Preschool Teacher Perceptions of Assistive Technology and Professional Development Responses

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Abstract: This study investigated the perspectives of teachers in an early childhood center concerning their thoughts and feelings about the implementation of a school wide assistive technology (AT) program designed to enhance emergent literacy skills for children identified as being at-risk or having special needs. Qualitative methodology was used to gain perspectives of all participants. Semi-structured interviews, observations in the classroom, and a self-assessment of AT knowledge and practice were used to collect data. Data were analyzed using a multiple coding approach resulting in identification of four major themes: (a) perceptions of technology, (b) perceived challenges to implementing technology, (c) perceptions of AT and literacy and (d) self-reported AT use. Discussion and recommendations focus on best practices of implementing school wide AT in early childhood settings.

Young children with disabilities have increasingly been placed in child care and preschool settings since the passage of the Individuals with Disabilities Education Act of 1997 (IDEA 97; National Early Childhood Technical Assistance Center, 2003). To serve these children appropriately in such settings, an individual education program (IEP) is developed for each child in which assistive technology (AT) devices [20 U. S. C. § 1401(1)] and services must be considered [20 U.S.C. 1401(2)]. Both devices and services can result in a range of developmental benefits for young children with disabilities (Drasgow, Yell, & Robinson, 2001; Mistreet, Lane, & Ruffino, 2005; National Association for the Education of Young Children [NAEYC], 1996; Reed & Bowser, 2005; Wiekle & Hadadian, 2003). However, the potential of AT to benefit these children is contingent on “thoughtful integration into the early childhood curriculum” (NAEYC, p. 3).

While IDEA 97 provides a clear requirement for ‘thoughtful’ consideration of AT in developing young children’s service plans, the No Child Left Behind Act of 2001 (NCLB) also provides additional demands for teachers by (a) requiring that children with disabilities be taught to the same standards as all children, and (b) holding schools accountable for student achievement. However, “taking full advantage of their rights to a high quality education requires support to learn in ways that meet their educational needs” (National Center for Technology Innovation, 2005, p. 3). AT affords many young children with disabilities with the necessary learning supports to learn and achieve, especially with regard to developing emergent literacy skills that provide the foundation for later success when entering public schools (Parette, Stoner, Watts, & Wojcik, 2006).

Use of technology to develop emergent literacy skills has been examined by numerous authorities (Beck, 2002; Pierce & Porter, 1996; Smedley et al., 1997; Scooter & Boss, 2002; Wright & Shade, 1994). In typical classrooms, early childhood teachers plan and implement an array of emergent literacy activities for chi-

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dren that emphasize oral language, experiences with print, storybook reading, and writing for different purposes (Beck; Donovan, Milewicz, & Smolkin, 2003; Van Scooter & Boss). Sadly, AT is infrequently used in many classrooms to support emerging literacy activities, and its potential to help develop important skills needed for later learning and success may be minimized. This is compounded by the fact that most early childhood education preservice programs still do not prepare teachers to be able to effectively consider AT during IEP development processes (Derer, Posgrove, & Reith, 1996; Lahm, 2003; Lesar, 1998; Mistreet et al., 2005; Parette, Peterson-Karlan, & Wojcik, 2005), nor do they rapidly integrate AT into their curricula (Zorfass & Rivero, 2005). The net result has been that (a) relatively few children receive AT in early intervention programs (RESNA Technical Assistance Project, as cited in Long, Huang, Woodbridge, Woolvert, & Minkel, 2003); (b) few professional publications discuss AT usage with young children (Edyburn, 2001, 2002, 2003); and (c) little is known about effective AT emergent literacy integration practices with early childhood populations.

Thus, it seems appropriate to ask the questions, “Why are teachers not considering and using AT for young children with disabilities?” and “What are the concerns that teachers have about AT?” Ashton (2005) noted that if negative perceptions or attitudes towards AT exist among practicing professionals, it is virtually an insurmountable task to change their mindsets. Ashton further observed that “Forcing teachers to learn something they perceive as unnecessary will prove a fruitless endeavor” (p. 236).

Exploring Early Childhood Teacher Needs

One project designed to address this need is the Making A Difference Using Assistive Technology (MDAT) Project, funded by the Illinois Children’s Healthcare Foundation in 2005 (Parette, Stoner, & Watts, 2005). The goal of this project was to develop an AT toolkit to enhance emerging literacy skills with preschool children who were at-risk or who had disabilities. However, the project involved the potential for substantive organization changes with regard to curricula approaches and professional development strategies used in schools. Research has indicated that when an organization is facing change there should be a systematic and deliberate process in place to ensure success and it is vital to involve those individuals affected by change in the initial planning process (Kotter, 1999). Similarly, attitudes of education professionals toward AT and its implementation in school programming has been reported to be a major challenge nationwide (SEAT Center, National Center for Technology Innovation, and Kansas University, 2005).

