Factors in In-service Training That Impact Classroom Use of Assistive Technology

by
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This applied dissertation was submitted by R. Ben Satterfield under the direction of the persons listed below. It was submitted to the Fischler School of Education and Human Services and approved in partial fulfillment of the requirements for the degree of Doctor of Education at Nova Southeastern University.

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Abstract

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Special educators are receiving in-service training in using assistive technology (AT). AT is software and hardware designed to help students with disabilities learn. Many have difficulty applying AT in their classrooms. The structure of in-service training and barriers to use of AT are examined and research on coaching as part of in-service training is reviewed.

Dunamis, Inc., a provider of in-service training in the southeastern United States, has offered an electronic community of practice to provide coaching and support for special educators taking in-service AT courses. A modified Delphi method was used to study the impact of an electronic community of practice, as part of in-service training, upon AT use. Participants from Dunamis, Inc. workshops were asked to identify factors in training that have contributed to AT use and barriers to AT use. Two Delphi panels were asked to rate this list of factors and barriers. A local panel had taken part in Dunamis AT training. A national panel of experts in AT was selected from participants in the QIAT Listserv.

Panelists' ratings were compared to identify factors which contribute to AT use. Panelists reached consensus that nine factors, including the electronic community of practice, encourage AT use. Consensus was reached on four common barriers. The Test of Marginal Homogeneity revealed no significant differences between responses in the final rounds.

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Chapter 1: Introduction

At the time of this study, there is widespread acceptance of the notion that specially designed software and hardware can help students with disabilities learn and operate more successfully in schools. These special hardware and software programs, known as Assistive Technology (AT), represent new implements in the instructional toolbox for teachers, therapists, and other school professionals.

Nature of the Problem

Special educators are requesting and receiving in-service training in the use of AT (Study of Personnel Needs in Special Education [SPeNSE], 2002). However, these professionals (Office of Technology Assessment [OTA], 1995; SPeNSE) report that, after receiving such training, they continue to feel unprepared to apply AT in their instruction. Studies (Bausch & Hasselbring, 2004; Bradshaw, 2002; Derer, Polsgrove, & Rieth, 1996; Schrum, 1999) support that there appears to be meager progress at implementing AT in the classroom. Several studies (Derer et al.; Hutinger, Johanson, & Stoneburner, 1996; Kapperman, Sticken, & Heinze, 2002; McGregor & Pachuski, 1996; OTA; Wehmeyer, 1999) that examine the barriers to use of AT universally identify a need for more in-service training.

If the training that has been provided has not resulted in classroom implementation, then the structure and content of in-service training in AT should be examined and alternative approaches investigated. This research study examined the structure of in-service training and to what degree component factors impact the use of AT by educational professionals working with students with disabilities.

Background and Significance of the Problem

The significance of AT for persons with disabilities has been given emphasis by a

series of laws passed by U.S. Congress over the past 2 decades. The Technology Related Assistance for Individuals with Disabilities Act (1988) was enacted upon the concept that individuals with disabilities could derive significant benefits from the use of AT (Rehabilitation & Engineering Assistive Technology Society of North America, 2003). Further impetus was forthcoming from the Individuals with Disabilities Education Act [IDEA] (1990), which enlarged the population who might be helped by AT to specifically include school-aged children (Office of Special Education and Rehabilitation Services [OSERS], 2002).

Furthermore, new mandates in the 1997 reauthorization of IDEA specified that AT be addressed as part of the development of the Individualized Educational Plan (IEP) of each student with a disability (OSERS, 2002). This has established the expectation that AT should play a pivotal role in the instruction of students with disabilities. At the time of this study, professionals (Bryant, Erin, & Lock, 1998; Derer et al., 1996; Lewis, 1998; Sawyer & Zantal-Wiener, 1993; Schlosser et al., 2000; Wisniewski & Sedlak, 1992) in the field of special education accepted generally the idea that technology could empower persons with disabilities by providing an opportunity for inclusion, access to learning, and greater fulfillment and accomplishment in life. Thus, there was professional, legislative, and social consensus concerning the efficacy of using AT in educational settings to improve learning opportunities for persons with disabilities.

However, studies (Derer et al., 1996; Edyburn & Gardner, 1999; Hutinger et al., 1996; Kapperman et al., 2002; Wehmeyer, 1999; Zhang, 2000) show that despite the consensus and collaboration mentioned above, AT has not been fully implemented with students with disabilities. In studies (Derer et al.; Hutinger et al.; Kapperman et al.; McGregor & Pachuski, 1996; OTA, 1995; Wehmeyer), reasons cited included

(a) insufficient time for planning and preparation; (b) failure to receive technical support and administrative leadership; (c) scarcity of appropriate materials, such as hardware and software; (d) inability to establish a common perspective for using technology; (e) a need for in-service training; and (f) the emerging influence of assessment upon instruction. While these studies cite numerous obstacles, the factor common among the studies was the need for in-service training that contributes effectively to integration of AT in the classroom.

Educators entering the field for the first time arrive without sufficient mastery of AT (Lesar, 1998). Wahl (2002) reported that officials in a California study observed that 1st-year teachers and therapists were poorly prepared for AT use in their instructional and therapy settings. Both the National Council for the Accreditation of Teacher Education and the International Society for Technology in Education have recognized this problem and called for greater investment of resources and instruction in AT for preservice educators (Tyler-Wood, Rademacher, & Mortensten, 2000). However, improvements to preservice teacher training now would not impact teachers and therapists who were already in the field.

Pressure to employ technology increased due to the enactment of No Child Left Behind. This law called for highly qualified instructors in the core subject areas for all students, including students with disabilities. The fact that teachers with degrees in special education generally do not have certification in core subject areas has led to a rapid forging of collaborative efforts between general educators and special educators. General educators and special educators have been paired as coteachers in inclusive classrooms. Local school districts have had to accelerate the inclusion of students with disabilities in general-education classrooms in order to comply with this mandate

(Council for Exceptional Children, 2005).

Students with special needs have been included in the testing and accountability process under the No Child Left Behind legislation along with the general population. This testing is used to measure adequate yearly progress of each school. Students with disabilities have had difficulty performing well on tests of regular academic subjects. Pressure to demonstrate this progress produced interest in alternative means of instruction that could better address the learning needs of students with disabilities (Council for Exceptional Children, 2005).

Research (Edyburn, 2004; Woodward & Rieth, 1997) supported that AT could play a significant role in this process by providing valuable tools with which to help struggling students. AT tools can assist teachers in the creation of curriculum materials that can be accessed by a range of students. Talking word processors provide auditory support for students having difficulty reading (Special Needs Technology Assessment Resource Team, 1996). Switch scanning provides a means of access to learning materials for students with orthopedic disabilities (Drenchek & Natale, 2004). Word-prediction tools and talking spell checkers help struggling writers with writing assignments (Quenneville, 2001). Studies (Edyburn; Tyler-Wood et al., 2000) show that while these AT features were designed to support students with disabilities, they also provide help for general students who experience difficulty in the regular classroom.

Setting

Dunamis, Inc., a privately held company in the Atlanta, Georgia, area, was founded in 1984 to promote the successful use of AT. Dunamis, Inc. has been a reseller of AT products and has represented over 60 different manufacturers and publishers of AT materials. The company's primary geographic focus has been the southeastern United

States. In the past, the company has been involved in the design and publishing of software and in the manufacture of hardware. Dunamis, Inc. has provided evaluations for consumers and trained consumers, families, teachers, and therapists. Dunamis, Inc. has offered consulting services for parents, educators, and administrators to support the use of AT (C. A. Shockley, personal communication, April 1, 2005).

In 2001, Dunamis, Inc. initiated a program of training to promote and encourage use of AT in the schools by increasing awareness of the best practices in AT. The company has provided a variety of in-service workshops that concentrated upon integration of AT in the classroom. These in-service workshops were intended to provide professionals working with students with disabilities the training necessary to apply AT in the classroom (Dunamis, Inc., 2003).

Dunamis, Inc. has developed a structure for in-service training that was based upon the trainers' own experience and observation. The Dunamis, Inc. training emphasized theory, demonstration, practice, and feedback. This structure was similar to that described by Joyce and Showers (2002). The in-service training Dunamis, Inc. provided has been well received. Local school districts have requested Dunamis, Inc. workshops for their special educational staffs. Participants in Dunamis, Inc. workshops provided positive feedback on training evaluations, indicating that instruction was helpful and appropriate. The staff at Dunamis, Inc. observed that only a few participants were effective at using AT. Many teachers and therapists were having difficulty actually using AT in their school settings (C. A. Shockley, personal communication, April 1, 2005).

The company has continued to explore ways to improve in-service training and further encourage and support AT use. Research by Joyce and Showers (1980, 2002) suggested that training structured to provide theory, demonstration, practice, and

feedback was effective with topics that required of the participants only minor changes in practice. However, when more significant changes were involved in implementing the training topic, this structure was not effective. Joyce and Showers found that coaching, in conjunction with in-service training, increased the likelihood of the content of workshops to transfer to the classroom when the topic demanded radical change.

Upon reflection, the Dunamis, Inc. instructors concluded that the introduction of AT constituted a fundamental change in instructional approach for many special educators. An effort was made to offer coaching as part of the in-service training provided by Dunamis, Inc. However, busy teacher schedules and limitations placed by district and local school administrations made coaching difficult to implement. The Dunamis, Inc. team sought an alternative way to include follow-along coaching and support as part of in-service training (C. A. Shockley, personal communication, April 1, 2005).

In the Spring 2005, the concept of a virtual or electronic community of practice (eCoP) was discussed. The team decided that an eCoP could be a way to provide a measure of coaching and support for educators as they attempted to use AT in their educational settings. In addition, the eCoP held out the possibility of providing support in a way that was less obtrusive than face-to-face coaching (C. A. Shockley, personal communication, April 1, 2005).

Beginning with the courses offered during the Summer 2005, Dunamis, Inc. has provided an eCoP as an additional online component to its workshops as a vehicle for providing support and coaching following in-service training. This eCoP was facilitated by the LMS (BlackBoard, Inc. (2003). The LMS was moderated by the Dunamis, Inc. course instructors, providing technical assistance and fostering peer support and group

problem solving as the participants go back to the schools and classrooms and begin to attempt to apply what they have learned in workshops and training opportunities. This eCoP provided threaded discussions, live chats, a virtual-classroom setting, an activity exchange, links to additional resources, and a space for reviews of new research (C. A. Shockley, personal communication, April 1, 2005).

Purpose

Bradshaw (2002), Derer et al. (1996), Ertmer et al. (2003), and Schrum (1999) have asserted that the current model for in-service training of teachers for classroom use of AT was ineffective. The purpose of this research study was to examine the structure found in the then-current in-service training in AT. Several related questions were explored:

1. To what degree do the component factors in in-service training impact AT use?

2. In what ways might this structure be modified to help educators use AT more successfully with students with disabilities?

3. Can an additional component to in-service training be incorporated to extend the training experience beyond the traditional workshop?

This component would provide support and coaching by means of an eCoP, as teachers and therapists attempt to implement the technology in their schools and classrooms.

Research Questions

There were three research questions for this project:

1. What are the factors in in-service training that encourage classroom use of AT?

2. Does participation in an eCoP, following a face-to-face in-service training event, enhance educators' use of AT with students with disabilities?

3. What obstacles or barriers impact the use of AT in the classroom?

This research compared Dunamis, Inc. training that included an eCoP with training after July 1, 2005, to Dunamis, Inc. training without the eCoP training prior to July 1, 2005.

The eCoP was intended as a way to extend effective instruction in the concepts and skills related to the Dunamis, Inc. training content into the time when the skills and concepts were implemented in the classroom. Such a model, if effective, could help increase the effectiveness and confidence of classroom teachers, therapists, and paraprofessionals with regard to using AT. By helping professionals experience success in the use of AT, the use of this model could result in more widespread applications of AT. The expanded use of AT could enable students with disabilities to gain better access to the general curriculum and become more independent and successful learners.

Definition of Terms

For the purposes of this applied dissertation, the following terms are defined.

Assistive Technology (AT), according to OSERS (2002), is defined by the Technology Related Assistance for Individuals with Disabilities Act of 1988 as including "such items as communication devices, adapted appliances for accessible living, environmental control devices, modified housing, adapted computers, and specialized software" (p. 3). Studies (Edyburn, 2000; Lahm, Bausch, Hasselbring, & Blackhurst, 2001) found that whether in an inclusive setting with typical peers or in a self-contained environment, AT permits students with disabilities to learn more independently and to realize academic potential more fully.

The practice of AT Cook and Hussey (2002) established in educational settings should be carried out through a team approach. Often, AT teams consist of two or more professionals from different backgrounds. Speech-language pathologists, teachers, occupational therapists, and physical therapists often collaborate in instructional settings

to help students with disabilities use AT. Each of these special-education professionals contributes their expertise and insight to the process of implementing technology for students with disabilities. Research (Putnam, Spiegel, & Bruininks, 1995; U.S. Department of Education, 1998) documented that, because of the move toward inclusion, students with disabilities are being taught more frequently in regular classes by general-education teachers. Thus, the practice of AT may also include general-education teachers and staff.

However, in practice, educators are often isolated. This fact works against the development of networks of peer interaction support and collaboration (Buysse, Wesley, & Able-Boone, 2001). The development of best practice strategies and methods in the use of AT with students with disabilities is carried out by individual teachers operating apart from their peers (Ertmer et al., 2003).

In-service training involves learning experiences intended to build understanding, expertise, and attitudes of practicing educators (Sparks & Loucks-Horsley, 1989). Sometimes, in-service training has been referred to as professional development (Neville & Robinson, 2003). Sparks and Loucks-Horsley positioned in-service training as one form of staff development. Other forms include (a) self-directed learning, (b) observation and assessment, (c) participation in a building or district level improvement process, and (d) participation in small-group inquiry. Of these models of staff development, in-service training has been the best researched.

Successful in-service training includes a theoretical framework to support understanding, modeling to build conceptual insight, and practice with feedback to build proficiency (Joyce & Showers, 1980). The knowledge about the innovation provided by the professional development is foundational for teachers; however, the ability to transfer

skills to everyday instruction sometimes requires coaching (Showers, Joyce, & Bennett, 1987).

