (8) resource information.

ACTTT Overview DVD

A second DVD product was *ACTTT: Accessing Curriculum Through Technology Tools: An Integrated Approach to Learning*. This DVD contains nine chapters: Introduction, Documenting, Bookmaking, Developing Concepts, Discovery, Videotaping, Music Making, Podcasting, and Sharing Knowledge. Each chapter provides an overview of ACTTT's work in the classroom, shows children's products that resulted from the integration of technology tools into the classroom curriculum, and lets the viewer see first-hand the experiences children had during the ACTTT activities.

Product Availability

The ACTTT Curriculum DVD and ACTTT overview DVD are available from the Center for Best Practices in Early Childhood, Horrabin 32, Western Illinois University, Macomb, IL 61455. Sample activities from the curriculum are available on the ACTTT website.

Objective 6

6.0 Disseminate information about ACTTT

Dissemination modes used during the reporting period included awareness materials sent to families of children in treatment classrooms (see page 30), the ACTTT website, a satellite broadcast and resulting DVD, and conference presentations.

Website

ACTTT maintains a website found at <www.wiu.edu/thecenter/acttt>. Table 14 contains a list and explanations of the seven links on that website that explain ACTTT's work and provide examples of children's work.

Table 14. ACTTT Website Links and Descriptions

Curriculum Activities	Nine complete curriculum activities that were tested in ACTTT classrooms (3 kindergarten activities, 5 first and second grade activities, and 1 Second Grade activity)
Children Using Technology	Photos taken in the ACTTT classrooms as children used technology tools to access curriculum. Children made books and videotapes; collaborated with each other; documented learning; created art, wrote and edited reports; and used the Internet as a research tool.
Children's Products	Sample products in seven categories: (1) Books created by kindergartners and second graders using *Kid Pix Deluxe 4, PhotoKit Jr*., and *iPhoto;* (2) Movies created by all kindergartners and first graders; (3) a SlideShow created by kindergartners; (4) three examples of Concept Maps; (5) over 60 podcasts created by kindergartners, first and second graders; (6) Virtual Field Trips (grades 1 and 2); (7) Internet Research activities, showing examples of a penguin research project and concept mapping using *Kidspiration* (grades 1 and 2).
Children's Comments	Thank you notes from kindergartners following a technology activity
Teachers' Comments	Sample comments from teacher interviews regarding child outcomes and involvement in technology activities
Technology Tools	Links to descriptions of the tools ACTTT used and photos of children using those tools. Links to websites of companies that sell the equipment, including digital camera, digital microscope, switch-adapted digital camera, flatbed scanner, and printer.
Software Used in Activities	Links to descriptions of software most frequently used in ACTTT activities: *Garageband, Google Earth, iMovie, iPhoto, Keynote, Kid Pix, Kidspiration, and Photo Kit Jr*. Links to websites of companies that sell the software or that have the application available for download (e.g., GoogleEarth).

Satellite Broadcast

On January 15, 2004, *APPLES Video Magazine*, a 30-minute satellite television program sponsored by the Illinois State Board of Education's early childhood technical assistance project, STARNET, featured "Tools of the Trade: Early Childhood Software." ACTTT staff were involved in planning content,

developing the script, interviewing teachers, taping, narrating, and editing the program. The video can be viewed online at www.wiu.edu/users/starnetv/mov/apples01152004b.mov. Program topics included "Why Use Technology with Young Children," "What Software and Hardware Tools are Used," and "How Technology Helps Teachers Connect with Families." It is also available as a DVD and can be ordered from STARNET, 32 Horrabin Hall, Western Illinois University, Macomb, IL 61455. Ordering information is available at www.wiu.edu/starnet/products/product.php.

Conference Presentations

ACTTT staff presented at numerous state, regional, and national conferences as indicated in Table 15. ACTTT workshops and conference presentations were always well attended by teachers interested in learning how to integrate technology into their curriculum. A variety of topics were covered including evaluating software, using digital cameras and microscopes, choosing the right technology tools for the classroom, using assistive and adaptive technologies, creating books, creating movies and podcasts, and using *Kidspiration* for concept mapping. One ACTTT staff member collaborated with the CEO of APTE, a software company, for two national conference presentations, one at the Illinois No Child Left Behind Conference and one at the Florida Educational Technology Conference.