Consequently, before the MDAT Project could be implemented and an AT toolkit developed, it was imperative to examine teacher perceptions regarding technology and literacy to assist project staff in decision-making regarding effective professional development and subsequent intervention approaches. This preliminary work prior to project implementation was guided by the following research questions:

1. How do teachers of preschool children describe their perceptions AT?
2. How do preschool teachers describe their concerns about implementation of a school-wide AT program?
3. How do preschool teachers perceive AT for assisting with literacy skill development?
4. What are the preschool teachers’ experiences and self-reported uses of AT?

Method

Participants

Participants were nine teachers at a self-contained preschool facility in a Midwestern city. Four of the teachers were teaching children with identified disabilities and the remaining five taught children who were identified as being ‘at-risk.’ All teachers held state teaching certificates (see Table 1).

Research Design

The study employed qualitative strategies described by numerous researchers (e.g., Bogdan & Biklen, 1998; Leedy & Ormrod, 2001; Millan & Wergin, 2002). Specifically, qualitative research allowed the researchers to deeply
explore the perspectives and gain insight into the feelings, emotions, and thought processes of the participants (Creswell, 2002; Strauss & Corbin, 1998). The study of perspectives of teachers who were designated to participate in the implementation of a school-wide AT program lends itself to qualitative methodology precisely because it is a phenomenon about which little is known. Additionally, understanding the perspectives of teachers as users of the AT was deemed essential prior to the implementation of the AT program.

Interview questions were developed to address the research questions (Kvale, 1996) and semi-structured interviews lasting approximately a half-hour were conducted with all participants. Semi-structured interviews allowed the researchers to ask for clarification or additional information. (See Table 2 for a list of interview questions.) All interviews were audio-taped and transcribed verbatim to ensure accuracy.

The Early Language and Literacy Classroom Observation (ELLCO) Toolkit, (Smith, Dickinson, Sangeorge, & Anastasopoulos, 2002) was used to assess environmental variables related to language development and literacy in each of the teachers’ classrooms (i.e., morning classes for the 3-year-old students and afternoon classes for the 4-year-old students). The ELLCO has three distinct parts: the (a) Literacy Environment Checklist, (b) Classroom Observation and Teacher Interview, and (c) Literacy Activities Rating Scale.

Two researchers observed each classroom to determine the extent of the diversity of reading and writing materials and classroom layout. Next, interactions between teachers and students were observed during reading and writing instruction, use of technology, oral language use, and assessment strategies. Finally, student-teacher and student-student interactions were observed for the number of times and length of time for book reading and writing during classroom activities. Inter-rater

**TABLE 1**

**Teacher Demographics**

<table>
<thead>
<tr>
<th>Teacher</th>
<th>Education Level</th>
<th>Yrs Experience</th>
<th>Classroom</th>
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</thead>
<tbody>
<tr>
<td>Barbara</td>
<td>B.A.</td>
<td>10</td>
<td>At-risk</td>
</tr>
<tr>
<td>Carole</td>
<td>B.A.</td>
<td>17</td>
<td>At-risk</td>
</tr>
<tr>
<td>Donna</td>
<td>M.A.</td>
<td>12</td>
<td>Special needs</td>
</tr>
<tr>
<td>Ellen</td>
<td>B.A.</td>
<td>30</td>
<td>Special needs</td>
</tr>
<tr>
<td>Jane</td>
<td>B.A.</td>
<td>1</td>
<td>At-risk</td>
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<tr>
<td>Karen</td>
<td>B.A.</td>
<td>5</td>
<td>At-risk</td>
</tr>
<tr>
<td>Sara</td>
<td>B.A.</td>
<td>18</td>
<td>Special needs</td>
</tr>
<tr>
<td>Toni</td>
<td>M.A.</td>
<td>35</td>
<td>Special needs</td>
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<tr>
<td>Teri</td>
<td>B.A.</td>
<td>3</td>
<td>At-risk</td>
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</tbody>
</table>

1 All teachers hold state teaching certificates

**TABLE 2**

**Interview Questions**

1. Describe your classroom.
2. Describe the literacy activities in your classroom.
3. Can you tell me about your experiences with assistive technology?
4. Describe your involvement with AT.
5. Tell me about your feelings using assistive technology with your students.
6. What additional information would you like concerning assistive technology?
7. How do you think assistive technology can help your students?
reliability was conducted between the researchers on all three parts of the ELLCO.