Inclusion is the incorporation of students with disabilities into classrooms populated with typical students and taught by general-education content area teachers (Cook, 2001). This practice has been widely used and is becoming more prevalent (Putnam et al., 1995). The U.S. Department of Education (1998) reported that the number of students with disabilities who spent more than three fourths of their instructional day in classes with typical peers increased from 31% in the 1989-1990 school year to 45% in the 1995-1996 school year.

The alternative placement to an inclusive setting for students with disabilities is a self-contained classroom. A self-contained classroom is populated exclusively by other students with disabilities and taught by a special-education teacher. A basic tenet of the IDEA (1990) is that every student must be given a free and appropriate public education in the least restrictive environment. The least restrictive environment requirement indicates that students with disabilities should be taught in classroom settings with typical peers to the greatest degree possible. For some students, this results in full inclusion with some level of additional support, perhaps from the assistance from a therapist or paraprofessional. For other students, least restrictive environment means a limited inclusion in selected classes and at certain times of the school day. The degree of inclusion is typically determined at an annual meeting with family and school staff to design the student's IEP (U.S. Department of Education, 1998).

Coaching is the method of assisting educators, through a process of observation and feedback, in the application of an innovation to their classroom (Joyce & Showers, 1981). Coaching (Hall & Hord, 2001; Joyce & Showers, 2002) may be done with the help

of an expert, a mentor, or peer coaches. This may be seen as part of a need to create a supportive environment that encourages the growth and development of teachers. This occurs in the context of the classroom where the attempt to implement AT is taking place. Educator and coach examine the issues raised by the implementation of AT. The educator is given constructive suggestions and feedback concerning the process of using AT (Joyce & Showers). In-service training that includes coaching has been found to be more effective than training based upon the typical expert model (Sparks & Loucks-Horsley, 1989).

Communities of practice (CoP) is a collection of individuals who come together to learn about a common interest or skill (Wenger, 2005). When such groups are focused upon education, they are often called learning communities (Buffington, 2003). When a learning community develops online, it is known as a virtual community of practice or eCoP (Stuckey, Buehring, & Fraser, 2002). Learning communities have been able to develop and thrive online as well as in a single geographical location (Brook & Oliver, 2002). These communities share three key common features:

1. A domain or a collective expertise.

2. The collection of individuals who have joined to learn and to help each other learn.

3. The practice or the application of the expertise being shared about this common interest.

The community shares ideas, airs problems and challenges, and engages in cooperative problem solving (Wenger, 2005).

Integration of technology refers to the application of technology in the classroom to improve instruction and enhance learning (Lahm et al., 2001). Studies (Bryant et al.,

1998; Derer et al., 1996; Lewis, 1998; Sawyer & Zantal-Wiener, 1993; Schlosser et al., 2000; Wisniewski & Sedlak, 1992) have shown that students with disabilities benefit from the integration of technology as it provides them with greater independence and access to the curriculum which is not otherwise available.

Differentiation of instruction is an instructional approach aimed at addressing the divergent-learning styles and abilities and the instructional challenges of an inclusive classroom (Tomlinson, 2003). This approach gives children choices in ways of receiving, incorporating, and responding to information. Teachers differentiating instruction anticipate the diversity of the students by designing varied instruction that attempts to support learning for those students. Tomlinson observed that this practice could take several forms:

1. Variation in the ways that content is presented.

2. Differentiation of learning activities and the opportunities students have to process information.

3. Alternative methods of assessment of learning.

4. Alteration in the structure of the classroom itself.

According to studies (Barry & Wise, 1996; Edyburn, 2004), the task of managing the differentiation of instruction is challenging but AT can be a useful tool in this process.

Implementation of AT refers to the attempt to apply AT in the school setting to enable students to be more active and effective participants in learning activities. Educators use AT to create multisensory instructional materials that enable students with disabilities to interact with curriculum content more effectively. AT helps students practice basic skills, complete assignments more accurately, and work more independently (Barry & Wise, 1996).

Implementation is contingent upon teacher and therapist performance (Hall & Hord, 1987). The implementation of technology represents a radical shift in classroom practice for many educators (Hall & Loucks, 1978). Change of such magnitude becomes a personal experience for many teachers (Hord, Rutherford, Huling-Austin, & Hall, 1987). Implementation of AT appears to require both training and support for teachers, therapists, and other staff involved in the instruction of students with disabilities (Kintsch & DePaul, 2002; Merbler, Hadadian, & Ulman, 1999; Puckett, 2004).

Transfer of training refers to the assimilation of skills and understandings from an in-service training experience to a teacher's repertoire of classroom practices (Joyce & Showers, 1981). Where innovations that are complex or radically different from current practice, such as the integration of AT, are concerned, transfer of training may be more challenging. Such innovations may require a different structure for in-service training which includes coaching (Joyce & Showers, 2002).

Chapter 2: Review of Literature

A review of literature examined (a) the history and status of AT use in schools, (b) barriers to the implementation of AT in schools, (c) research studies on the role of training in the implementation of AT in schools, (d) the then-current model of in-service training in AT, (e) the structure of in-service training in AT, (f) the impact of learning communities upon practice, and (g) the relationship of this dissertation to literature. This literature was obtained by searching the ERIC First Search, ProQuest Research Library, and Wilson Education Full Text databases for descriptors and key words, such as AT, special education, disability, technology, professional development, in-service training, learning community, and community of practice. Citations and references in these documents were examined to identify additional studies to consider for inclusion in this review.

History and Status of AT Use

Blackhurst (1997) contends that, historically, leadership in the area of providing technology for the education of persons with disabilities in America has fallen to the federal government and to the U.S. Congress, in particular. In 1879, Congress provided a $10,000 grant to the American Printing House for the Blind for the development of Braille materials. In 1904, Congress addressed the need to expand the distribution of adapted reading materials for individuals with visual impairments. In 1920, the U.S. Congress expanded access to therapy services that had been provided to soldiers returning from World War I (Blackhurst). In 1958, the U.S. Congress supported the development of film captioning for individuals with hearing impairments. In 1964, the regional Special Education Instructional Materials Centers were created to support teachers in the use of media and technology. Ultimately, the regional network of Special

Education Instructional Materials Centers gave way to state and local agencies that provided such support to special education teachers (Blackhurst & Edyburn, 2000).

The leadership of the U.S. Congress continued in the second half of the 20th century. The Elementary and Secondary Education Act (1965) contained provisions to develop and circulate materials and media for use in the instruction of persons with disabilities. The Education of All Handicapped Children Act (1975) was enacted to establish the right of students with disabilities to a free and appropriate public education. In 1988, Congress defined the terms, AT and AT Services, in the Technology Related Assistance for Individuals with Disabilities Act (1988), known as the Tech Act (National Center for the Dissemination of Disability Research, 2001). The IDEA of 1990, as reauthorized in 1997, extended AT support specifically to children with disabilities and required that AT be considered during the IEP process for every student with a disability (OSERS, 2002).

Bausch and Hasselbring (2004) reported that State Education Agencies have generally acknowledged the federal requirement for policies and guidelines that would encourage implementation of AT in local schools. Local school districts have invested significant resources into the acquisition of AT and educational technology just prior to this applied dissertation project. Yet, it appears that AT is not being extensively integrated into kindergarten to Grade 12 (K-12) classrooms (Edyburn, 2003).

Derer et al. (1996) studied 405 K-12 classroom teachers in Kentucky, Tennessee, and Indiana, and found teachers using AT with about 34% of their students. In a report to the Idaho AT Project, regional coordinators reported that there was a critical lack of AT services for students with disabilities in Idaho (Espe, 1998). Wehmeyer (1999) surveyed the families, advocates, and care providers for 1,802 individuals with intellectual

disabilities. Only 20% of school-aged respondents reported use of AT. Kapperman et al. (2002) found that only 40% of students in with visual impairments surveyed in Illinois used AT.

Bausch and Hasselbring (2004) concluded from a review of unpublished studies of Kentucky special educators that AT use was not widespread. A 1999 survey by Bauder of 1,000 special education teachers found that AT was mentioned in only 22% of students' IEPs (Bausch & Hasselbring). In a study of teachers of students with visual impairments by Abner (as cited in Bausch & Hasselbring), only 26% of students served had AT indicated as part of their IEP. The mention of AT on an IEP may not necessarily translate to effective AT use in the classroom. While these studies do not address general AT use by special education teachers as a classroom tool, the IEP should indicate when AT should be in use. The fact that the percentages in these studies are so low, appears to reflect a large number of students with disabilities who are not benefiting from AT in their classrooms.

Barriers to the Implementation of AT in Schools

Several reasons for the failure to implement AT effectively were presented in the literature. The OTA (1995) identified several barriers to use of AT in schools: (a) low funding and limited access to equipment, (b) inadequate technical support, (c) the growing impact of assessment and accountability upon instruction, and (d) a lack of training in the use and application of technology to the classroom.

McGregor and Pachuski (1996) reported that lack of time for planning and preparation, and the need for in-service training were identified by teachers as limiting their use of AT. Derer et al. (1996) identified (a) shortages of AT hardware and software, (b) inadequate funding for AT, (c) inadequate technical support, (d) poor administrative

leadership, and (e) a lack of in-service training as limiting implementation of AT with students with intellectual disabilities in three southern and midwestern states. Hutinger et al. (1996) reported that difficulty in developing a common perspective for using technology and a need for more extensive training in the use of AT obstructed the use of AT with elementary and middle school children with disabilities in Illinois as they transitioned from one program to another. Wehmeyer (1999) listed excessive cost of AT devices combined with inadequate funding, and a need for training as reasons why AT was underused with children and adults with intellectual disabilities. Among the obstacles identified in these studies, the factor common among the studies is the need for in-service training that contributes effectively to integration of AT in the classroom.

The Role of Training in the Implementation of AT in Schools

Among teachers who have attempted to incorporate AT into their instruction, a need for more effective in-service training has been repeatedly been identified. Izen and Brown (1991) related that teachers of children with severe disabilities mention their need for more training as a reason for a lack of success in employing technology in their classrooms. Teachers reported either failing to implement AT altogether or attempting to do so with ineffective results. Derer et al. (1996) cited insufficient teacher training as a major factor in the implementation of technology in K-12 classrooms in Kentucky, Tennessee, and Indiana. Of the 405 teachers participating in this study, 41% stated that their training in AT was inadequate for the requirements of their classrooms. McGregor and Pachuski (1996) found that 44% of the 366 educators sampled had had preservice AT training and a full 76% had received in-service AT training. Yet when it came to rating their satisfaction with the results of their use of technology, teachers rated their experience as less than satisfactory.

Hutinger et al. (1996) reported that special-education teachers receiving new students often had not received training in the specific AT devices the students needed to use and were unprepared to incorporate the new device into classroom instruction. Lesar (1998) disclosed that a majority of teachers, participating in a survey of early childhood special educators in North Carolina and Tennessee, described themselves as lacking in preparation for use of AT in the classroom and lacking hands-on exposure to AT. Espe (1998) reported that the Idaho AT Project, which conducted a 3-year study of services provided to children in K-12 classrooms, concluded that there was a need for more in-service training in AT, specifically access and communication technology, for teachers in that state. Merbler et al. (1999) found that teachers and staff needed to receive adequate training to make most effective use of AT equipment in inclusive classrooms. Gallagher, Malone, Cleghorne, and Helms (1997) reported that 72% of early intervention personnel surveyed indicated that in-service training in AT was a continuing high priority need.

In their report on AT in a large school system in the southwestern United States, Wahl and Buzolich (as cited in Wahl, 2002) discovered that special educators desired more training and expressed the concern that they had very limited knowledge of AT. Kapperman et al. (2002) reported that teachers of students with visual impairments in an Illinois survey cited their lack of adequate training as a factor in the failure to use AT with their students. Michaels and McDermott (2003) found that teachers who enter the classroom without adequate preparation in AT feel overwhelmed and exasperated when presented with AT.

Puckett (2004) studied the impact of providing teachers with a tool kit of AT devices and software upon teachers' ability to assist students with disabilities to access

the general curriculum. The study indicated that providing AT to special-education classrooms alone does not lead to effective implementation of AT. In-service training in AT is a vital component in the successful use of the tools. Wahl (2004) surveyed the knowledge and use of AT among 356 northern California in-service special educators. The study revealed the need for in-service training that addresses teacher concerns about implementation of AT.

Broader studies also reflect the perception among teachers about the training they have received. OTA (1995) reported that most teachers indicated that they consider themselves ill-prepared for technology use in their classrooms. The National Council on Disability (2000) cited a lack of adequately trained teachers and professionals as a major reason that persons with disabilities are not achieving independence and success in their use of AT devices. The National Center of Educational Statistics (2000) identified the need for special educators to receive training in AT as an important hurdle to effective implementation of technology in public schools. SPeNSE (2002) reported that special education teachers consider their abilities in AT to be inadequate.

Studies (Bradshaw 2002; Schrum, 1999) reported the carryover from teacher in-service training in technology to classroom use of technology remains elusive. The Idaho AT Project reported that teachers continue to list in-service training in AT as a high priority for their professional development (Espe, 1998). SPeNSE (2002) reported that AT was among the most frequently provided in-service workshop topics for public school teachers. In fact, the report indicated that many teachers have attended numerous hours of in-service training in AT. The SPeNSE report went on to relate that, despite this training, special educators continue to feel they lack competency in AT. According to studies (Derer et al., 1996; Schrum, 1999; Wahl, 2002), as educators have received training and

yet have continued to express the need for more, it would appear that in-service training in AT in its then-current form is not contributing to the integration of technology into the classroom.

The Model of In-Service Training in AT

In-service training in AT typically conforms to what may be labeled an Expert Model (Schrum, 1999). In such training, a subject matter expert is brought in to provide a workshop for teachers on an aspect of AT. The workshop typically lasts for less than a single day, usually just a few hours. Apart from an exit survey, which often captures only the sentiment of the moment, no attempt to assess the quality or the value of the workshop is usually made. Studies (Bradshaw, 2002; Schrum) have shown that rarely do such workshops result in any subsequent follow-up. Wade (1984) suggested that the amount of contact time available in the then-current model might be insufficient for the establishment of the connection between student and instructor. Certainly the time available does not provide support for any independent implementation of the innovation in the actual classroom. Typically, the then-current model fails to provide for interaction with peers or the instructor while the implementation of the change is in progress (Bradshaw).