Table 15. ACTTT Conference Workshops and Presentations

Presentation Title	Conference	Date
New OS & Old Software – Now What?	Illinois Education and Technology Conference, Springfield, IL	Nov. 2008
Technology Integration in the Early Childhood Classroom	Illinois STARNET Regions I and III workshop, Peoria, IL	Sept. 2008
Software Tools for Young Children	Illinois STARNET Regions I and III Summer Camp, Macomb, IL	July 2008
Accessing the Curriculum Through Technology Tools: Using the Tools of Technology to Support and Enhance Learning for Children of Varying Abilities	NAEYC's 17th National Institute for Early Childhood Technology & Early Childhood Education, New Orleans, LA	June 2008
Technology in the Early Childhood Classroom: The Right Tools	Illinois STARNET Regions I and III workshop, Decatur, IL	Feb. 2008
Technology by Children, For Children, About Children	National Center for Technology Innovation Tech Expo, Washington, DC	Nov. 2007
Turn On Your iPod and Listen to the Children	Illinois Educational Technology Conference Springfield, IL	Nov. 2007
Software and Gadgets for Young Children	Illinois Sharing A Vision Conference Springfield, IL	Oct. 2007
A Digital Camera, Digital Microscope, and Photo Kit Junior – A Winning Combination	Illinois Sharing A Vision Conference Springfield, IL	Oct. 2007
Software Tools that are Right for Young Children	Illinois Sharing A Vision Conference Springfield, IL	Oct. 2007
Making A Podcast: It's Not As Hard As It Looks	Summer Experience Macomb, IL	July 2007

Using Technology to Support Learning for All Children	NECC Annual Conference Atlanta, GA	June 2007
What Teachers Do: Use Technology to Support and Enhance Learning for All Children	NAEYC Annual Conference Atlanta, GA	Nov. 2006
ACTTT on Technology	Illinois Educational Technology Conference Springfield, IL	Nov. 2006
What Do You Mean I Was Learning? This was Fun!	Early Childhood Conference River Forest, IL	Aug. 2006
Making Better Readers with Digital Photography	NECC Annual Conference San Diego, CA	July 2006
Children's Software Overview	Midwest AEYC Conference Omaha, NE	Apr. 2006
Kidspiration	Midwest AEYC Conference Omaha, NE	Apr. 2006
Children's Digital Options	Midwest AEYC Conference Omaha, NE	Apr. 2006
Software for Children with Disabilities	Midwest AEYC Conference Omaha, NE	Apr. 2006
Hands-on Book Creation	Midwest AEYC Conference Omaha, NE	Apr. 2006
You Mean I Was Learning? It Didn't Seem Like It	Florida Educational Technology Corporation Orlando, FL	Mar. 2006
You Mean I Was Learning? How Did that Happen?	Conference on the Young Years Osage Beach, MO	Mar. 2006
Accessing Curriculum Through Technology Tools: The Right Stuff	NAEYC Annual Conference Washington, DC	Dec. 2005
Technology Tools	Illinois Sharing A Vision Oakbrook, IL	Oct. 2005
Decisions, Decisions, Decisions: The Right Software	Midwest AEYC Annual Conference Minneapolis, MN	Apr. 2005
Assistive Technology=Active Engagement for All	Midwest AEYC Annual Conference Minneapolis, MN	Apr. 2005
Technology Tools: What Do I Need? How Do I Know I Need It? Where Do I Get It?	Conference on the Young Years Osage Beach, MO	Mar. 2005
Create Books with Technology Tools	24th IL ASCD Kindergarten Conference Arlington Heights, IL	Mar. 2005
Using Digital Photography As a Reading Tool	No Child Left Behind State Conference Chicago, IL	Feb. 2005
Accessing Curriculum Through Technology Tools	DEC 2004 Chicago, IL	Dec. 2004

Conclusions about the Success of ACTTT

On many levels, ACTTT was a success. All objectives were met. The products produced are of excellent quality. Teachers who participated in the treatment groups were amazed at what the young children could accomplish once they were comfortable with the technology. Those teachers gained new insights into technology integration, learned new skills, and acquired knowledge about using technology to support learning standards. The children were proud of their work and gained confidence in themselves. They garnered many new skills as a result of their participation, such as how to turn on and operate the digital cameras, video cameras, and microscope; how to download images and video and how to use them to create a product. They learned how to create music using *GarageBand*; how to use *Kidspiration* to build a concept map; and how to investigate the world using *GoogleEarth*. Working in pairs or teams, they honed their social and communication skills as they worked on various activities. They shared ideas and discussed pros and cons of each during the planning stages. They participated in planning, investigation, and problem-solving situations. They learned about organizing and concept mapping. They learned research skills by finding photos and information on the Internet. They used technology tools to create books, movies, and podcasts, participating in each step from planning to completion and gaining new knowledge and skills as they did so.