Additionally, an Assistive Technology Self-Assessment Survey was delivered to participants in person, prior to classroom observations and interviews (see Table 3). The paper-pencil survey was developed using recommended best practices from the Division for Early Childhood (DEC) (Sandall, McLean, & Smith, 2000) for the application of technology in settings for young children who attend early intervention and early childhood special education programs. Content of the survey included the definition of assistive technology according to IDEA and 16 questions related to DEC’s recommended technology practices. The format of response options followed a five-point common rating scale focusing on agreement and disagreement (Fink, 1995).

Data Analysis

This study employed collective case study methodology (Stake, 2000), involving the study of more than one case in order to “investigate a phenomenon, population, or general condition” (p. 437). This approach assumes that investigating a number of cases will lead to better comprehension and better theorizing. Cross-case analysis was used to analyze each individual participant responses as a whole entity. A comparative analysis of all participant responses was then conducted which allowed researchers to see processes and outcomes across many participants, thereby developing a deeper understanding of the emerging phenomena through more powerful descriptions and explanations (Miles & Huberman, 1994).

After completion of the interviews, data were analyzed using a line by line multiple coding approach (Barbour, 2001). The researchers then met frequently as a group and developed categories based on their individual line-by-line coding. Disagreements about the categories were discussed, categories were refined, expanded, and/or deleted as needed, and concordance was reached (Barbour). The constant comparative method by which researchers continually returned to the data for analysis was used as an overall methodological framework (Charmaz, 2000). Three members of the research team (i.e., three faculty members in a Midwestern university’s Department of Special Education) analyzed the data. NVivo® 2.0, a data management software program, was used to manage the data (Richards, 2002).

Confirmability

Confirmability of the findings was achieved through three approaches: (a) triangulation (Creswell, 2002) of incidences that occurred across cases and confirmed through observations in the classroom, results of the ELLCO, and responses to an Assistive Technology Self-Assessment Survey; (b) respondent validation (Creswell, 2002), i.e., confirmation of graphic and textual findings presented to participants regarding the researchers’ understanding of observations; and (c) member checks (Janesick, 2000), or allowing participants and the school principal the opportunity to review and quotes used in this report. All participants confirmed the findings.

Findings

Four major themes emerged from the data analysis: (a) perceptions of technology, (b) perceived challenges to implementing technology, (c) perceptions of AT and literacy, and (d) self-reported AT use. Each of these themes is discussed in the following sections, with participant quotes supporting the findings (see Table 2).

Theme 1: AT Use

The use of AT was assessed by two means: observations and self-reports. Prior to the structured interviews conducted with teachers, observations were made by two of the researchers using the ELLCO. An Assistive Technology Self-Assessment Survey was also completed by each of the participants.

Observed AT use. Limited use of AT was observed in the classrooms identified as “at-risk” and, while there was more use of AT in the classrooms which had students with disabilities, not all classrooms used AT at the same level. The ELLCO instrument was used as an observation tool because it has a section that focuses on the use of AT in preschool
TABLE 3

Assistive Technology Self-Assessment

**Code Number:** ____  
**Date:** ____

*Directions:* Read the definition of AT and circle one number for each item.

Assistive technology (AT) is defined as “any item, piece of equipment, or product system, whether acquired commercially off the shelf, modified, or customized, that is used to increase, maintain, or improve functional capabilities of children with disabilities” (IDEA, 1997).

<table>
<thead>
<tr>
<th>Items</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>Not at all</th>
<th>Great Extent</th>
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<tbody>
<tr>
<td>1. I am confident in using assistive technology (AT) as a vehicle for more effectively serving children and families.</td>
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<td>2. I am confident in my ability to consider assistive technology applications to increase children’s ability to function and participate in diverse and less restrictive environments.</td>
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<td>3. I am confident in my ability to consider chronological age-appropriateness for children when selecting types of assistive technology in assessment and intervention.</td>
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<td>4. I am confident in my ability to consider developmentally appropriate practices for children when selecting types of assistive technology in assessment and intervention.</td>
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<td>5. I am confident in my ability to match assistive technology tools/devices to individual children’s capabilities and limitations.</td>
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<td>6. I am confident in my ability to consider the least intrusive, least intensive, yet effective low-tech tools/devices in making decisions about assistive technology for individual children.</td>
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<td>7. I am confident in my ability to use assistive technology to facilitate the assessment process of children.</td>
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<td>8. I am knowledgeable of sources for funding assistive technology.</td>
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<td>9. I am confident in my ability to select and use assistive technology based on families’ preferences.</td>
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<td>10. I am confident in my ability to provide assistance to individual families in the use, maintenance, and generalization of assistive technology to facilitate child development.</td>
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<tr>
<td>11. I am confident in my ability to provide children access to assistive technology across situations and settings where instruction and interaction can take place.</td>
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<td>12. I am confident in my ability to be responsive to the culture, language, and economics of the family when making decisions concerning assistive technology applications.</td>
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<td>13. I am confident in my ability to identify and evaluate educational software to meet the needs of children.</td>
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<td>14. I am confident in my ability to integrate or embed assistive technology within children’s school activities.</td>
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<td>15. I am confident in my ability to verify proper implementation of mechanical and electrical safety practices in the assembly and integration of the technology to meet the needs of children.</td>
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<td>16. I understand the legislative mandates and governmental regulations and their implications for technology in special education.</td>
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classrooms. For each of the three “at-risk” classrooms, the presence and use of technology were scored at a ‘basic’ level within the general classroom environment. Indicators of ‘basic’ technology use included (a) computers accessible to children with use being limited to unmonitored game-playing; (b) infrequent instructional use of overhead projectors, audiowires, or digital cameras; and (c) lack of a range of technology used for a variety of purposes. Across the four classrooms that had students with disabilities, the availability and use of technology varied from a ‘basic’ level to an ‘exemplary’ level. Exemplary use was characterized by daily use of a range of technologies (e.g., switches, adaptive keyboard, computer, picture schedules, and communication boards) for a variety of purposes.