The structure of the expert training model does not permit extension of the instructor's influence beyond the workshop experience. The current structure of in-service training fails to permit consideration of the concerns and attitudes of teachers involved in implementing the innovation (Bradshaw, 2002).

In a survey of staff development plans of 27 local school districts, Bradshaw (2002) concluded that, as currently structured, in-service workshops "do little to ensure that technology will be used in our schools or classrooms in ways that will improve

student learning" (p. 132). Thus, it appeared that while teachers have been receiving training in AT, they were finding it difficult to apply what they are being taught. There remains a need for in-service training that delivers appropriate technical instruction, provides effective support, and helps shape teacher performance in the classroom use of AT (Derer et al., 1996).

The Structure of In-Service Training

Well-designed in-service training in AT should facilitate the learning of new concepts, the development of new skills, and the ability to apply them to the classroom. A second goal should be to engage participants in such a way that they become empowered learners, able to grow in their understandings and abilities in the weeks and months following the training. Workshop planners should identify the desired outcomes of the in-service training and select strategies that are appropriate to reach those outcomes (Joyce & Showers, 2002).

Showers et al. (1987) conducted an extensive review of the literature in professional development and performed meta-analysis of approximately 200 research studies. These studies examined such considerations as teacher qualities, school and district characteristics, features of in-service training, and student attributes.

Four components were found in effective in-service workshops: (a) examination of theoretical framework by means of direct instruction and dialogue, (b) modeling or demonstration, (c) hands-on practice, and (d) feedback (Joyce & Showers, 2002). These are the traditional factors that comprise in-service training events. Joyce and Showers have suggested that coaching, involving the application of the content of in-service training to the classroom setting be included as an additional factor.

Joyce and Showers (1980, 2002) broke down the types of in-service training

content into several categories. Joyce and Showers (2002) wrote that these categories are ranked in an ascending hierarchy according to their "level of impact" of the outcomes of the training event: (a) simple awareness of theory or practice, (b) new understandings concerning the content and about one's self which relate to the subject, (c) skill and proficiency with the materials, and (d) the transfer of new skills and understandings in the participant's own instructional setting (p. 72). Thus, it is only after this last level has been addressed as part of training that evidence of changes in the classroom can be expected. It is this last level of outcome where there is the greatest potential to impact student performance (Joyce & Showers).

Showers, Joyce, and Bennett (1987) expressed the relative impact of these components upon the outcomes of professional development in terms of effect size. Effect size is a concept used in meta-analysis of multiple research studies developed by Glass (1982). Effect size establishes a numerical value for the size of the difference between two standardized sets of data. A positive effect size indicates an authentic impact. Effective size helps establish a standardized scale for comparing data from different studies (Joyce & Showers, 2002). When skill development was the targeted outcome of in-service training, the average effect size of using direct instruction in theory was found to be 0.5. When demonstrations, practice, and feedback are combined with theory, the effect size grew to a more substantial 1.18. However, Joyce and Showers related that the literature reveals that the development of skill in a professional development setting does not translate instinctively into use in the classroom.

When transfer of training content to the professional setting was the measured intentional outcome of in-service training, the effect size of using information and theory is 0.00. When theory is accompanied by demonstration, the effect size remains 0.00.

Even the addition of practice and feedback does not improve the effect size (0.00). However, when coaching is employed in conjunction with theory, demonstration, practice, and feedback, an effect size of 1.42 was observed (Joyce & Showers, 2002). This suggests that coaching may have a significant impact upon the transfer of training.

It is helpful to recognize whether the content of the in-service training is either similar to, or different from, the teaching approach and the areas of competence of the individual participants. It is also useful to identify the level of complexity of the training topic. Outcomes that are similar to or not far removed from the classroom teacher's classroom system are much more easily assimilated from in-service training than are outcomes involving complex radical departures from classroom practice (Joyce & Showers, 2002).

After an analysis of more than 200 studies of in-service training methods, Joyce and Showers (1980) found that when the subject matter in workshops pertained to minor modifications to teachers' regular classroom routine, a traditional structure to in-service training was adequate. The studies on the effectiveness of these training components revealed that the combination of the theory, demonstration, practice, and feedback components were effective in settings that focused upon awareness, knowledge, and skill development. However, when the goal of the workshop related to the integration and transfer of complex ideas or required significant modifications to teaching method, only the combination of all five components--theory, demonstration, practice, feedback, and coaching--was consistent with the transfer of training to the classroom (Joyce & Showers, 2002).

The application of technology to instruction constitutes a significant shift in teaching style for most teachers (Hord et al., 1987). The National School Boards

Foundation (2002) study found that many educators were not prepared to integrate technology into the learning activities in their classroom. Hord et al. found that such significant changes become a very personal experience for individual teachers. Studies (Kintsch & DePaul, 2002; Merbler et al., 1999; Puckett, 2004) reported that addressing the integration of AT with special educators requires a solution that is both individualized and designed to support a transfer of training.

Showers et al. (1987) found that ongoing coaching following in-service training in a new concept resulted in significantly greater instructional applications of the concept than were evident from teachers who took part in the new concept training alone. Joyce and Showers (1982) reported that when teachers who received in-service training were monitored in their next assignment, those who experienced coaching as a condition of training were more successful in transferring the training into their classroom learning environments than those teachers who demonstrated proficiency in, motivation for, buy-in to the innovation, or combinations of these three factors. A survey of studies on in-service training which was conducted by the Florida Department of Education indicated that in-service training which incorporated observation and feedback or coaching had a positive impact on teachers more often than training which required teachers to attend lectures alone (Cruickshank, Lorish, & Thompson, 1979)

Coaching provides an opportunity to address the performance of individual participants more directly, including issues and concerns that might impact performance (Wade, 1984). Incorporating coaching into in-service training improves the workshop experience for participants (Fleming, 1999). Yet, the National Center for Educational Statistics (2000) reported that this model has not been employed extensively. Only 19% of the teachers surveyed indicated that they had experienced coaching or mentoring. Of

those who did, 70% indicated that it positively impacted their instruction (National Center for Educational Statistics, 1999). Teachers who experienced coaching following in-service training demonstrated greater mastery of the competencies and concepts related to the content of the training than did their uncoached counterparts (Joyce & Showers, 2002).

CoP

Wenger (1998) has defined a community of practice (CoP) as a voluntary collection of individuals who share a common skill or domain knowledge, a passion for the practice of that skill, and a desire for the application of that knowledge. CoP participants exchange knowledge and information and collaborate to develop solutions to issues faced by the participants. Communities can grow and operate totally within the boundaries of organizations, such as schools or districts. However, CoPs often attract participating memberships that extend beyond the periphery of any single organization (Wenger & Snyder, 2000)

The theoretical framework involved in communities of practice is that of collaborative learning. The foundation of this framework is the assertion that learning is a social process. Vygotsky (1978) articulated a sociocultural perspective on cognitive development that incorporates both individual learning and a social context for learning. In contrast to an objectivist perspective, in which instruction is dispensed and individuals learn independently of others, the collaborative perspective projects a more active role in the learning process for the learner. In this model, each learner becomes involved in the construction of knowledge for themselves and as part of the larger group. Experienced participants mentor and coach the less experienced community members. Problems are generated from real life situations and are posed by neophytes and experts alike.

Solutions are derived from the input of those who have experience with the question. The topics revolve around the common interest or vocation (Hiltz, Coppola, Rotter, & Turoff, 2000).

Teachers are in need of in-service training that provides an opportunity to interact with peers and compare experiences and ideas for applying new skills and concepts (Gersten & Brengleman, 1996). Robinson and Carrington (2002) suggested that a change in the culture of schools is required. Rather than expecting teachers to accept new programs and theories that are handed down by administrators and lawmakers, there needs to be a professional environment that encourages teachers to develop their own theories and to integrate what is presented during in-service training into their classroom practice.

In education, there has been interest in CoPs as a way to enhance professional development (Palincsar, Magnusson, Marano, Ford, & Brown, 1998). Making a CoP a component of a professional development program could help develop an environment conducive to exploration and reflection (Buysse et al., 2001). Palincsar et al. contended that the notion of including the CoP in the larger picture of professional development has been rooted in the proposition that learning is, in part, a social process. John-Steiner and Mahn (1996) have conceptualized the construction of knowledge as being influenced by the context and by others participating in the learning process. Given this social dimension to learning, it may be useful to consider the CoP as a means to cooperative learning and the quest to achieve collectively desired outcomes.

Professional development and communities of practice. Englert and Tarrant (1995) studied special educators who formed a community, along with researchers, around the implementation of an early literacy project. The multiyear study revealed that

a collaborative community provided an effective platform for the discussion and reflection upon classroom practice and for the construction of new understandings of and solutions to classroom problems. Participants demonstrated success at integrating collaboratively constructed reading and writing strategies into their local classroom practice. After a year of working with educators in a CoP in an urban elementary school, Davis and Sumara (1997) found that such a community helps provide a means for educators to collectively explore the fundamental nature of teaching and to help one another define their own instructional approach to the students they teach.

Palincsar et al. (1998) sought to foster the development of a CoP around a professional development program for teachers in kindergarten to Grade 5. The focus of this community was the development of discovery- or inquiry-based teaching strategies for kindergarten to Grade 5 science classrooms. The researchers found that the CoP model offered opportunities for peer interaction, discussion about best practice, and shared experiences to broaden the understandings of the participants.

Brook and Oliver (2002) employed a virtual learning community, called Learnscope, as a means to facilitate professional development among vocational educators in Australia. In a survey of 121 participants, the authors sought to discover particular factors that contributed to the formation of a sense of community. They found that a participant's level of involvement and interaction was a key element in the development of an awareness of community.

Gallucci (2003) analyzed the impact of participation in CoPs upon educators from two sites in low-income areas of the state of Washington. The study found that teachers, participating in a vibrant CoP that encouraged open exploration of issues, appeared to help accelerate the adoption of new policies and curriculum changes. The study also

found that teachers participating in active CoPs were able to assimilate and apply more from in-service training than their counterparts who did not take part in such communities.

Meyers, Davis, and Botti (2002) conducted a study in which 44 middle school science teachers took part in an online collaborative community as part of a professional development program to develop discovery-oriented approaches to teaching earth systems science. The study found that participants in the collaborative community were effective at developing and implementing learner-focused classroom strategies.

Robinson and Carrington (2002) studied a group of teachers who participated in a learning community as part of professional development for inclusive schooling. Participants reported that the group interactions proved helpful to teachers in overcoming their sense of isolation, and in providing new strategies and ideas for use in the classroom. Participants were able to expand their personal understanding and skill in a cooperative atmosphere. The researchers observed that the participants needed ongoing encouragement and assistance, and concluded that coaching and peer mentoring contributed to a proper environment of open exploration.

Virtual communities of practice. Stuckey et al. (2002) studied two cases of the use of the eCoPs model in the delivery of professional development. The first eCoP was the community that formed around the use of the Prodigy Web site in the United Kingdom's health care industry. The intent of the Prodigy site was to provide general practitioners with viable focused assistance during consultations with patients. Stuckey et al. reported that prodigy provided training support through "message boards, e-mail lists, and other messaging tools" (p. 4).

A second eCoP concerned the community that formed around the use of

e-learning program called StageStruck (Stuckey et al., 2002). This program had been developed by the Wollowong University in conjunction with the Australian National Institute for Dramatic Art. StageStruck was widely distributed in schools throughout Australia as a tool to foster student-centered focus in the teaching of the creative arts. The StageStruck program was designed around a constructivist perspective. Stuckey et al. found that the provision of a community space did not guarantee interaction among the community members. While individuals did avail themselves of resource information, it was only after the introduction of moderators who presided over targeted discussion areas that real sharing took place.

Buysse et al. (2001) argued for using eCoPs to enhance professional development to support inclusion in the fields of Early Childhood and Early Intervention. Early Intervention programs seek to identify and provide developmental support for children from birth to the age of 3 years with disabilities and those who might be at risk for developmental delay. At the time of this study, the fields of Early Childhood and Early Intervention were in the process of merging as students with disabilities are being included in the educational setting of typical children. This requires early education professionals to learn new skills and to modify the delivery of services to accommodate the diverse abilities of the students in their classes. During this transition, eCoPs can provide support. The eCoP in this study served as a repository for information about inclusive practices in the evolving field. This virtual community also served as a focal point for the shaping of new insights concerning the changes in the practice of Early Intervention and was a source of coaching and mentoring regarding this process.

Hegarty, Bostock, and Collins (2000) implemented a distance-education staff development course in information technology for instructors of students with special

needs. The course intended that participants would be implementing what they learned in their local settings. While the course was not intended as a CoP, the researchers observed that participants indicated that support from the instructional team following classroom instruction was important to successful implementation.

AT and Virtual CoP. In the 1980s, a number of special educators were attracted to online bulletin boards as a means to communicate with fellow professionals about their work with children with disabilities. SpecialNet and AppleLink demonstrated the potential value of eCoPs (Edyburn, 2005).

Around the turn of the century, other forms of community have emerged. The Quality Indicators for AT (QIAT) Listserv was established at the University of Kentucky. *Closing the Gap*, a monthly magazine featuring articles on AT, has sponsored a series of forums or moderated online discussions about issues in the field of AT. Communities, such as these, have drawn the participation of a number of professionals seeking to employ AT in their educational settings (Edyburn, 2005).

Relationship of Dissertation to Literature

This applied dissertation contributed to the existing literature on in-service training in AT by examining the component structure of in-service training that was then-currently provided and by exploring a model for in-service training which incorporates an eCoP as a means of extending the professional development experience into the period of classroom implementation. While coaching had been demonstrated to be a valuable means of supporting the transfer of training to the classroom (Joyce & Showers, 2002), it was unclear how many special educators were currently supported this way. The dissertation examined the impact of this model upon teacher use of AT. It identified issues for further study and examination related to the role of in-service

training in the integration of AT in the classroom.

Chapter 3: Methodology

The purpose of this research was to examine the impact of the components of in-service training upon the use of AT with students with disabilities. Specifically, the project looked at whether participation in a community of practice following in-service training impacted the use of AT by educational professionals as an instructional support for students with disabilities. The research was accomplished by means of the Delphi technique (Dalkey, 1969). This section includes a discussion of the participants, instruments, background, research design, and procedures for conducting this research.