Unanticipated Difficulties

The unanticipated difficulties came not from the extensive travel staff did on a daily basis to get to the demonstration sites, not from creating and testing the activities, and not from working with children and teachers in multiple classrooms in multiple schools, but from data collection. Data collection activities were built into the site visitation schedule and strictly adhered to, but consumed an extraordinary amount of time and effort. Data were collected but the team struggled to find the right data to demonstrate effectiveness for the treatment group children. ACTTT tried to use instruments that were based on ISTE technology standards for K-12 and those for teachers. The child measure (*TABS*) just did not work well, as explained on page 18 of this report. The instrument was revised but yielded little to show the positive results staff could see taking place with their own eyes as children in the treatment groups learned new skills. In an attempt to use a measure with both treatment and comparison groups, the *TABS* fell short. To level the playing field for children in both treatment and comparison groups, *TABS* was used in a contrived computer lab situation with software (*KidPix*) that was familiar to children in both groups. *KidPix* was the *only* program used

the majority of the time by the comparison children while, in addition to using *KidPix*, the treatment children also experienced a rich variety of software and technology-based activities on and off the computer that contributed to team-building, planning, organizational, problem-solving, and communication skills. The *TABS* could not measure those skills in a lab situation. The frustrating thing is that we know the project made a difference in children's knowledge and skills, but we do not have the data to prove it. Links to the ACTTT website are included in this report so readers can see for themselves what treatment group children were able to do and the skills it took for them to accomplish what they accomplished.

Another barrier was that ACTTT had fewer staff than were needed to accomplish all we set out to accomplish. The staff included only one full-time staff member, and the brunt of the work fell on her, although she was supported by three part-time staff. On the road nearly every weekday, ACTTT staff, especially the full-time employee, had little office time to plan and develop activities or to simply re-group and make decisions about changes that might be needed, especially regarding data collection. Much of that was relegated to the summer months. Looking back, we believe that a helpful change would have been to cut the number of demonstration sites and focus time and attention on juggling only two sites instead of three.

Unanticipated Outcomes

An unanticipated outcome was the success of the children's podcasts. Children in all three grades displayed knowledge and expertise in their use of multiple technology tools when they created their podcasts. In addition, they worked as teams to develop, tape, and edit the podcasts, gaining team-building and other skills as they did so. One podcast created by three first-graders had great success. During its development the children demonstrated familiarity with using a digital camera, digital microscope, laptop computer, *Keynote,* and *GarageBand*. Once completed, the podcast, "Using the ProScope Digital Microscope" was uploaded to the ACTTT website (along with podcasts completed by other children in ACTTT treatment groups) and was later submitted to the Apple Learning Interchange. It was accepted and enjoyed a front-page placement for a number of months. The podcast continues to be part of that learning community and can be viewed at http://edcommunity.apple.com/ali/item.php?itemID=11003.

Morrie Reese, Apple's Senior Education Development Executive for Higher Education, used that "ProScope" podcast as an example of work done by young children. He included the podcast in

his presentation to groups of college and university faculty and staff supporting his position on the need to use and the ease of using podcasting in education.

Next, the podcast came to the attention of the Peter White, Director of Sales and Marketing for Bodelin Technologies, Inc., the company that sells the ProScope. He was so impressed that he phoned ACTTT staff saying, "*Oh My Gosh! That is just the most adorable podcast. Now, if we were to send a ProScopeHR on our dime would those students do another Podcast with the ProScopeHR and talk about how they use it on insects or flowers—something we could possibly use on our website. Is that possible?*"

ACTTT staff then contacted the children and their school principal to ask if they were interested. Two of the three children were available. They were excited to be asked and agreed to work on a new podcast. The school administrator obtained necessary permissions from parents and made arrangements with classroom teachers. All decisions related to photos, music, narrative, design elements, and organization were made by the children, who were now in second grade. The children's elementary school received its very own ProScopeHR digital microscope as a result of the children's podcast. The second podcast is available at http://www.bodelin.com/proscopehr/science_education/. Podcasts by other children involved in the ACTTT project are available at http://www.wiu.edu/thecenter/acttt/products/podcasts/. We think viewers will find all podcasts impressive.