Self-reported AT use. There was a range of AT use reported by teachers. Teachers in the four classrooms with children having disabilities had the most extensive experiences with AT; two had children with severe disabilities and already had some AT devices. Two of the five teachers—Jane and Terri—who were in at-risk classrooms, had graduated in the previous two years and each had an AT course in their teacher certification curriculum. The three other teachers—Karen, Barbara, and Carole—in the at-risk classrooms reported limited experience and use of AT. Teachers were forthright in assessing their AT experiences. For example, Karen stated that her experience was very minimal:

I am familiar with the computers and things, and the touch screens. I know that there are certain kinds of mouse that help the children use that easier. But I haven’t really worked with much of that, just have seen it.

Overall, the Assistive Technology Self-Assessment Survey revealed that all teachers indicated a basic level of confidence in their abilities in making decisions concerning low-tech/devices for individual children and were least confident in two areas: understanding AT legislation or regulations in special education and sources of funding for assistive technology. Comparison of the teachers of “at-risk students” and teachers of students with disabilities indicated that both groups of teachers did not differ significantly in their AT self-assessment, except in one area. Teachers of students with disabilities were more confident in their abilities to provide assistance to families when using AT to facilitate child development than teachers of “at-risk” students.

Overall, observations of classroom activities confirmed the teachers’ self-reported limited use of AT. However, all teachers, regardless of their AT experience, stated that they were (a) excited about the school-wide project, (b) willing to learn, and (c) desired to use their new knowledge to benefit their students. As noted by Carole: “You know, I hear of all of these new things that are going on, and I know that the horizon is expanding. I am willing to do anything that would promote that.”

Theme 2: Perceptions of Technology

All teachers identified AT in terms of computers, software, augmentative and alternative communication (AAC), or items such as digital cameras or tape recorders. For example, Carole defined AT as,

My first vision would be a non-verbal child touching something and saying “I want that” or picking up a card to say “eat.” So, when you say assistive technology, it means to me, you are helping those who are non-verbal to communicate.

The majority of the teachers defined AT in terms of devices or objects that children could use to assist them in completing specific tasks. Two teachers with previous AT experiences identified a wider variety of tools. Ellen described her experience as,

We do use communication books at snack/breakfast, beginning PECS. We use ‘I need a break’ cards, sabotaging something so they have to ask for it. I use Big Mac switches for participation. In the morning we say ‘yo’ for attendance, and if they can’t make that verbalization, we use a recording. We use Go Talk, minimally at the moment for recognizing classmates. I use Tech Speak, and again with kids that are more non-verbal, more physical disabilities, to be able to answer questions about colors, shapes, classmates, letters, etc.
Integration or supplemental perspective. During the interviews teachers specifically described how they used or could use AT and how AT affected or could affect their students’ learning. From their responses emerged two broad categories of perspectives. There were two teachers who described AT as something integrated in the curriculum. These two teachers—Sara and Ellen—worked in classrooms with children with disabilities and perceived AT as being an integral and vital component of their curriculum. A statement by Ellen revealed her comfort level and recognition of the value of AT:

Right now I am real comfortable with low tech, use of pictures, switches. I feel like with the students I teach, I want them to participate, be challenged, and do something, and that is my best option. I couldn’t live without AT. I couldn’t be comfortable as a teacher and not use some of those things.

Similarly, Sara described the benefit of AT for her students: “It fosters independence, pride because they can participate, and it makes them active learners.” These teachers, because of their knowledge, their experience, and their student’s needs, appeared to integrate AT actively into their curriculum.