Participants

Ideally in educational settings, the use of AT with individual students is applied by means of a team approach. AT teams consist of two or more educational professionals, often from different backgrounds. Often, speech-language pathologists, teachers, occupational therapists, physical therapists, and paraprofessionals collaborate in instructional settings to help students with disabilities use AT. Studies (Barry & Wise, 1996; Buysse et al., 2001; Putnam et al., 1995) reported that general-education teachers may also employ AT in classroom instruction with students with disabilities who are included in regular education classrooms. Each of these special education professionals approaches the practice of AT from a slightly different perspective. Each contributes insights and expertise from different disciplines to the process of implementing technology for students with disabilities (Cook & Hussey, 2002).

The participants in this research were drawn from among the professional backgrounds mentioned above. The individuals participating in Round 1 worked with students with disabilities in K-12 schools from the southeastern United States. These individuals completed at least one in-service training workshop in AT from Dunamis,

Inc. from 2001 to the time of this study. The goals of Round 1 were to identify the factors in in-service training which impacted AT use in the classroom and to identify barriers to AT use in the local settings.

Round 1 participants were divided into two groups. The first group was those who had participated in a Dunamis, Inc. workshop between 2001 and June 30, 2005. During this time, no follow-along support was provided. The first group did not participate in an eCoP. There were 137 educators identified and invited to take part in this group. The second group was made up of individuals who participated in Dunamis, Inc. professional development workshops after July 1, 2005. These individuals were invited to become part of an eCoP as an extension of their in-service training. Participation in the eCoP was voluntary. There were 350 educators invited to take part in Group 2.

At the end of Round 1, a panel of 12 members was selected from the pool of Round 1 survey respondents. This panel was asked to take part in Round 2, a Delphi study of the factors and barriers identified in Round 1. Linstone and Turoff (2002) described the model of a "monitor team," (p. 87); in this study, a three-member committee was employed to help select panelists from original set of participants. The committee consisted of the researcher and two instructors from Dunamis, Inc. Panelists were selected on the basis of participation in Dunamis, Inc. in-service training and interest in implementation of AT. The committee referred to the demographic questionnaire (see Appendix A) to assist in the selection of panel. Thirty-five individuals were invited from the Round 1 respondents to take part in Round 2. Five members of this panel accepted from Group 1 and seven accepted from Group 2. This panel was identified as the Local Panel.

A second panel made up of experts in the field of AT was invited to participate.

These individuals were selected, with the assistance of the committee, from around the United States. These were identified by their participation in the QIAT Listserv. Edyburn (2005) identified the QIAT Listserv as an example of an eCoP that focused upon AT issues and challenges. These experts did not attend any Dunamis, Inc. training and did not participate in the Dunamis, Inc. eCoP. However, by virtue of their participation in the QIAT Listserv, these panelists had participated in an established eCoP.

The criteria by which these individuals were selected involved reviewing contributions each had made to the QIAT Listserv over the period from October 15, 2004, to March 31, 2006. If the individual had responded with quality postings to questions posed by other QIAT participants on at least 10 occasions during that period, that individual was put on a list for consideration. A list of 35 names was developed from a search of a database of QIAT postings compiled by the researcher. The quality of the postings was then considered. Postings were evaluated on the basis of the apparent knowledge of AT. A further criteria was applied that looked for reports of the use of AT with students with disabilities in the local setting. A total of 26 individuals were invited to participate. Fourteen accepted initially. Two withdrew during the early stages of the second round. The remaining panel of 12 was identified as the National Panel.

Martino (1993) found that the panelists in effective Delphi research should be authorities in the context and the community they represent. Eggers and Jones (1998) indicated that experts were those who had knowledge and experience in the issue at hand. The fact that the individuals invited to be panelists were experts in AT or had completed Dunamis, Inc. training, and were educators attempting to use AT in the school setting satisfies this requirement. The participants in the National Panel were recognized as authorities in AT by consensus of the committee.

Instruments

The Delphi technique was selected in order to obtain an inventory of factors from Dunamis, Inc. training which have positively impacted use of AT in schools and to obtain consensus as to the factors with the greatest impact (Helmer, 1983). Showers et al. (1987) observed the difficulty researchers looking into the effectiveness of professional development had in isolating particular factors for examination. By employing the Delphi technique, this study provided a blank sheet during the first round on which participants could list the factors they believed had been most important. The panelists in Rounds 2 and 3 then rated and clarified the component factors that had been identified. The Delphi approach was viewed to be superior to a survey because researcher bias in the design of the study could be minimized.

The Delphi method provided a means to confirm consensus and to identify and measure contrasting views. Statistical reporting of Delphi results can help identify the point of focus of the participants' views as well as the scale to which views diverge from that center (Martino, 1993). Dalkey (1969) and Riggs (1983) found that the Delphi panelists arrived at conclusions that were more precise and dependable than could be concluded from interviews or group discussions.

Linstone and Turoff (2002) indicated that the applicability of the Delphi approach is related to the nature of the study. When the context defies experimental investigation or lends itself to collecting and analyzing individual perspectives, the Delphi technique may be of particular value. Linstone and Turoff wrote that Delphi represents a unique solution to the challenge of obtaining and making meaning out of what has been called "collective human intelligence" (p. 5). By virtue of the anonymity provided by the Delphi approach, a diversity of views may be entertained and protected from persuasive

individuals who might otherwise exert undue influence or preempt the expression of alternate perspectives (Helmer, 1983; Martino, 1993).

As noted earlier in studies (Derer et al., 1996; Hutinger et al., 1996; Kapperman et al., 2002; McGregor & Pachuski, 1996; OTA, 1995; Wehmeyer, 1999), the larger environment within which AT use is attempted contains many barriers. Isolating these conditions in a variety of instructional settings is difficult and unlikely to be supported by participating local school administrations. However, educational professionals attempting to employ AT can assist individuals in identifying the aspects of their professional development which have influenced their use of AT.

The Delphi technique. Dalkey and Helmer (1963) developed the Delphi technique while engaged in defense research at the RAND Corporation in the 1950s. The technique has developed into a means to gather and refine information from a group on complex or difficult issues without necessitating a face-to-face assembly of participants. The Delphi method is viewed as a means to develop a consensus of opinion from among a group of panelists or respondents (Helmer, 1983). A coordinator typically identifies an issue and solicits information from a group of panelists. Through a series of successive clarifications, the coordinator refines and resubmits the responses of the group for further clarification and prioritization (Dunham, 1996).

Typically, the Delphi approach involves three or four distinct rounds. In each round, panelists are presented with a survey or questionnaire. After each round, responses are statistically analyzed using median, mean, and either standard deviation or interquartile range (IQR). Summarized data concerning the panel's collective expression is then submitted along with the survey items to each panelist. Panelists are asked to consider the items again. During each round after the first, an opportunity is provided for

panelists to give clarifying comments about any ratings that differ significantly from the rest of the panel or concerning any changes a panelist might make. Consensus is measured by the degree of spread in the IQR or standard deviation. Once the desired degree of consensus has been achieved, the research is halted and the collected data is analyzed (Martino, 1993). The target level of consensus for this study was IQR $\leq$ 1.75.

The statistics used in Delphi analysis are generally descriptive (Helmer, 1983). Calculations of the median and mean for a particular factor indicate the collective center of the participants' views. Measures of the IQR and standard deviation represent the degree of spread or convergence of views about a particular factor. This approach provides visibility to divergence of opinions as well as agreement (Martino, 1993).

The Delphi technique has been used in several studies to compare the opinions of two groups of panelists. Simpson and Brown (1977) used the Delphi technique to examine and compare the ratings of competencies that should be required of science teachers, as provided by two groups of panelists from different states. Klessig et al. (2000) employed a modified Delphi approach to compare the views of directors of programs of internal medicine at teaching hospitals to those of residents in such programs as to what policies and practices constituted a quality residency program in internal medicine. Wei and Hammons (2001) employed a Delphi format to identify areas of consensus between kindergarten teachers and program professors as to what skills should be required during certification testing in Taiwan. Cardon and Rogers (2002) used the Delphi approach to identify and rate factors that influenced the student enrollment in graduate programs in technical education.

Research questions. There were three research questions to be addressed in this study:

What are the factors of in-service training that encourage classroom use at AT? This question was presented to Round 1 participants without elaboration to generate an original list of factors. Panelists were subsequently asked to consider and rate these factors.

Does participation in an eCoP, following a face-to-face in-service training event, enhance educators' use of AT with students with disabilities? This was addressed in the analysis of the results of the panel ratings in the Delphi process. The underlying hypothesis in this study was that participation in an eCoP positively impacts AT use by professional educators working with children with disabilities.

What obstacles or barriers impact the use of AT in the classroom? The possibility remained that the integration of AT involves issues that cannot be addressed by training alone. One item on the questionnaire in the preliminary round asked participants to list obstacles that prevent successful use of AT. This information could be useful in explaining why educators have not been more successful in using AT in the classroom. Based upon preliminary round responses, an investigation of barriers which impede use of AT was incorporated into the subsequent rounds of the Delphi process.

Background. Dunamis, Inc. has provided in-service training in AT after 2001. The structure of this training emphasized theory, demonstration, practice, and feedback as distinct components. The staff attempted to implement a coaching component to in-service training as Joyce and Showers (1980, 2002) have described. This approach was intended to extend the practice and feedback stage of the in-service instruction into the period when the AT was actually put into use by the participant. Coaching by the instructors was viewed by local school district officials to be expensive and difficult to schedule. This approach has not been successfully implemented to date (C. A. Shockley,

personal communication, April 1, 2005).

An alternative approach to providing coaching was developed. By providing participants with access to an eCoP, coaching in the use of AT could be provided by other participants as well as by the instructors. This could also be accomplished in an asynchronous manner where appropriate. This was anticipated to be less intrusive than personal coaching. Beginning with in-service courses delivered after July 1, 2005, Dunamis, Inc. implemented its own eCoP. The face-to-face instruction was structured in exactly the same manner as before July 2005. The only difference was the invitation to participate in the online community following the workshop. It was estimated that there have been between 75 and 100 participants who took part in the CoP in some way in the 1st year (C. A. Shockley, personal communication, September 30, 2005).

A BlackBoard LMS has facilitated the eCoP. The LMS was designed and structured by the Dunamis, Inc. in-service training instructors to accommodate (a) peer coaching, (b) e-mail communication with instructors, (c) synchronous online chats, (d) asynchronous threaded discussions, (e) an activity exchange where participants share created lesson materials, (f) links to additional resources, and (g) articles and research to support AT use. Virtual spaces for each of these activities were established on the LMS site. The Dunamis, Inc. instructors helped moderate the discussions, conducted chats, and responded to issues that participants raised (C. A. Shockley, personal communication, September 30, 2005).

This asynchronous approach was selected because of the potential to support the technology implementation efforts of teachers with little intrusion into the participants' busy teaching day. Teachers could post questions and scan other communications to find ideas and solutions that will apply to their classroom experiences. Periodic chats were

held to compare experiences and answer questions. The use of the Dunamis, Inc. eCoP as a central online coaching center was considered attractive to certain local school districts as their IT infrastructure was unable to host such an operation (C. A. Shockley, personal communication, September 30, 2005).

Research Design

This research employed a modified Delphi approach (Eggers & Jones, 1998) to gather and clarify the perceptions of special educators concerning Dunamis, Inc. in-service training in AT. The Delphi approach was appropriate for this project because of the diversity of factors that have been identified that may impact the use of technology in the classroom. The Delphi method provided a means to collect and quantify consensus and disagreement about the impact of the factors upon AT use, while minimizing researcher bias (Helmer, 1983).

Originally a four-round Delphi technique was to be employed. In the first round, a pre-Delphi probe (Eggers & Jones, 1998) asked the local pool of participants to identify the factors in Dunamis, Inc. training that have positively impacted AT use in their professional setting. Participants were also asked to list barriers to AT use they encountered. In the second round, two smaller panels of experts in AT, the Local Panel and the National Panel, were to be called upon to rate the factors that had been identified in Round 1 to determine which factors were believed to contribute most to AT use. The third and fourth probes were intended to ask for clarification and attempt to expand consensus on the most significant factors. The data was analyzed by use of descriptive statistics with means and medians calculated for each item when rated. Interquartile range was calculated for each factor and barrier, as a means of assessing the level of consensus.

In the initial round of a Delphi study, the context is left intentionally amorphous

(Martino, 1993). In Round 1, a survey asked the larger pool of participants (individuals in Local Groups 1 and 2) to address the research questions. Each participant was asked to list the factors in Dunamis, Inc. in-service training that contribute to use of AT with students with disabilities. Each panelist was also asked to identify any barriers to AT use that they encountered in their local setting. The responses were collected electronically via a Web-based response site. Lists from Group 1 and Group 2 were assembled separately. The listed factors were analyzed by the committee. Redundant factors were discarded. A compiled list of all unique factors was produced.

In the second round, panelists were presented with the compiled list of factors and asked to rate each factor concerning impact upon AT use. A Likert scale was employed, including the following responses: 1 = *strongly disagree,* 2 = *disagree,* 3 = *unsure,* 4 = *agree,* and 5 = *strongly agree*. Participants were also presented a list of barriers to AT use that had been compiled during Round 1. The same Likert rating scale was used for the list of barriers. The responses were collected via a Web-based response site.

Second-round responses were analyzed for degree of group consensus using computations of median and interquartile range (IQR). Helmer (1983) indicated that this approach is the most appropriate for Delphi analysis. This describes the ranges of differing perspectives on a particular item (Martino, 1993). Factors were listed with mean, median, and first and third quartiles. Results from Local Panelists and National Panelists were tabulated and listed separately. Panelists were invited to view the results for their panel online.

In the third round, the list of factors and barriers, with group statistics from Round 2, were presented to each participant along with their own rating for each item on the previous round. Panelists were invited to adjust any of their previous ratings using the

same Likert scale. Space was provided for clarifying comments. Panelists were asked to justify changes and explain choices that are a significant departure from their group's mean. Responses from the third round were collected and the mean, median, and first and third quartiles calculated to accommodate any changes that were made. Again, each group's statistics were calculated and recorded separately.