A second unexpected outcome was collaboration with the APTE software company. An APTE software application used frequently by kindergarten, first, and second grade children was *Photo Kit Junior*. A conversation with Sally DeVincentis, APTE's CEO, about how ACTTT was using the software, caused her to realize that the software was being used in ways her developers had not envisioned. Excited about the new information, she requested that we collaborate on a presentation to let others know how the software was being used with young children in classroom settings. An ACTTT staff member and the APTE CEO presented at Illinois' No Child Left Behind conference and the Florida Education and Technology Conference. During both presentations, activities developed by ACTTT and the treatment classroom teachers' use of *Photo Kit Junior* were described and demonstrated.

References

Abbott, J., & Ryan, T. (1999). Constructing knowledge, reconstructing schooling. *Educational Leadership, 57*(3), 66-69.

Anderson, T. (1996). What in the world is constructivism? *Learning, 24*(5), 48-51.

Barclay K., Benelli, C., and Wolf, J. (1996). Me, me, wonderful me! *Social Studies and the Young Learner, 9*(1), 15-16; 26.

Barclay, K., & Walwer, L. (1992). Linking lyrics and literacy through song picture books. *Young Children, 47*(4), 76-84.

Behrmann, M., & Lahm, E. (1994). Computer applications in early childhood special education. In J. L. Wright & D. D. Shade, (Eds.), *Young children: Active learners in a technological age* (pp. 105 - 120). Washington, DC: National Association for the Education of Young Children.

Brett, A. (1997). Assistive and adaptive technology supporting competence and independence in young children with disabilities. *Dimensions of Early Childhood, 25* (3), 14-15, 18-20.

Bickart, T., & Pierrel, E. (1999). Technology learning in the K-3 classroom. *Principal, 78*(4), 19-20.

Bransford, J.D., Brown, A. L., & Cocking, R.R. (Eds.). (2000). *How people learn: Brain, mind, experience, and school*. Washington, DC: National Academy Press.

Brooker, L. (2003). Integrating new technologies in UK classrooms: Lessons for teachers from early years practitioners. *Childhood Education, 79*(5), 261-276.

Buckleitner, W. (1994). What's hot for the computer-using tot. *Technology and Learning, 14*(5), 18-27.

Castellani, J., & Jeffs, T. (2001). Emerging reading and writing strategies using technology. *Teaching Exceptional Children, 33*(5), 60-67.

Campbell, B. (1992). Multiple intelligences in action. *Childhood Education, 68*(4), 197-201.

Clements, D. H. (1999a). The effective use of computers with young children. In J. V. Copley (Ed.), *Mathematics in the early years*. Reston, VA: National Council for Teachers of Mathematics.

Clements, D. H. (1999b). Young children and technology. In *Dialogue on Early Childhood Science, Mathematics, and Technology Education*. Washington, DC: American Association for the Advancement of Science, Project 2061. Retrieved October 14, 2005, from the World Wide Web: www.project2061.org/publications/earlychild/online/experience/clements.htm

Clements, D. H. (January 2001). Mathematics in the preschool. *Teaching Children Mathematics, 7*(5), 270-275.

Clements, D. H., Nastasi, B. K., & Swaminathan, S. (1993). Young children and computers: Crossroads and directions from research. *Young Children, 48* (2), 56-64.

Davis, B. C., & Shade, D. D. (1999). Integrating technology into the early childhood classroom: The case of literacy learning. In D. D. Shade (Ed.), *Information Technology in Childhood Education Annual*. Norfolk: VA: Association for the Advancement of Computing in Education.

Derer, K., Polsgrove, L., & Rieth, H. (1996). A survey of assistive technology applications in schools and recommendations for practice. *Journal of Special Education Technology, 13*(2), 62-80.

Dever, M., & Hobbs, D. (2000). The learning spiral—Toward authentic instruction. *Kappa Delta Pi, 36*(3), 131-133.

Division for Early Childhood. (DEC) Task Force on Recommended Practices (1993). DEC recommended practices: Indicators of quality in programs for infants and young children with special needs and their families. Reston, VA: Author.

Driver, R. (1995). Constructivist approaches to science teaching. In L.P. Steffe & J. Gale, (Eds.), *Constructivism in education,* (pp. 385-400). Hillsdale, NJ: Lawrence Erlbaum Associates.

Godt, P., Hutinger, P., Robinson, L., & Schneider, C. (1999). A simple strategy to encourage emergent literacy in young children with disabilities. *TEACHING Exceptional Children, 32*(2), 38-44.