The remaining seven teachers perceived AT as a supplement rather than an integrated aspect of their curriculum. This was illustrated by Terri’s response to a request to describe how she uses AT in the classroom, “This will be short! Basic use of a computer and digital camera. I haven’t used the computer as much because we had so many pictures already, but I am very limited in assistive technology.” The research team observed that these teachers had worked hard to meet the needs of their students and foster learning. AT had been demonstrated to them at various points in their careers, although they had no inservice professional development experiences in AT, and had no support for the limited amount of technology in their classrooms. All teachers recognized their limitations, stated their desire to learn, and spoke of the challenges awaiting them with regard to using AT in their classrooms.

Theme 3: Perceived Challenges to AT Use

All teachers spoke of challenges regarding the implementation of school-wide AT. These challenges were categorized into three primary sub-themes: (a) support, (b) time, and (c) student population characteristics. Each of these sub-themes is discussed in the following sections.

Support. Teachers noted their intense need of AT support, especially technical support and professional development. Technical support was defined as supports related to use of computers, the ability to problem solve technical difficulties, and the need for guidance in choosing appropriate AT. There was consensus on the desire for a new operating platform for their computers. Teachers spoke frequently of the difficulty they had with the current operating system in the Macintosh (Macs) computers that were in their classrooms. The primary difficulty was not in the performance of the Macs, but in their own level of knowledge as to how to use them. All teachers had a Windows operating system on their home computers, used that operating system primarily, and stated that they had little time to learn to use the Macs proficiently. Carole flatly stated, “We are not too happy with the Macs. I just don’t think they are as easy. I just don’t care for them.” And when probed with a question about her use of Windows she added, “Yes, and that could be the difference, that I am used to working with Windows.”

Additional technical support needs were the need for a network color printer that would consistently print, in color, and could be accessed directly from the classroom. When equipment did not function properly, teachers were frustrated since they had spent limited free time to produce a product. Ellen spoke of a particular instance that illustrated her frustration:

All that time you just spent, and then you have to redo it [Boardmaker pictures] on another computer. And I told you about another time, getting my breakfast cards done; I paid for it, went to Kinkos, laminated it, put Velcro on it, all that kind of stuff. Then I bring it back here, and the pictures came off. All the time you spent was just gone.
Needed support for professional development in specific areas was identified by all teachers. One particular need was professional development focusing on the technical skill of operating AT. Terri spoke of her willingness to receive training in this area: “I would be very positive towards it if somebody trained us, I’m very open to it, I just need to learn about it.” Additionally, teachers identified a need to be informed or guided towards purchasing AT that would benefit their students. For example, Toni commented, “I guess I would like to know what there is to help the kids. High or low tech, I don’t even know what to ask for.”

Characteristics of student population. All teachers discussed challenges with the student populations they served. Sara was only at school in the morning when the initial interviews were conducted; however, she is currently at the school full time. The structure of the school day, having both morning and afternoon groups, coupled with varying ability levels among these groups, provided substantive challenges. Additional challenging factors that the teachers identified were (a) poverty; (b) high mobility among the children; (c) English as a second language; and (d) differences in maturity between the younger, morning group (M age = 3.5 yrs) and the older, afternoon group (M age = 4.5 yrs). The high mobility rate was noted to be both particularly challenging and disturbing. Carole said,

Yeah, especially for the children that need it the most, they’re the ones that are here for three weeks and then take off. We open the door for the homeless, or if we find out they are in the Mission. They come for two days and then we’ll never see them again because they’ve moved, and that’s tough. We had a little girl that was here for 6 days, and was here for our class picture, and then she was gone. And then you know you look at that, and you say ‘Where’s she at?’ I hope she is safe and warm.”

Teachers cared deeply about their students. They recognized that some of their students had no opportunity to experience technology other than what was provided in the classroom, and even then such opportunities were of short duration.

Instructional goals for the morning and afternoon groups differed also, with teachers identifying the afternoon groups as more academically oriented while the morning groups required a significant amount of social instruction. Donna describes her morning class as needing instruction in social skills: “We have just gotten a couple of really interesting students. In the morning class, we’ve got such a variety, the range is incredible. There are some self-help things that we really need to push.” Teachers wanted AT that would benefit both their morning classes, with a focus on social skills, and their afternoon classes, which focused more on academic skills.

Time. A prevalent theme that emerged was the issue of time constraints. All teachers discussed their concern that AT would cost them time—a limited commodity in preschool settings. Time concerns included time (a) required to learn AT, (b) required to incorporate the AT into lessons, and (c) needed to teach the children how to use AT. Observations of the classrooms confirmed that the typical day was filled with activities, with children being engaged in a range of centers, activities, and therapy sessions (for children with disabilities). Carole described a typical class:

From the moment they walk in here in the morning or in the afternoon, for the two hours and 40 minutes they are in here, there is not one time when we sit down. There’s just constant motion, constant transitions, not only for us but for the kids.