After careful analysis of the results of Round 3, the fourth round was deemed unnecessary. Martino (1993) pointed out that a fourth round may be unnecessary. When the analysis of the factor ratings leads to the identification of a set of particularly ascendant factors, the data collection phase of the project may be considered finished. If sufficient consensus has been reached, and there is little variation between the second and the third round responses, the fourth round may be dropped. Similarly, if there are clear differences of opinion expressed with sufficient elaboration, and responses do not vary between rounds, then no additional round may be required. An IQR of 1.75 was deemed to indicate sufficient consensus.

Procedures for Analyzing the Data

The initial research question concerns the identification of factors that contribute to classroom AT use. Two aspects were examined to ascertain which factors have influenced AT use. One aspect was the panelists' ranking of factors by median. The second aspect was the IQR that is an indicator of consensus. A high mean ranking and a narrow IQR would indicate consensus that a particular factor was influential.

A second question to be investigated in this research was whether participation in an eCoP, following in-service training, improved special educators' ability to implement AT with their students. Again, two aspects were measured to determine whether participation in an eCoP has impacted participating teachers' ability to implement AT in

their classroom. The first was the panelists' ranking of eCop as a factor. This was measured by a ranking of factors by median. A high ranking would indicate the importance of the eCoP. The second consideration is that of the degree of consensus about the impact of the eCoP. A small IRQ would indicate a high degree of consensus among the panelists.

The third element of this study was the question of what barriers to AT use existed in the local settings. As in the case of the factors and the eCoP above, median rankings of the panel ratings and the IQR would be examined to discern common barriers and the degree of related consensus.

The analysis of the final round responses was compared to results of the preceding round. For each of the final two rounds, factors and barriers were presented listing mean, median, first quartile, and third quartile. A comparison of median scores for each factor and barrier from the last two rounds and a calculation of interquartile differential were constructed for each group. Results from the final round were analyzed for significance using the Test of Marginal Homogeneity.

Presentation of results. A list of factors was presented listing mean, median, first quartile, third quartile, and IQR, by group, for each of the final two rounds. These factors were also presented according to two additional sorts: ranked by median and ranked by IQR. Barriers identified in this study were listed and ranked in the same way as the factors.

Summary

AT holds the promise of greater opportunities for learning and growth for students with disabilities. Teachers are central to the process of implementing technology with students in special education classrooms. For in-service teachers, training has been

identified as an essential element in the implementation of AT. In-service training that incorporates coaching is more effective at addressing innovations requiring radical change than the existing model (Joyce and Showers, 2002). This research explored the component factors that are present in Dunamis, Inc. in-service training. Specifically, this study sought to examine the incorporation of an eCoP as part of in-service training to discover its impact on use of AT by educators working with students with disabilities.

Chapter 4: Results

This research was undertaken to investigate the impact of the factors that comprise in-service training upon the use of AT. In particular, the study sought to determine whether participating in an eCoP following face-to-face in-service training had a constructive impact upon AT use. In addition, the project endeavored to identify current barriers to AT use. This research employed the Delphi technique (Dalkey, 1969) to collect the opinions and observations of experts in the field of AT concerning these questions. These questions were addressed in a series of surveys conducted from April, 2006 through August 2006. This chapter presents the outcomes of the implementation of the research plan and the results obtained from the expert panelists who took part in this project.

Research Questions

This project addressed three research questions.

1. What are the factors in in-service training that encourage classroom use of AT?

2. Does participation in an eCoP, following a face-to-face in-service training event, enhance educators' use of AT with students with disabilities?

3. What obstacles or barriers impact the use of AT in the classroom?

A three-round modified Delphi technique (Eggers & Jones, 1998) was used to examine these research questions. The outcomes of the conduct of this research design are discussed in the section that follows.

Results: Implementation of Research Design

This study employed a Delphi approach to collect information from participants in training provided by Dunamis, Inc., a provider of in-service training in AT in the Southeastern U.S. The Delphi technique (Dalkey, 1969) involves participants (called

panelists) in a series or rounds or probes in which the perceptions of panelists are collected, tabulated, and resubmitted for additional comments and consideration. The objective in Delphi research is the achievement of consensus among the panelists.

Using a process described by Eggers and Jones (1998), 487 individuals who had attended Dunamis, Inc. training between 2001 and 2006 were invited to take part in an online survey. The survey asked several general questions about background, experience, and AT use. The survey also contained two open-ended questions about factors in in-service training that encourage AT use and barriers to AT (see Appendix A).

Each participant was contacted by e-mail if the address was known and still active and invited to take part. When e-mails were not available, invitations to participate were sent by U.S. Mail. Participants were informed that their responses would be collected by means of an online questionnaire. A second communication was sent to each prospective participant (by e-mail or U.S. mail) providing the Internet address of the questionnaire. A third e-mail, supplemented by postcards, was sent to remind participants who had not yet completed the questionnaire. A sample letter of invitation is included in Appendix B.

A total of 52 individuals completed the Round 1 survey. Twenty-two participants in Group 1 in Dunamis, Inc. workshops prior to July 1, 2005, responded. Twenty-nine individuals in Group 2 who took part in training after July 1, 2006, responded. Only two participants had difficulty using the Internet site to complete their questionnaire. These were able to print the survey out and deliver it via facsimile or U.S. mail. Round 1 produced a list of 12 factors and 12 barriers.

From the participants in Round 1, a group of 12 individuals agreed to become a Local Panel for the purposes of Rounds 2 and 3. An additional group of 12 individuals, made up of experienced AT users from around the country, agreed to take part in Rounds

2 and 3. These individuals were designated as the National Panelists. A sample invitation to participate in Round 3 is presented in Appendix C. Demographic data collected from participants in this research are presented in Appendix D.

In Round 2, lists of factors and barriers were submitted to the 24 Delphi panelists in the form of an online 5-point Likert-type scale survey providing the following responses: 1 = *strongly disagree,* 2 = *disagree,* 3 = *unsure,* 4 = *agree,* and 5 = *strongly agree* (see Appendix E). All 24 panelists completed the second-round survey. The median and mean ranking for each factor and barrier, along with first and third quartiles, were posted for each panel at separate Web addresses.

After being given a week to review the results of Round 2 online, panelists were sent an e-mail inviting them to take part in Round 3. Attached to the e-mail was the survey as a Microsoft Word document from Round 2 along with participant's own responses and the mean, median, and quartile scores for each question. Panelists were asked to consider each question again in the light of the group's responses, and give a rating for each factor or barrier that reflected the panelist's then-current thinking. All 12 National Panelists completed Round 3. Ten of the Local Panelists completed the round.

Data from Round 3 was analyzed in the same way as the data from Round 2. Particular attention was paid to the IQR calculation for each item. A number of items presented a low IQR indicating that consensus had been reached. Thus, it was concluded that there was no need to conduct a fourth Delphi round.

Results: Factors in In-Service Training That Impact AT Use

A list of factors from in-service training that influence the use of AT were obtained from 52 respondents to the online survey used in Round 1. The results from the survey for each group were collected separately and listed as received. A committee

(Linstone & Turoff, 2002) reviewed the list looking for similarity of content.

Participants in Groups 1 and 2 identified very similar lists of factors and barriers during Round 1. There were differences in the frequency with which the items were identified. For example, Group 1 identified practical implementation ideas (6) and hands-on practice (5) as its top two factors. Group 2 identified comprehensive instruction about features of AT products (7), effective demonstrations (5), and exposure to a variety of AT options (5) as its top factors. Because both groups identified such similar lists factors, a single list of 12 factors (see Appendix F) was produced for use in Round 2.

In Round 2 panelists were asked to rate the factors identified in Round 1. Panelists employed a 5-point Likert-type scale to indicate the degree to which each factor contributed to AT use with students with disabilities (see Appendix G). In Round 3, panelists were provided with the responses of their own panel and their individual response from Round 2. Participants were asked to consider each factor again in the light of the panel's ratings.

At the conclusion of Round 3, the ratings of the panelists were analyzed (see Appendix H). All 12 factors were rated highly by the Local Panel. Of the 12 items, 7 received all 4s and 5s and correspondingly presented small IQRs (< 1.00), indicating strong consensus. All 12 factors received large median scores (median ≥ 4.00) and all demonstrated significant consensus (IQR < 1.75). None of the factors received less than a 3 from any Local Panelists.

National Panelists rated 7 of the 12 factors highly, giving them 4s and 5s exclusively. Ten factors received median scores of 4.00 or higher. For 3 of these items, the IQR scores were very low (< 1.00). Six additional factors also received a high median score (≥ 4.00) from the National Panel and demonstrated a significant level of consensus

(IRQ = 1.00). Three of the 12 factors received higher IQR scores (≥ 1.75). The factors are listed with National Panel ratings in Appendix H.

The nine factors that were highly rated (median ≥4.00) by both panels and also given low IQR scores (≥ 1.75). These nine factors were (a) hands-on practice using the AT products; (b) effective demonstrations; (c) interactive presentation, encouragement to ask questions; (d) quality documentation and handouts that support the instruction; (e) practical implementation strategies, ideas, applications; (f) examples from personal experiences and real-life to specific applications; (g) effective communication--presented in "layman's terms," (h) information and support available following workshop, through eCoP; and (i) expertise, knowledge of workshop leader (see Appendix I).

Results: Impact of Participation in an eCoP Upon AT Use

In Round 1, none of the participants in either group identified the eCoP as a factor in in-service training that contributed to AT use. This was surprising because some of the participants from Group 2 had actually participated in the eCoP provided by Dunamis, Inc. The committee decided that two explanations appeared to be possible. One was that the eCoP was, in fact, of no value in encouraging AT use. The other was the possibility that participants may have viewed participation in the eCoP to be a separate and distinct set of experiences and not perceived the eCoP as directly related to the in-service training experience. As such, while the eCoP might have been perceived as valuable, it may not have occurred to participants to include it in a list of factors related to in-service training.

Because the list of factors had been collected from an open-ended survey questions, the committee found the latter explanation to be a plausible explanation. The committee decided to include the eCoP as a factor for consideration in Round 2, despite it not having been mentioned by participants in Round 1. In this way, greater clarity could

be achieved concerning the relative value of the eCoP. If the eCoP was of no value, then it would be made clear in the ratings in subsequent rounds. If the eCoP was valuable, but had not been viewed as part of the in-service experience, then panelists could clarify how valuable it was relative to other factors.

The distinction in Round 1 between Group 1 and Group 2 had been based upon whether or not participants had taken part in the eCoP. Given the failure of the respondents in Round 1 to identify the eCoP with the in-service training experience, the committee decided that the local participants should be treated as one single group for the purposes of Round s 2 and 3.

During Round s 2 and 3, the median for ratings of eCoP was 4.0000 for the Local Panel. The Local Panel interquartile range (IQR) for eCoP was 0.7500 for both rounds. The median for the National Panel on eCoP as a factor contributing to AT use was 4.33 for both rounds. The National Panel IQR was 1.00 for both rounds. These median scores remained constant through the two rounds. The IQR scores were consistent and low.

Results: Barriers That Impact AT Use

The respondents to the online survey used in Round 1 (see Appendix A) also contributed to a list of barriers to AT use from the local setting. In the same manner as described for the factors, the results for barriers from the survey were collected and listed as received. The committee reviewed the list and consolidated the survey statements into 12 factors (see Appendix F).

As with the factors, Groups 1 and 2 identified a very similar set of barriers. Again, there were differences between the groups as to what items received the most frequent mention. Group 1 identified not enough time (10) and not having enough computers and AT materials (4) as the most common barriers. Group 2 identified not enough training (7)

and getting fellow professionals to use AT consistently (5) as the most frequent barriers. Because Groups 1 and 2 identified such a similar list of barriers, the panelists in Round 2 were presented with a single consolidated list of 12 barriers (see Appendix F).

As with the factors, the 12 barriers were submitted to the Delphi panelists in the form of an online survey. The Round 2 survey on barriers also employed the same 5-point Likert-type scale that was used for the factors (see Appendix E). The Local Panel identified 6 barriers that were significant (median ≥ 4.00) and about which there appeared to be significant consensus (IRQ ≤ 1.75). The National Panel also rated 4 barriers highly (median ≥ 4.00) and demonstrated significant consensus (IRQ ≤ 1.00) concerning these four. The four barriers that were identified by both panels were (a) not enough training, (b) not enough time, (c) getting fellow professionals to use AT with students consistently, and (d) teachers and parents lack of AT knowledge and unwillingness to try it.

Consensus and the Test for Marginal Homogeneity

The aim of a Delphi project is for the panel to reach consensus (Dalkey, 1969). In this case, the target was consensus concerning whether particular factors and barriers affect the use of AT in the classroom. The IQR was used to measure the emerging consensus. The test of Marginal Homogeneity was used to confirm consensus.

Median scores from Round 2 for each factor for each panel were compared to those for that factor and panel in Round 3 by means of the test of Marginal Homogeneity. The same calculation was done for barriers for each panel. Helmer (1983) indicated that comparing the median scores between rounds reflects the progress toward consensus most effectively. Marginal Homogeneity indicates the degree to which the panelists are employing the Likert scale categories of *strongly disagree, disagree, unsure, agree,* and *strongly agree*, similarly. Marginal Homogeneity measures the boundaries with which

panelists define and distinguish these ratings as they categorize their perceptions of the impact of each factor or barrier (Uebersax, 2000).

The Monte Carlo method of computing significance was used when the exact significance could not be computed. This method calculates a large number of possible outcomes and compares the results from the research data with the Monte Carlo calculation to determine significance. The test for Marginal Homogeneity was conducted testing for significance at the 95% confidence level, which corresponds to significance at the $p \leq .05$ level (Torrence & Compo, 2006) for each factor and barrier. No factor or barrier was found to have ratings that were significant at this level. The significance value ranged from .12 to 1.00 (see Appendix J).

Summary

The Delphi method was used to identify and rank 12 factors and barriers which impact AT use. Results from ratings by panelists in Round 2 and Round 3 were presented and compared. Interquartile ranges were compared as a means to examine consensus.

The chapter following elaborates upon the results of this study. The limitations of the study are detailed. Areas for further future research are identified. The dissertation is summarized and possible applications are discussed.

Chapter 5: Discussion

Introduction of Dissertation

In this chapter, the implications of the results of this study are presented. The research problem and research questions are reviewed. The research findings are interpreted and limitations of the research are discussed. Recommendations for practice and further study are presented.