Gordon, A., & Brown, K. (Eds.). (1996). *Beginning and beyond: Foundations in early childhood education* (4th ed.). Albany, NY: Delmar.

Gurganus, S., Janas, M., & Schmitt, L. (1995). Science instruction: What special education teachers need to know and what roles they need to play. *Teaching Exceptional Children, 27*(4), 7-9.

Haugland, S. W. (1992). The effect of computer software on preschool children's developmental gains. *Journal of Computing in Childhood Education, 3*(1), 15-30.

Haugland, S. W. (2000). *Computers and young children*. ERIC Digest. Retrieved November 7, 2002, from http://www.askeric.org/plweb-cgi/obtain.pl

Higgins, K., & Boone, R. (1997). *Technology for students with learning disabilities: Educational applications*. Austin, TX: Pro-Ed.

Hohmann, M., & Weikart, D. (1995). *Educating young children: Active learning practices for preschool and child care programs*. Ypsilanti, MI: High/Scope Educational Research Foundation. (ERIC Document Reproduction Service No. 386 294)

Hutchinson, J. (1995, September). A multimethod analysis of knowledge use in social policy: Research use in decisions affecting the welfare of children. *Science Communications*, 90-106.

Hutinger, P. (1987). Computer-based learning for young children. In J. L. Roopnarine & J. E. Johnson (Eds.), *Approaches to early childhood education* (pp. 213-236). Columbus, OH: Charles E. Merill.

Hutinger, P. (1996a). Computer application in programs for young children with disabilities: Recurring themes. *Focus on Autism and Other Developmental Disabilities, 11*(2), 105-114.

Hutinger, P. (1996b, April). *Final report: Activating children through technology*. Macomb, IL: Macomb Projects, Western Illinois University. (ERIC Document Reproduction Service No. 395411)

Hutinger, P. (1998). *The expressive arts project: A final report*. Macomb, IL: Macomb Projects, Western Illinois University. (ERIC Document Reproduction Service No. 415646)

Hutinger, P. (1999). How interactive technology affects emergent literacy. *Children and Families, 18*(3), 82-83.

Hutinger, P., & Clark, L. (2000). TEChPLACEs: An Internet community for young children, their teachers, and their families. *Teaching Exceptional Children, 32*(4), 56-63).

Hutinger, P., Bell, C., Beard, M., Bond, J., Johanson, J., & Terry, C. (1998). *Final report: The early childhood emergent literacy technology research study*. Macomb, IL: Macomb Projects, Western Illinois University.

Hutinger, P., Bell, C., Johanson, J., & McGruder, K. (2002). *Final report: LitTECH Interactive Outreach*. Macomb, IL: Center for Best Practices in Early Childhood Education.

Hutinger, P., Betz, A., Johanson, J., & Clark, L. (2003). *A Final Report: Results from the Early Childhood Curriculum Support Predicting, Listening, Observing, and Recording—Integrating Technology (ECCSPLORe-IT) Model Development Project*. Macomb, IL: Center for Best Practices in Early Childhood. Available http://www.wiu.edu/thecenter/reports.php

Hutinger, P., Clark, L., & Johanson, J. (2001). *Final report: Technology in early childhood-planning and learning about community environments*. Macomb, IL: Center for Best Practices in Early Childhood Education.

Hutinger, P., & Johanson, J. (1998). Software for young children. In S. Lesar Judge and P. H. Parette (Eds.), *Assistive technology for young children with disabilities: A guide to providing family-centered services*. Cambridge, MA: Brookline.

Hutinger, P., & Johanson, J. (2000). Implementing and maintaining an effective early childhood comprehensive technology system. *Topics in Early Childhood Special Education, 20*(3), 159-173.

Hutinger, P., Johanson, J., Bond, J., Clark, L, & Robinson, L. (2003). *Replicating and maintaining an effective early childhood comprehensive technology system: A final report*. Macomb, IL: Center for Best Practices in Early Childhood. Available http://www.wiu.edu/thecenter/reports.php

Hutinger, P., Johanson, J., & Rippey, R. (2000). *Final report: Benefits of comprehensive technology system in an early childhood setting: Results of a three year study*. Macomb, IL: Center for Best Practices in Early Childhood Education.

Hutinger, P., Johanson, J., & Stoneburner, R. (1996). Assistive technology applications in educational programs of children with multiple disabilities: A case study report on the state of the practice. *Journal of Special Education Technology, 13*(1), 16-35.