An additional concern related to time, was the time required to assist children with AT, specifically with computer use. Karen described this issue as, “If things [computer software programs] get too difficult then me or my assistant have to be over there to show them. You know, I don’t mind helping them, but I have 20 other children.” Observations confirmed that 20 3- and 4-year-olds required consistent attention by both teacher and paraprofessional in each of the classrooms.

Ellen spoke of the time required to make the products using AT. Ellen was one of the teachers that used AT consistently in her classroom and knew first-hand of the time required to produce products for use with 10 children with disabilities. She explains her concern,
I don’t know if there are any answers to that [time required to produce products]. If you want to use that stuff, you do have to make it, and I know there is time involved. [I would like] Any ease in that process, and making it practical or efficient in the classroom.

Teachers’ perceptions of challenges to implementing AT technology in their classroom were grounded in the knowledge of their classroom students, their classroom schedules, and their need for additional time.

**Theme 4: Perceptions of AT and Literacy**

Teachers described the literacy in the curriculum and consistently made references to reading. Reading was the primary focus of all literacy activities; activities that incorporated writing were not mentioned. Most of the writing in the classrooms was focused on students’ learning to write their names. This perception of literacy being comprised almost exclusively by reading activities was confirmed by observations in the classroom and the observational structure provided by the ELLCO. Terri’s description of her classroom literacy activities is typical of other teachers’ responses:

Oh yeah, we use the large picture books, and books on tape, we do a lot of that. Yesterday, we were doing some role play with it, we have a lot of fun with it, and expand a lot of the stories. We try to use pictures and different kinds of things with that also.

Sara, one of the teachers with the most AT experience, described her inclusion of AT during literacy activities:

When we are in calendar we have those Boardmaker® pictures and we make the sentences, “Today is ____.,” Different things with the Intellikeys®. We are beginning to make the letters of our names and recognizing our names, without pictures now, which I’m very excited. So much of it [AT] wraps into every little activity it’s hard to separate it out.

However, most of the teachers did not use AT during reading, or during writing. The exception was if one of the children was receiving occupational therapy services; then the occupational therapist may have recommended a low tech AT device to assist with the technical aspects of writing.

The overall finding was that teachers perceived literacy, at this young age, as primarily reading activities and writing was minimally addressed. The incorporation of AT during reading or writing activities was also minimal. More incorporation occurred in the two classes where teachers (Ellen and Sara) had more experience and knowledge of AT.

**Discussion**

Implementing AT into a literacy curriculum in any preschool program requires substantial organizational change. Consistent with the research on successful organizational changes, one of the primary stakeholders in this preschool setting—the teachers—were interviewed to understand their perspectives about AT, AT and literacy, and to understand their perceived challenges regarding implementation of the project. Such understanding was critical before developing any intervention approaches—particularly professional development support strategies. The following discussion is organized around each of the four major themes.

**Assistive Technology Use**

Findings regarding lack of familiarity with AT and infrequent usage is consistent with previous studies (Derer et al., 1996; Lesar, 1998; Parette, 1997; Scott, 1997). Involving teachers in AT planning processes, whether for a single device or a school-wide AT program, has been strongly recommended in the literature (Carey & Sale, 1994; Copley & Ziviani, 2004; Riemer-Reiss & Wacker, 2000; Tods & Walker, 1993). Prior to any professional development approach designed to increase teacher familiarity with AT, it was critical to ask teachers about their concerns, knowledge, and perceptions of AT. Interviews were the first step in enhancing teacher involvement with the MDAT project.

The teacher participants in this study readily admitted their lack of training and lack of knowledge regarding types of AT, while also noting their willingness to learn. Kotter
(1999) observed that the first step to effective change in organizations is creation of a sense of ‘urgency’ for the change. All teachers were well aware of the impact of the NCLB student achievement emphasis on their profession. They were also aware that emerging literacy skills provided the foundation for children’s success on entering school. This knowledge, supported by administrative support for the MDAT grant (i.e., expressed and fiscal support by the school administration), appeared to drive their own commitments to participate in the project.

Perceptions of Technology
Consistent with previous research (e.g., Hutinger, Johanson, & Stoneburner, 1996) participants in this study, with the exception of two of the special educators, viewed AT as supplemental to the curriculum, rather than being integrated. Approaching AT use from this paradigm is limiting to both teachers and students. The participants most commonly viewed AT narrowly, specifically in terms of computer and educational software. Only two special educators saw AT from an integration perspective. It was determined that all teachers must learn, experience, and receive support when implementing AT as an integral part of the curriculum. Changing this perspective of current teacher paradigm is viewed as a major challenge confronting this project, and most preschool programs currently. Strategies to deal with such challenges include direct contact in classrooms by intervention staff regularly, and engaging students and teachers in hands-on activities that model integrative AT.