Research problem. There has been an increase of in-service training in AT for teachers and therapists who work with students with disabilities (SPeNSE, 2002). However, studies (Bausch & Hasselbring, 2004; Bradshaw, 2002; Derer et al., 1996; Schrum, 1999) supported that there has been only limited progress in implementing AT. Research (Derer et al.; Hutinger et al., 1996; Kapperman et al., 2002; McGregor & Pachuski, 1996; OTA; Wehmeyer, 1999) reported that insufficient training continues to be identified as a barrier to greater implementation of AT. If in-service training in AT is expanding but implementation of AT lags, then one area for investigation would be the structure of in-service training.

Purpose of research. The purpose of the research was to examine the structure of in-service training in AT to identify the factors involved in in-service training which impact use of AT with students with special needs. In particular, the study sought to discover how participation in an eCoP as part of in-service training might impact AT use. Further, the study attempted to identify barriers to AT use in the settings where participants worked.

Dunamis, Inc., an Atlanta, Georgia, based provider of in-service training in AT, modified its training approach in July 2005 to include an eCoP as a component of its in-service workshops. Participants in Dunamis, Inc. training held after July 1, 2005, were

invited to take part in the eCoP.

Research questions. There were three questions which guided this research:

1. What are the factors in in-service training that encourage classroom use of AT?

2. Does participation in an eCoP, following a face-to-face in-service training event, enhance educators' use of AT with students with disabilities?

3. What obstacles or barriers impact the use of AT in the classroom?

These questions were addressed by the participants in this study.

Overview of results. This study employed a modified Delphi approach (Eggers & Jones, 1998). A total of 487 Dunamis, Inc. workshop participants were invited to take part in a survey to identify the structural components of Dunamis, Inc. in-service training that contributed to AT use with students with disabilities. The participants were also asked to list barriers to AT use that they found in their setting. Fifty-two individuals responded in Round 1. From the participants' responses 12 factors and 12 barriers were identified.

In preparation for Round 2, two smaller panels, each consisting of 12 members, were assembled to rate the factors and barriers according to the level of impact each had upon AT use in the local setting. A Local Panel was drawn from educators who participated in the first round of the research. A National Panel of AT experts was selected from among participants from around the United States who participated in the QIAT Listserv. These panelists participated in two Delphi rounds. In each round, they were presented with a survey listing the factors and barriers generated by the participants in Round 1. A Likert scale was employed where 1 = *strongly disagree,* 2 = *disagree,* 3 = *unsure,* 4 = *agree,* or 5 = *strongly agree* that the item contributes to AT use.

All 12 factors were rated highly by the Local Panel. National Panelists rated 10 of the 12

factors highly. There was significant agreement between the two panels about 9 of the factors identified as having an impact on AT use. These items were (a) hands-on practice using the AT products; (b) effective demonstrations; (c) interactive presentation, encouragement to ask questions; (d) quality documentation and handouts that support the instruction; (e) practical implementation strategies, ideas, applications; (f) examples from personal experiences and real-life to specific applications; (g) effective communication presented in "layman's terms"; (h) information and support available following workshop, through eCoP; and (i) expertise and knowledge of workshop leader.

Both the National and Local Panels rated the eCoP highly. Both panels reached consensus concerning the impact of the eCoP. The National Panelists were more positive about the impact of the eCoP. Both panels identified several other factors as having at least as much impact upon AT use as the eCoP.

The Local Panel identified five barriers that were significant and about which there appeared to be significant consensus. There were four barriers the National Panel rated highly and about which significant consensus was evident. Four barriers were common to the lists of both panels: (a) not enough training, (b) not enough time, (c) getting fellow professionals to use AT with students consistently, and (d) teachers and parents lack of AT knowledge and unwillingness to try it.

Implications of Findings

There are several implications of the results of this research. This section describes how the findings are consistent with the research literature and identifies areas where the results depart from what was anticipated. The application of these findings to the local setting of the Dunamis, Inc. workshops is discussed with particular emphasis upon the eCoP.

Relationship of findings to literature. The nine factors from in-service training that positively impact AT that have been agreed upon by the two panels conform closely to the ideal structure for in-service training described by Joyce and Showers (2002). Joyce and Showers identified five components to successful in-service training: (a) presentation of theory, (b) demonstration, (c) practice, (d) feedback, and (e) coaching. The panels identified several specific factors which relate to direct instruction and dialogue as it relates to theory. The expertise of the workshop leader and ability to communicate effectively, the quality of the documentation and handouts, and the presentation of practical implementation strategies all contribute to effective presentation of underlying theory. The panelists identified and rated highly two factors relating to modeling and demonstration: effective demonstrations and providing examples from experience. The panelists specifically identified three factors which were specific components of ideal structure described by Joyce and Showers: (a) hands-on practice, (b) interactive presentations or feedback, and (c) eCoP or coaching. In Appendix K, a comparison of factors from Dunamis, Inc. training is provided which was identified by Local and National Panels as having significant impact on AT use to ideal structure for in-service training which was described by Joyce and Showers.

The specific ratings given the eCoP as a factor in in-service training by the two panels appears to be less substantial than the research of Showers et al. (1987) might lead one to expect. Showers et al. indicated that the impact of training which includes all five factors--theory, demonstration, practice, feedback, and coaching--is significantly greater than training which includes any combination of components but excludes coaching after the training. Both panels rated eCoP as an important factor but neither panel appeared to see it as a factor of surpassing importance. The possible reasons for this may lie in the

design of this study. This is discussed further in the section, Recommendations for Further Study.

The participants in Round 1 identified many of the same barriers to AT use that have been mentioned in the literature. The panels narrowed the significant barriers down to four: (a) not enough training, (b)getting fellow professionals to use AT with students consistently, (c) teachers and parents lack of AT knowledge and unwillingness to try it, and (4) not enough time. Research (Derer et al., 1996; Hutinger et al., 1996; Kapperman et al., 2002; McGregor & Pachuski, 1996; OTA, 1995; Wehmeyer, 1999) also reported that among these, the issues of a lack of training and inadequate knowledge of AT were prominent in most of the studies on barriers to AT. The fact that the issue of a lack of training in AT received the highest mean ranking and achieved the greatest consensus in both panels is consistent with the findings throughout the research literature.

Similarly, studies (Kapperman et al., 2002; McGregor & Pachuski, 1996; Wehmeyer, 1999) also identified that the issue of a lack of time as a barrier to AT use. The fact that this barrier was confirmed by both panels but not ranked as highly as other barriers is also characteristic of the literature in that the issue of time appears in about half of the studies on barriers to AT use. However, the intensity of comments volunteered by some panelists concerning the impact of time constraints upon AT use was striking. A national panelist (personal communication, August 1, 2006) stated that

> Regular education and special education teachers are overwhelmed with adhering to The No Child Left Behind laws which have greatly impacted IDEA. To many of them, a child with AT needs and the training required is just another thing to stress them out.

Also noteworthy in this study is the prominence of the issue of obtaining the participation of fellow professionals in the use of AT. This barrier is mentioned only

peripherally in the study by Hutinger et al. (1996). Two other studies (Derer et al., 1996; Wehmeyer, 1999) mentioned that awareness and understanding of the possible applications of AT could be barriers. This barrier is discussed further in the section, Recommendations for Further Study.

Eight other barriers were identified in Round 1 of this study. When these barriers were presented to the panelists in Rounds 2 and 3, they did not receive high median rankings. Some of these barriers did receive significant consensus, however. The National Panel reached consensus concerning lack of financial support (IQR = 0.00) and equipment breakdowns (IQR = 1.75), but rated these very low (Median ≤ 2.67) as barriers. The Local Panel achieved consensus upon the responsiveness of AT staff (IQR = 1.75). Both panels reached consensus concerning the difficulty of use of AT (IQR = 1.75). In each case, these barriers received a mean ranking at or below 3.00. These rankings indicate a lack of panelists' conviction that these were barriers to AT use.

The panels had more difficulty reaching consensus on other barriers. The National Panel demonstrated the least consensus concerning the availability of sufficient computers (IQR = 3.00). In this case, responses stratified at two poles: s*trongly disagree* (1st quartile = 1.00) and *agree* (3rd quartile = 4.00). Comments from panelists indicate that these diverse ratings may be the result of very different experiences in the local settings of the panelists.

Panelists achieved more limited consensus on the other barriers where IQR = 2.00. These items received mean rankings from 2.75 to 3.00. Such rankings also indicated that panelists as a whole did not regard these barriers to be significant. However, it is worth noting that a few individual panelists did rank these barriers highly. Their accompanying comments confirm that some of these barriers were important in

their local settings. While it may be observed that some barriers appear be more common than others, it appears likely that the barriers that were identified in Round 1 still persist as impediments to AT use in some local settings.

Implications of findings in local setting. Participants in Round 1 identified factors from Dunamis, Inc. training that were contributing to AT use. These factors were verified by the Local Panel and confirmed by the National Panel during Rounds 2 and 3. This would indicate that Dunamis, Inc. training incorporates several factors that have been identified as having a positive impact upon AT use. Comments from Round 1 participants confirmed that Dunamis, Inc. training has been effective and helpful: "Dunamis, Inc. provided expert advice/instruction on how to use programs;" another said, "The presentations are always interesting, professional, and encouraging."

Other participants related that Dunamis, Inc. training encouraged use of AT with students with disabilities: "I always come out with simple, easy to use and make ideas that I can implement immediately without too much effort." Another participant volunteered a similar comment: "I could easily use the information with my students when I returned to school."

Consistent with the research literature, the educators in this study reported that more training was needed to support successful implementation of AT. Both panels saw the lack of AT training as a primary barrier (Median=5.00). Both panels evidenced strong consensus (IQR=1.00) on this item. Panelists stressed the importance of training for them personally, "AT instruction is a powerful tool, and I would like to participate in more training that would assist me in utilizing it in my therapy sessions." Another panelist asserted the importance of in-service training in AT in the local school setting: "This is huge!"

It appeared clear from this research that there continues to be a need for in-service training in AT similar to that provided by Dunamis, Inc. Panelists in this research indicated that they believed that Dunamis, Inc. training contributed to use of AT. The Local and National Panels confirmed that the structure of Dunamis, Inc. is consistent with the ideal structure for in-service training described in the literature (Joyce & Showers, 2002).

The innovation of employing an eCoP as a follow- up to Dunamis, Inc. in-service training appeared to have been regarded as having a positive impact upon AT use. The panelists achieved significant consensus relating to the eCoP. The IQR from the National Panel was 1.00. The Local Panel's IQR was 0.75. The panelists also provided high mean rankings for the eCoP. The Local Panel rated the eCoP at 4.10. The mean ranking from the National Panel was 4.33. These responses argued for the continuation of the use of the eCoP in conjunction with Dunamis, Inc. in-service training.

However, the level of the mean rankings relative to other factors indicated that panelists did not see the eCoP as the catalyst for improved transfer of training that was anticipated. In fact, the participants in Round 1 appeared not to perceive the eCoP as an integral part of the in-service training experience. It would appear that Dunamis, Inc. should explore the potential of the eCoP further.

Some of the panelists' comments are illuminating. Several mentioned the benefits of using the eCoP. It "allows people to ask questions and also see that others have used this successfully." Another said, "Often people lurk on these communities and have questions answered without ever having to be the one to ask them." A National Panelist observed that eCop was useful because of the isolation of many professionals; "special educators are pretty much out there on their own." One summed up by saying, "I can only

see this as a strong positive because it provides another means of feedback and support."

Others noted the limitations. One Local Panelist said that the eCoP was useful "for a limited number of teachers who will take the time to look for information." Another said, "it's only useful if the community itself is active and responsive. I think this is a developing kind of support that we do not know how to use effectively yet."

These comments reinforce the need to explore further the potential that the eCop represented. Specifically, it may be useful to examine how the community can be encouraged to become more interactive. It seemed clear that the eCoP would be viewed as successful to the degree individual participants could be encouraged to value and become involved in the community. This is discussed further in the section, Recommendations for Further Research.

Limitations

The applicability of the findings from this research must be tempered by two considerations. This first is the selection process by which participants entered the study. The second is the design of the research which was focused around training provided by Dunamis, Inc.

The means by which participants in this study were selected dictated that care must be taken in the application of any conclusions. The participants in Round 1 and on the Local Panel were all participants in Dunamis, Inc. training events. While all participants in Dunamis, Inc. training after 2001 were invited to take part in this research, the actual participants were self-selected. As such, the participants in this study may not be representative of all educators who took part in Dunamis, Inc. training nor of special educators, in general. It was true that results from the Local Panel might serve to verify the factors and barriers that had been identified in the literature, but because no effort was

made to consider input from additional participants, the applicability of the results remained limited.

The participation of National Panelists did provide some measure of broader insight into the impact of the factors and barriers. However, because the National Panel was not selected at random, but rather gathered from a collection of participants in the QIAT Listserv, the panel cannot be said to be representative of special educators, in general. As a panel of experts (Linstone & Turoff, 2002), the views of the National Panel may be of some informational value with respect to the condition of AT training on a national scale. However, the findings of this study should not be applied generally without further research.

The design of the research also argued that caution be used when applying findings from the study. This study solicited factors that contributed to AT use as they were presented in training provided by Dunamis, Inc. The barriers identified came from the local settings of the participants in Round 1. The entire study was based upon these factors and barriers. No attempt was made to solicit additional factors or barriers from the National Panel or from other sources. While the National Panel accepted and embraced the content of this study, the question of whether these factors and barriers constituted an exhaustive list was never addressed. While the Delphi method (Dalkey, 1969; Linstone & Turoff, 2002; Riggs, 1983) which surveys the opinions of panels of experts provides a measure of confidence in the results obtained, the fact remains that the study addressed items identified in Dunamis, Inc. in-service training. Given that the participants were not selected at random and the research was designed around Dunamis, Inc. training events, care must be taken to apply the findings from this research, without further study, beyond the environment of Dunamis, Inc. training.

Recommendations

Recommendations for practice. This study examined the factors in Dunamis, Inc. in-service training that encourages use of AT with students with disabilities. The findings of this research could be applied most readily to the in-service training provided by Dunamis, Inc. There may be some generic applications of this study that can serve as a guide to in-serve training programs as they seek to improve AT use.