Hutinger, P., Robinson, L., Schneider, C., & Johanson, J. (2002). *Final report: The early childhood interactive technology literacy curriculum project*. Macomb, IL: Center for Best Practices in Early Childhood Education.

Illinois State Board of Education. (2002). *Illinois early learning standards*. Springfield, IL: Illinois State Board of Education: Division of Early Childhood.

International Society for Technology in Education. (1998). *National education technology standards for students*. Eugene, OR: Author.

Jonassen, D. H. (2000). *Computers as mindtools for schools: Engaging in critical thinking* (2nd ed.). Upper Saddle River, NJ: Merrill.

Kamii, C., & Ewing, J. (1996). Basing teaching on Piaget's constructivism. *Childhood Education, 72*(5), 260-264.

Kataoka, J. C., & Lock, R. (1995). Whales and hermit crabs: Integrated programming and science. *Teaching Exceptional Children, 27*(4), 17-21.

Katz, L. G., & Chard, S. C. (2000). *Engaging children's minds: The project approach* (2nd ed.). Westport, CT: Ablex Publishing.

Lewis, R. (2000). Musings on technology and learning disabilities on the occasion of the new millennium. *Journal of Special Education Technology, 15*(2), 5-12.

Lewis, R., Ashton, T., Haapa, B., Kieley, C, & Fielden, C. (1998/1999). Improving the writing skills of students with learning disabilities. *Learning Disabilities: A Multidisciplinary Journal, 9*(3), 87-98.

Lewis, R., Graves, A., Ashton, T., & Kieley, C. (1998). Word processing tools for students with learning disabilities. *Learning Disabilities Research and Practice, 13*(2), 95-108.

Manzo, K. K. (January 2001). Forget math feud, take broader view, NRC panel urges. *Education Week*, *20*(20), 1, 12. Retrieved October 8, 2001, from http://edweek.com/ew_printstory.cfm?slug=20math.h20

National Association for the Education of Young Children. (1996). *Guidelines for preparation of early childhood professionals*. Washington, DC: Author.

Pappas, C., Kiefer, B., & Levstik, L. (1990). *An integrated language perspective in the elementary school*. New York: Longman.

Patton, J. R. (1995). Teaching science to students with special needs. *Teaching Exceptional Children, 27*(4), 4-6.

Pressman, H. (1999, November). *The impact of technology on learning in our schools: Where are we heading?* Paper presented at the meeting of AACTE's Creating the Future of Schools, Colleges, and Departments of Education in the Age of Technology: An Invitational Working Conference, Cupertino, CA.

Oliver, K. (2000). Methods for developing constructivist learning on the web. *Educational Technology, 40*(6), 5-18.

Rainer, J., Guyton, E., & Bowen, C. (2000, April). Constructivist pedagogy in primary classrooms. Paper presented at the Annual Conference on the American Educational Research Association, New Orleans, LA. (ERIC Document Reproduction Service No. ED 440 760)

Roser, N., Hoffman, J., and Farest, C. (1990). Language, literature, and at-risk children. *The Reading Teacher, 43* (8), 554-561.

Sandall, S., McLean, M. E., & Smith, B. J. (Eds.). (2000). *DEC recommended practices in early intervention/early childhood special education*. Reston, VA: Council for Exceptional Children.

Sawyer, W., & Sawyer, J. (1993). *Integrated language arts for emerging literacy*. Albany, NY: Delmar.

Short, V. M. (1991). Theoretical framework for preschool experiences. In B. Persky & L. H. Golubchick (Eds.), *Early childhood education* (2nd ed.). Lanham, MD: University Press of America®, Inc.

Sloane, M. W. (2000). Make the most of learning centers. *Dimensions of Early Childhood, 28*(1), 16-20.

von Glasersfeld, E. (1995). A constructivist approach to teaching. In L.P. Steffe, & J. Gale (Eds.), *Constructivism in education,* (pp. 3-15). Hillsdale, NJ: Lawrence Erlbaum Associates.

Wakefield, D. V. (Spring 2000). Math as a second language. *The Educational Forum, 64* (3), 272-279.

Wilson, B., & Lowry, M. (2000, Winter). Constructivist learning on the web. *New Directions for Adult and Continuing Education, 88,* 79-88.

Wood, E. & Bennett , N. (1999). Progression and continuity in early childhood education: Tensions and contradictions. *International Journal of Early Years Education, 7*(1), 5-16.

Wright, J., & Shade, D. (Eds.). (1994*). Young children: Active learners in a technological age*. Washington, DC: NAEYC.