Perceived Challenges to AT in the Classroom
The anticipated challenges identified by teachers were support, time, and student needs. Interestingly, even with their limited AT experience and use, the teachers clearly articulated challenges that are consistently identified in the literature. Support challenges, specifically technical support and professional development, have been documented as barriers to the use of AT (e.g., Beukelman & Mirenda, 1998; Carey & Sale, 1994; Copley & Ziviani, 2004; Riemer-Reiss & Wacker, 2000).

The challenge of time focused on finding time to learn and implement the AT into the classroom. In earlier studies involving instructional technology, researchers concluded that something on the order of 3 to 5 years is required for teachers to become really adept at incorporating technology into their teaching practice (Sheingold, 1991, 1992). Currently, time to learn and effectively use technology in classrooms remains a concern for many teachers (Valmont, 2003). More recent publications have emphasized essential conditions for effective use of technology in classrooms, including (a) a shared vision for integration; (b) standards and curricula support; (c) required policies (e.g., use of the Internet, legal use, equity); (d) access to hardware, software, and other resources; (e) trained personnel; (f) technical assistance; and (g) appropriate teaching and assessment approaches (Roblyer, 2006; Whitehead, Jensen, & Boschee, 2003). However, less is known about the time commitment required for teachers to become comfortable with integrating AT into their curricula (see, e.g., Randle & Harris, 2004). Ideally teachers should have time to learn the AT, experiment with it in the classroom, and discuss any difficulties with support staff (MacArthur, 2001).

The reality of teaching in an early childhood setting with children identified being at-risk or having disabilities is that time is a ‘precious commodity’ and adequate time—both for professional development in learning to use devices, planning for integration, and implementation of devices in the curriculum—are critical elements for successful technology integration (Speck & Knipe, 2005). Challenges of time to the project staff continue to be of prime concern.

When the MDAT project was first implemented students did not attend school on Friday, and that day was designated for professional development several times a month. Within the first year of project implementation, students began attending school five days a week. The original professional development schedule was significantly affected and adaptations, consisting of hands-on activity groups in the classroom conducted by project staff and graduate students, early morning abbreviated training sessions, half day Institute
sessions, and the establishment of user groups, was immediately implemented. However, time for professional development continues to be a challenge for all involved.

Characteristics of students in the preschool classrooms also presented unique challenges. It was found that access to AT in the homes varied, and the mobility rate of the students was high, i.e., children across classrooms were transitioning in and out of the program. Teachers also repeatedly reported that dealing with behavioral concerns often took precedence in all activities occurring in the classrooms. One particular AT strategy that can assist teachers with behavioral concerns in the classroom would be to incorporate visual strategies to promote appropriate behavior. Teachers in this project have been instructed in the use of Boardmaker™ and Writing with Symbols™ to create visual schedules for classroom routines and sequences in specific classroom activities. This and other strategies will be systematically infused into the AT professional development approaches to ensure that teachers develop the necessary skill sets to use AT effectively in the curriculum.

**AT and Literacy**

The philosophy of emergent literacy views individuals who are either “chronologically or cognitively young learners” as capable of learning literacy (Pierce & Porter, 1996, p. 142). Skills that emerge during early literacy learning include an understanding of the function and concept of print. Understanding the function of print can be facilitated by activities such as reading a story, making lists, or scribbling and drawing (Justice & Pullen, 2003; Sulzby & Teale, 1991). Similarly these activities can also facilitate concepts of print such as turning the page from right to left, reading from left to right and recognizing printed vocabulary (Pierce & Porter). Additionally, early literacy intervention is critical because young children who exhibit difficulties with emergent literacy skills rarely attain the literacy level of peers who have adequate emergent literacy skills (Juel, 1988). The students in the targeted preschool were identified as at-risk or had identified disabilities, which underscored the importance of facilitating emergent literacy skills.

**Summary and Recommendations**

The MDAT project has been implemented with the goal of using AT to foster emerging literacy skills. However, the first step of this project was to investigate the teachers’ use and perspectives of AT, address their needs of professional development and minimize their challenges to making AT integral to their curriculum. Supported by the knowledge of teachers’ needs and perceived challenges the project staff has provided teachers with an AT toolkit, implemented professional development for AT within the toolkit, and modeled use of AT during group activities. The following recommendations are based on initial experiences with this project that should have applicability to programs nationally.