As the impact of the factors identified from Dunamis, Inc. training was validated by the Local and National Panels, Dunamis, Inc. training appears to be structured in a way that contributes to AT use. However, there may be other factors that may contribute to AT use that were not considered. Dunamis, Inc. should continue to build upon its then-current training structure and continue to seek ways to encourage and enhance the transfer of its training to the classroom.

With respect to the question of whether an eCoP contributes to AT use, this research appeared to confirm that it does. Yet the results of this study leave open the question of how best to structure the eCoP. As described above, this data was collected at the end of the 1st year of an innovation that was still evolving at the time of this study. The comments of the panelists should provide some impetus and guidance for further development of the eCoP as an extension of in-service training. Specifically, Dunamis, Inc. might consider the initiation of a Listserv to accompany its eCoP Web site. The elevated level of the National Panel's perceived impact of the QIAT Listserv upon AT use supports this step. Second, Dunamis, Inc. might examine the then-current procedures and practices of the eCoP with a view to making them more accessible and interactive. Panelists comments indicated that opportunities to interact with other professionals concerning AT use are helpful. Third, it seemed clear that the link between face-to-face

in-service training and the eCoP needs to be strengthened. Some means of immediate connection to the eCoP, such as an online chat during the week following a workshop, might help participants identify it as a continuation of the in-service training experience.

Beyond the experience of Dunamis, Inc. in-service training, some of these findings are worthy of further consideration and exploration. Other in-service training programs in AT might consider surveys of their constituents that ask questions similar to those asked in this study. The research of Joyce and Showers (2002) has provided a framework with which to approach the structure of in-service training in general. This study has applied that framework to in-service training in AT. The findings of this study may provide a launching point for other programs to explore the needs of professionals in the local setting.

The innovation of employing the eCop as a means of coaching following in-service training appears to have merit. While there remains questions about how best to structure the eCoP, it is worthy of consideration as a way to support educators as they seek to implement AT following training. One barrier that was identified indicated that some are experiencing difficulty getting fellow professionals to AT use with students consistently. If professional performance issues play a significant role in the failure of educators to implement AT in the classroom, coaching provides an opportunity to assist teachers in meeting performance criteria (Wade, 1984). If face-to-face coaching as an extension of in-service training is difficult to implement, the eCoP presents a potentially viable alternative to explore.

Recommendations for further research. Several points from this research deserve further study and examination. While this study provided visibility to the impact of components of Dunamis, Inc. training upon AT use, it did not systematically investigate

beyond that environment. Further investigation is warranted concerning: (a) The possibility of additional factors that might contribute to AT use, (b) the optimum structure of the eCoP, and (c) the significance of the barriers of lack of time and difficulty getting fellow professionals to use AT.

One question that should be asked has to do whether there are components of in-service training that impact AT use that are not present in the Dunamis, Inc. training. Replications of the Round 1 survey involving participants in other AT in-service training environments may indicate that there are other factors that contribute to AT use that were not considered in this research. Because the Dunamis, Inc. training was modeled after the research of Joyce and Showers (2002) and because the results of this study appear to echo that research, the in-service training in this project would appear to represent the then-current best-practice in professional development for AT use with students with disabilities. However, that cannot be concluded from this research alone.

While this research appears to indicate that the eCoP was a factor which contributed to AT use, the study did not delve into the structure or operation of an eCoP. Two different models were represented in the two panels for Rounds 2 and 3. The Dunamis, Inc. eCoP to which Local Panel participants were exposed was built around a Web-based LMS to which participants had to login in order to participate. The National Panelists were familiar with the QIAT Listserv which employed a Listserv e-mail system to connect its members. The Dunamis, Inc. eCoP required that participants "pull" information. QIAT participants had information "pushed" to them as part their regular daily e-mail routine. There may be aspects of these two models, or of other models beyond these, that make for more effective support and communication. The question of what constitutes an effective eCoP was not addressed in this study and could have had

bearing upon how the panelists in this study rated this factor.

Further, the research of Joyce and Showers (2002) indicated that coaching, in connection with in-service training, has a considerable impact upon the successful implementation of the core concepts of that training. That sizeable effect was not in evidence in this research. If the eCoP represented a follow-along coaching experience for in-service training participants, then it would be instructive to examine the construct of various electronic communities to determine what structure delivers the best support and coaching. To consider the full effect of the eCoP as part of an in-service training program, the research would have to go beyond identifying individual factors contributing to AT use. This would involve the study of the impact of the combination of the factors identified in this study upon transfer of training to classroom use of AT.

The part of this study that dealt with barriers confirmed the continuing perception that more training is needed in order for successful implementation of AT to be achieved. However, two barriers were identified and rated with such significance and consensus that they deserve further investigation. Earlier studies (Kapperman et al., 2002; McGregor & Pachuski, 1996; Wehmeyer, 1999) found that the issue that educators raise that they do not have enough time to work with AT has appeared in this study. However, the intensity and breadth with which it has appeared in this study raises two questions: How have the changes in accountability and the emphasis upon testing as the measure of student progress for students with disabilities impacted teaching and working with students with disabilities? What can be done to give professionals who work with students with disabilities more time to incorporate AT into their practice?

A second barrier identified in this study has to do with the challenge of getting fellow professionals to use AT with students consistently. This barrier was rated highly

by both the Local and National Panels and received significant consensus in both. The practice of AT has been depicted as a team-based process (Cook & Hussey, 2002). If there is difficulty in getting all members of a student's support team to participate fully and consistently in the implementation of a students' Individual Education Plan, then additional questions are raised. Why are educators not consistently supporting students' AT use? Does this relate to the time factor mentioned above? Does this relate to a performance consideration? If this relates more to performance management, then is in-service training really an appropriate or complete solution to the challenge of supporting AT use? Perhaps a concerns-based approach to research on this subject can shed more light on to what may be happening here (Hall & Hord, 2001).

Summary

This research has identified 12 factors from Dunamis, Inc. in-service training which contribute to AT use. One of these factors was the eCoP used as a follow-up to in-service training to provide ongoing coaching and support. Nine of these factors were validated by Local and National Panels through the Delphi method. The eCoP was 1 of the 9 factors on which the Delphi panels agreed. These results were consistent with the Joyce and Showers (2002) model for the ideal structure of in-service training.

This study also identified 12 barriers to AT use in local settings. The panelists in this study reached consensus on only 4 of these barriers. Others were apparently issues affecting only selected panelists. Three of these 4 barriers were also presented in the research literature on barriers to AT use. One barrier, "difficulty in getting fellow professionals to use AT consistently with students," was rarely mentioned in the literature. Because of its significance in this study, this barrier deserves further investigation.

This research appeared to validate the structure of Dunamis, Inc. in-service training as incorporating elements that encourage AT use. While the eCoP was identified as one of these elements, there remain several issues to be explored regarding the best structure and operation of the eCoP.

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Appendix A

Demographic Survey and Research Questions From Round 1

Demographic Survey and Research Questions from Round 1

For each of the following questions please circle the best answer. All information gathered will be reported in group form to insure confidentiality.

1. How many years of classroom teaching experience do you have?
   - None
   - One year
   - Two Years
   - Three Years
   - Four years
   - Five years or more

2. Gender: Male Female

3. What is your age?
   - 20-25
   - 26-30
   - 31-35
   - 36-40
   - 41-45
   - 46-50
   - 51-55
   - 56-60
   - 60 or older

4. What is your race?
   - Asian
   - Black
   - Caucasian
   - Hispanic
   - American Indian
   - Other _____

5. What is the highest degree you have earned?
   - Associate
   - Bachelor
   - Masters
   - Doctorate

6. Prior to this year, how many years have you used a computer?
   - Never
   - One year
   - Two Years
   - Three years
   - Four years
   - Five years or more

7. How would you rate your computer skills?
   - Beginner
   - Limited skills
   - Somewhat skilled
   - Skilled
   - Expert

8. How often do you personally use a computer in classroom instruction?
   - Daily
   - Several times a week
   - Several times a month
   - Several times a semester
   - Not very much
   - Never

9. How often do you personally use a computer for other functions than instruction?
   - Daily
   - Several times a week
   - Several times a month
   - Several times a semester
   - Not very much
   - Never

10. What barriers or obstacles to successfully using AT in your professional setting have you encountered?

11. What aspects of Dunamis, Inc. workshops you attended do you feel have contributed to your use of Assistive Technology with students with disabilities?

12. Please use the space below to share any additional feelings or concerns you might have about using Assistive Technology in instruction.

Appendix B

Sample Invitation Letter for Round 1

Date, 2006

Dear [ ],

I want to thank you for your past participation in Dunamis, Inc. workshops and training activities. The work that you do with students with disabilities is very valuable. You are to be commended for your efforts to use Assistive Technology (AT) to help your students succeed in school and in life.

I am a doctoral student at Nova Southeastern University. I am conducting research on the factors from in-service training workshops that impact the use of AT with students with disabilities in the classroom. To do this I am conducting a Delphi study of this topic.

You have received AT training in the past from Dunamis, Inc. You have also been identified as someone who has been exemplary in your efforts to provide excellent instruction and support to your students with disabilities. As such I value your insights and perspective. It would help me a great deal if you would be willing to participate in this study by sharing your opinions and experiences.

As a participant in this study, you will be asked to rate several factors that have been identified as valuable components of in-service training in AT provided by Dunamis, Inc. You will be asked to indicate whether you feel the individual factors were ultimately valuable to your use of AT in your professional setting.

A Delphi study typically takes three or four rounds for the participants to achieve a consensus. Your participation in each round should take about 30 minutes. If you are willing to participate in this project, please indicate your willingness by e-mailing me at satterfi@nova.edu

Results from each round will be posted on the Dunamis, Inc. web site. In addition, you will be sent a copy of the results, if you would like. Please note that I, as the principal investigator of this research study, have a significant financial interest as it relates to this study.

I appreciate your assistance in this project.

Ben Satterfield

Appendix C

Sample Panelist Invitation Letter

Date, 2006

Dear [ ],

I want to thank you again for your participation in the first stage of my dissertation research project.

As you will recall, I am a doctoral student at Nova Southeastern University and am conducting research on the factors from in-service training workshops that impact the use of AT with students with disabilities in the classroom. There are two stages in this research project. I am now ready to proceed with the second stage. This stage involves a Delphi study of this topic.

You have received AT training in the past from Dunamis, Inc. You have also been identified as someone who has been exemplary in your efforts to provide excellent instruction and support to your students with disabilities. As such I value your insights and perspective. It would help me a great deal if you would be willing to participate in this next phase of my study by sharing your opinions and experiences.

As a participant in this stage of the study, you will be asked to rate several factors that have been identified as valuable components of in-service training in AT. You will be asked to indicate whether you feel the individual factors were ultimately valuable to your use of AT in your professional setting. This will be done in the form of a series of online questionnaires over a 4 to 6 week period.

A Delphi study typically takes three or four rounds for the participants to achieve a consensus. Your participation in each round should take about 20-30 minutes. Results from each round will be posted on the Dunamis, Inc. web site. In addition, you will be sent a copy of the results, if you would like. Please find attached an Informed Consent Form with additional details concerning participation in this project. Please note that I, as the principal investigator of this research study, do have a significant financial interest as it relates to this study.

If you are willing to participate in this project, please indicate your willingness by e-mailing me at: satterfi@nova.edu

Please use an e-mail address that you will be accessing during the summer. If you have any questions about the project, please do not hesitate to e-mail me or to call me at 1-800-828-2443.

I appreciate your assistance in this project.

Ben Satterfield
3423 Fowler Blvd.
Lawrenceville, GA, 30044
800-828-2443

Appendix D

Demographic Data Collected From Participants

Demographic Data Collected From Participants

Table D1.Years of classroom teaching experience

	Round 1 Participants	Local Panel	National Panel
None	2	0	0
One year	2	0	0
Two Years	1	0	0
Three Years	4	0	1
Four years	1	2	0
Five years or more	42	10	11
N	52	12	12

Table D2. Gender of participants

	Round 1 Participants	Local Panel	National Panel
Male	4	1	0
Female	48	11	12
N	52	12	12

Table D3. Age of participants

	Round 1 Participants	Local Panel	National Panel
20-25	1	0	0
26-30	8	3	1
31-35	11	1	1
36-40	5	1	1
41-45	4	1	2
46-50	11	4	2
51-55	5	1	0
56-60	6	0	4
60 or older	1	1	1
N	52	12	12

Table D4. Race of participants

	Round 1 Participants	Local Panel	National Panel
Asian	1	0	0
Black	3	0	0
Caucasian	45	11	12
Hispanic	0	0	0
American Indian	1	0	0
Other (Mixed)	2	1	0
N	52	12	12

Table D5. Highest degree earned

	Round 1 Participants	Local Panel	National Panel
Associate	2	1	0
Bachelor	15	3	2
Masters	34	8	10
Doctorate	1	0	0
N	52	12	12

Table D6. Years of computer use

	Round 1 Participants	Local Panel	National Panel
Never	0	0	0
One year	0	0	0
Two Years	1	1	0
Three years	0	0	0
Four years	2	1	0
Five years or more	48	10	12
N	52	12	12

Table D7. Self-rating of computer skills

	Round 1 Participants	Local Panel	National Panel
Beginner	1	0	0
Limited skills	2	2	0
Somewhat skilled	18	2	0
Skilled	29	7	4
Expert	2	1	8
N	52	12	12

Table D8. Frequency of computer use in classroom instruction

	Round 1 Participants	Local Panel	National Panel
Daily	47	11	12
Several times a week	4	0	0
Several times a month	0	0	0
Several times a semester	0	0	0
Not very much	1	1	0
Never	0	0	0
N	52	12	12

Table D9. Frequency of computer use in other functions than instruction

	Round 1 Participants	Local Panel	National Panel
Daily	17	7	5
Several times a week	18	2	3
Several times a month	9	1	2
Several times a semester	1	0	0
Not very much	3	0	0
Never	4	2	2
N	52	12	12

Table D10. Professional Role

	Round 1 Participants	Local Panel	National Panel
Administrator	5	3	5
Speech Language Pathologist	12	4	2
Occupational Pathologist	1	0	2
Teacher	31	2	2
Consultant	1	1	1
Paraprofessional	1	1	0
Physical Therapist	1	1	0
N	52	12	12

Appendix E

Survey From Round 2

Survey From Round 2

Factors that Encourage AT Use

Several factors in in-service training activities have been identified as contributing positively to use of Assistive Technology with students with disabilities.