**Strategy 1. Gain perspectives of stakeholders.**

All too often, top-down approaches are used in public school settings (Kolderie, 1990) that are sometimes characterized by such artifacts as lack of teacher input regarding selection and development of curricula, budgeting, and decisions regarding professional development needs. However, for professional development to be successful, teachers need opportunities to discuss their beliefs about technology and its relationship to pedagogy (MacArthur, 2001). This project assumed that teacher input was critical to developing effective approaches for the integration of AT into the preschool curricula. For example, had the research team not explored teacher perceptions prior to developing intervention strategies and an AT toolkit to facilitate writing literacy skills, a decision may have been made to use currently available computers (Macs). However, interviews with teachers revealed that preferences for operating platforms should be incorporated into the AT toolkit to maximize their use. The change of the platform has increased teacher involvement with the project, increased their use of AT, and facilitated their enthusiasm for the changes this project has required. Similarly, at every phase of project decision-making regarding curricula approaches, ideas were presented to teachers for feedback, and teacher suggestions were systematically considered.

**Strategy 2. Ensure flexibility in professional development approaches.**

With the loss of a designated professional development day, project
staff had to make adjustments in key strategies to meet the identified needs of training. Training sessions were scheduled before school, which were minimally successful since they were of short duration and offered no opportunity to have hands-on experience with the technology. Moving into the classroom and modeling activities for the teachers has been received well. The activities embed AT and writing assessments and teachers are provided with a time to observe the implementation of AT.

**Strategy 3. Use stipends to support teachers.** Even though the U.S. Department of Education has recommended that 30% of a school district’s budget be allocated to support professional development, only about 6% is allotted for such activities (International Reading Association, 2001). Zabala and Carl (2005) argue that education agencies have obligations to (a) include AT in the technology planning and budgeting processes, and (b) provide continuous AT learning opportunities for teachers. Though it may be difficult to secure internal funding in school systems to support teachers for professional development, numerous approaches have been promoted in recent years to expand the professional growth of teachers, including (a) school/university partnerships (Bauer & Anderson, 2001; Maring, Boxie, & Wiseman, 2000; Wojcik, Peterson-Karlan, Watts, & Parrette, 2004); (b) use of online professional development resources [cf. Infinitec Assistive Technology Coalition, 2006; North Central Professional Development Laboratory, n.d.; Special Education Assistive Technology [SEAT], 2004; (c) cybermentoring (Boxie & Maring, 2001); (d) and increased access to professional organization training (cf. Center for Applied Special Technology, n.d.; Don Johnston, n.d.; Intellitools™, n.d.), and listservs (Quality Indicators for Assistive Technology [QIAT], n.d.). Securing small mini-grants (Parette, Murdick, & Gartin, 1996) from local community groups, and grants from state and national private foundations may also be helpful in securing resources to support professional development activities of teachers. While some on-line professional development resources are free (e.g., QIAT), others require membership fees or payment for participation (e.g., Infinitec Assistive Technology Coalition).

Regardless of costs for professional development, teacher participation in any AT curricula integration effort can be enhanced by providing teacher stipends (Hirsch, 2006; Reichardt, 2001). As noted by the National Staff Development Council (Hirsch), schools must increase their capacity for teachers to learn and use technology by using stipends for teacher leaders who serve as mentors for new teachers, team leaders for learning teams, and trainers. One strategy that holds particular promise is the use of AT User Groups. Generally, a user group is defined as “a set of people who have similar interests, goals, or concerns. The members have regular meetings where they can share their ideas” (Whatis.com, 2006). Creating such groups requires a commitment on the part of (a) one or more individuals having expertise with specific AT applications to serve as a facilitator, and (b) a small group of 6-8 teachers who express interest in developing new AT integration skills. User groups would meet at regularly scheduled times, such as after school, for 1-2 hours, and allow teachers the opportunity to share ideas with one another regarding AT solutions used in their classrooms. It would also allow for more intensive instruction and creative problem-solving in collaboration with one or more facilitators having more advanced skills. Integral to the creation and maintenance of these groups is a stipend to support participation. In this project, the research team will employ a user group approach currently used in a collaborative project—the Heart of Illinois Low Incidence Association (HILIA)—which involves a cadre of teachers having AT interests, and who represent Illinois State University, and five school districts in Central Illinois (SEAT Center, 2006). In this project, a decision was made to offer interested teachers a small stipend to participate in minimum of 6 out of 8 scheduled user group sessions that would be held in scheduled after-school sessions. Since teachers have other demands placed on their time (e.g., families) and given the lack of time available during typical school days for professional development, monetary incentives are both appropriate and necessary. They ensure teacher buy-in, and also support the development of critical AT competencies.
that would be difficult to develop outside of a formal, ongoing professional development program.

References


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