For each of these following factors, please use your in-service training experiences to rate the factor for its contribution to AT use in your professional setting. Please indicate whether you (1) *strongly disagree,* (2) *disagree,* (3) are *unsure,* (4) *agree,* or (5) *strongly agree* that the item contributes to AT use.

Please feel free to comment on any or all of the factors in the space provided:

1. Hands-on practice using the AT products

[] *strongly disagree* [] *disagree* [] *unsure* [] *agree* [] *strongly agree*
Comment: [ ]

2. Effective demonstrations

[] *strongly disagree* [] *disagree* [] *unsure* [] *agree* [] *strongly agree*
Comment: [ ]

3. Interactive presentation: encouragement to ask questions

[] *strongly disagree* [] *disagree* [] *unsure* [] *agree* [] *strongly agree*
Comment: [ ]

4. Quality documentation/ handouts that support the instruction

[] *strongly disagree* [] *disagree* [] *unsure* [] *agree* [] *strongly agree*
Comment: [ ]

5. Practical implementation strategies, ideas, applications

[] *strongly disagree* [] *disagree* [] *unsure* [] *agree* [] *strongly agree*
Comment: [ ]

6. Examples from personal experiences & real-life to specific applications

[] *strongly disagree* [] *disagree* [] *unsure* [] *agree* [] *strongly agree*
Comment: [ ]

7. Effective communication - presented in "layman"s terms"

[] *strongly disagree* [] *disagree* [] *unsure* [] *agree* [] *strongly agree*
Comment: [ ]

8. Comprehensive instruction about the features available in AT products

[] *strongly disagree* [] *disagree* [] *unsure* [] *agree* [] *strongly agree*
Comment: [ ]

9. Exposure to a variety of equipment/ software, exploration of options

[] *strongly disagree* [] *disagree* [] *unsure* [] *agree* [] *strongly agree*
Comment: [ ]

10. The one-on-one attention: personal, caring approach

[] *strongly disagree* [] *disagree* [] *unsure* [] *agree* [] *strongly agree*
Comment: [ ]

11. Information/support available following workshop: through electronic community of practice (eCoP)

[] *strongly disagree* [] *disagree* [] *unsure* [] *agree* [] *strongly agree*
Comment: [ ]

12. Expertise, knowledge of workshop leader

[] *strongly disagree* [] *disagree* [] *unsure* [] *agree* [] *strongly agree*
Comment: [ ]

Barriers to AT Use

Several barriers to successful use of Assistive Technology with students with disabilities have been identified.

For each of these following barriers, please to rate the factor for its impact upon AT use in your professional setting. Please indicate whether you (1) *strongly disagree,* (2) *disagree,* (3) are *unsure,* (4) *agree,* or (5) *strongly agree* that the item is a barrier to AT use.

Please feel free to comment on any or all of the factors in the space provided:

1. Not enough training

[] *strongly disagree* [] *disagree* [] *unsure* [] *agree* [] *strongly agree*
Comment: [ ]

2. Students lack skills and time to use AT independently

[] *strongly disagree* [] *disagree* [] *unsure* [] *agree* [] *strongly agree*
Comment: [ ]

3. Teachers and parents lack of AT knowledge and unwillingness to try it

[] *strongly disagree* [] *disagree* [] *unsure* [] *agree* [] *strongly agree*
Comment: [ ]

4. Getting fellow professionals to use AT with students consistently

[] *strongly disagree* [] *disagree* [] *unsure* [] *agree* [] *strongly agree*
Comment: [ ]

5. Not having enough computers available in my setting

[] *strongly disagree* [] *disagree* [] *unsure* [] *agree* [] *strongly agree*
Comment: [ ]

6. Lack of financial support

[] *strongly disagree* [] *disagree* [] *unsure* [] *agree* [] *strongly agree*
Comment: [ ]

7. Equipment breaks down & repairs take too long

[] *strongly disagree* [] *disagree* [] *unsure* [] *agree* [] *strongly agree*
Comment: [ ]

8. Not enough time.

[] *strongly disagree* [] *disagree* [] *unsure* [] *agree* [] *strongly agree*
Comment: [ ]

9. Technical problems and computer & network glitches.

[] *strongly disagree* [] *disagree* [] *unsure* [] *agree* [] *strongly agree*
Comment: [ ]

10. Unresponsiveness of IT support team.

[] *strongly disagree* [] *disagree* [] *unsure* [] *agree* [] *strongly agree*
Comment: [ ]

11. AT Software/hardware lacks adaptability and is difficult to use.

[] *strongly disagree* [] *disagree* [] *unsure* [] *agree* [] *strongly agree*
Comment: [ ]

12. Lack of administrative support

[] *strongly disagree* [] *disagree* [] *unsure* [] *agree* [] *strongly agree*
Comment: [ ]

Appendix F

Lists of Factors and Barriers From Round 1

Lists of Factors and Barriers From Round 1

Table F1. Compiled List of Factors from Round 1

1. Hands-on practice using the AT products
2. Effective demonstrations
3. Interactive presentation: encouragement to ask questions
4. Quality documentation/ handouts that support the instruction
5. Practical implementation strategies, ideas, applications
6. Examples from personal experiences & real-life to specific applications
7. Effective communication - presented in "layman's terms"
8. Comprehensive instruction about the features available in AT products
9. Exposure to a variety of equipment/ software, exploration of options
10. The one-on-one attention: personal, caring approach
11. Information/support available following workshop: through electronic community of practice (eCoP)*
12. Expertise, knowledge of workshop leader

* Added by the researcher

Table F2. Compiled List of Barriers from Round 1

1. Not enough training
2. Students lack skills and time to use AT independently
3. Teachers and parents lack of AT knowledge and unwillingness to try it
4. Getting fellow professionals to use AT with students consistently
5. Not having enough technically current computers & AT materials available in my setting
6. Lack of financial support
7. Equipment breaks down & repairs take too long
8. Not enough time.
9. Technical problems and computer & network glitches.
10. Challenges in working with IT support team.
11. AT Software/hardware lacks adaptability and is difficult to use.
12. Lack of administrative support

Appendix G

Ranking of Factors and Barriers From Round 2

Ranking of Factors and Barriers From Round 2

G1

Round 2: Local Panel Factors in In-service training that encourage implementation of AT by Median

Rank	Item	Item no.	*N*	Quart1	Median	Mean	Quart3	IQR
1	Hands-on practice using the AT products	1	12	5.0000	5.0000	4.9167	5.0000	0.0000
2	Effective demonstrations	2	12	5.0000	5.0000	4.9167	5.0000	0.0000
3	Practical Implementation strategies, ideas and applications	5	12	5.0000	5.0000	4.9167	5.0000	0.0000
4	Effective communication - presented in "layman's terms"	7	12	5.0000	5.0000	4.8333	5.0000	0.0000
5	Expertise, knowledge of workshop leader	12	12	5.0000	5.0000	4.6667	5.0000	0.0000
6	Interactive presentation: encouragement to ask questions	3	12	4.2500	5.0000	4.7500	5.0000	0.7500
7	Examples from personal experiences & real-life to specific applications	6	12	4.0000	5.0000	4.5000	5.0000	1.0000
8	The one-on-one attention: personal, caring approach	10	12	4.0000	4.5000	4.4167	5.0000	1.0000
9	Quality documentation/ handouts that support the instruction	4	12	4.0000	4.5000	4.3333	5.0000	1.0000
10	Comprehensive instruction about the features available in AT products	8	12	4.0000	4.0000	4.2500	4.7500	0.7500
11	Exposure to a variety of equipment/ software, exploration of options	9	12	4.0000	4.0000	4.2500	4.7500	0.7500
12	Information/support available following workshop: through electronic community of practice (eCoP)	11	12	4.0000	4.0000	4.0833	4.7500	0.7500

G2

Round 2: National Panel Factors in In-Service Training That Encourage Implementation of AT by Median

Rank	Item	Item no.	*N*	Quart1	Median	Mean	Quart3	IQR
1	Hands-on practice using the AT products	1	12	5.0000	5.0000	4.8333	5.0000	0.0000
2	Practical Implementation strategies, ideas and applications	5	12	4.2500	5.0000	4.7500	5.0000	0.7500
3	Expertise, knowledge of workshop leader	12	12	4.2500	5.0000	4.7500	5.0000	0.7500
4	Interactive presentation: encouragement to ask questions	3	12	4.0000	5.0000	4.5833	5.0000	1.0000
5	Quality documentation/ handouts that support the instruction	4	12	4.0000	5.0000	4.5833	5.0000	1.0000
6	Examples from personal experiences & real-life to specific applications	6	12	4.2500	5.0000	4.7500	5.0000	0.7500
7	Effective communication - presented in "layman's terms"	7	12	4.0000	5.0000	4.5000	5.0000	1.0000
8	Effective demonstrations	2	12	4.0000	5.0000	4.4167	5.0000	1.0000
9	The one-on-one attention: personal, caring approach	10	12	3.2500	5.0000	4.3333	5.0000	1.7500
10	Information/support available following workshop: through electronic community of practice (eCoP)	11	12	4.0000	4.5000	4.3333	5.0000	1.0000
11	Exposure to a variety of equipment/ software, exploration of options	9	12	3.2500	4.0000	4.0833	5.0000	1.7500
12	Comprehensive instruction about the features available in AT products	8	12	2.2500	3.5000	3.4167	4.7500	2.5000

G3

Round 2: Local Panel Barriers to Implementation of AT by Median

Rank	Item	Item no.	*N*	Quart1	Median	Mean	Quart3	IQR
1	Getting fellow professionals to use AT with students consistently	4	12	4.2500	5.0000	4.6667	5.0000	0.7500
2	Teachers and parents lack of AT knowledge and unwillingness to try it	3	12	4.0000	5.0000	4.4167	5.0000	1.0000
3	Not enough training	1	12	4.0000	5.0000	4.4167	5.0000	1.0000
4	Students lack skills and time to use AT independently	2	12	3.2500	4.0000	3.8333	4.7500	1.5000
5	Not enough time.	8	12	2.2500	4.0000	3.5833	4.7500	2.5000
6	AT Software/hardware lacks adaptability and is difficult to use.	11	12	2.0000	3.5000	3.3333	4.0000	2.0000
7	Equipment breaks down & repairs take too long	7	12	2.0000	3.5000	3.3333	4.0000	2.0000
8	Technical problems and computer & network glitches.	9	12	2.0000	3.0000	3.1667	4.0000	2.0000
9	Unresponsiveness of IT support team.	10	12	2.0000	3.0000	2.9167	3.7500	1.7500
10	Lack of financial support	6	12	2.0000	2.5000	2.9167	4.0000	2.0000
11	Not having enough computers available in my setting	5	12	2.0000	2.5000	2.9167	4.0000	2.0000
12	Lack of administrative support	12	12	2.0000	2.5000	2.8333	4.0000	2.0000

G4

Round 2: National Panel Barriers to Implementation of AT by Median

Rank	Item	Item no.	*N*	Quart1	Median	Mean	Quart3	IQR
1	Not enough training	1	12	4.2500	5.0000	4.5833	5.0000	0.7500
2	Getting fellow professionals to use AT with students consistently	4	12	4.0000	5.0000	4.4167	5.0000	1.0000
3	Not enough time.	8	12	4.0000	4.0000	4.1667	5.0000	1.0000
4	Teachers and parents lack of AT knowledge and unwillingness to try it	3	12	3.0000	4.0000	3.8330	5.0000	2.0000
5	Lack of administrative support	12	12	2.0000	4.0000	3.3333	4.0000	2.0000
6	Students lack skills and time to use AT independently	2	12	2.0000	3.5000	3.1667	4.0000	2.0000
7	Technical problems and computer & network glitches.	9	12	2.0000	3.5000	3.1667	4.0000	2.0000
8	AT Software/hardware lacks adaptability and is difficult to use.	11	12	2.0000	3.5000	2.9167	4.0000	2.0000
9	Unresponsiveness of IT support team.	10	12	2.0000	2.5000	2.9167	4.0000	2.0000
10	Not having enough computers available in my setting	5	12	1.2500	2.5000	2.8333	4.0000	2.7500
11	Equipment breaks down & repairs take too long	7	12	2.0000	2.5000	2.7500	3.7500	1.7500
12	Lack of financial support	6	12	2.0000	2.0000	2.4167	2.0000	0.0000

Appendix H

Ranking of Factors and Barriers, Round 3 Ranked by Median

Ranking of Factors and Barriers Round 3 Ranked by Median

H1

Round 3: Local Panel Factors in In-service training that encourage implementation of AT by Median

Rank	Item	Item no.	*N*	Quart1	Median	Mean	Quart3	IQR
1	Hands-on practice using the AT products	1	10	5.0000	5.0000	4.9000	5.0000	0.0000
2	Effective demonstrations	2	10	5.0000	5.0000	4.9000	5.0000	0.0000
3	Practical Implementation strategies, ideas and applications	5	10	5.0000	5.0000	4.9000	5.0000	0.0000
4	Effective communication - presented in "layman's terms"	7	10	5.0000	5.0000	4.9000	5.0000	0.0000
5	Expertise, knowledge of workshop leader	12	10	5.0000	5.0000	4.9000	5.0000	0.0000
6	Interactive presentation: encouragement to ask questions	3	10	5.0000	5.0000	4.8000	5.0000	0.0000
7	Examples from personal experiences & real-life to specific applications	6	10	4.2500	5.0000	4.7000	5.0000	0.7500
8	The one-on-one attention: personal, caring approach	10	10	4.0000	5.0000	4.5000	5.0000	1.0000
9	Quality documentation/ handouts that support the instruction	4	10	4.0000	4.5000	4.4000	5.0000	1.0000
10	Comprehensive instruction about the features available in AT products	8	10	4.0000	4.0000	4.3000	4.7500	0.7500
11	Exposure to a variety of equipment/ software, exploration of options	9	10	4.0000	4.0000	4.2000	4.7500	0.7500
12	Information/support available following workshop: through electronic community of practice (eCoP)	11	10	4.0000	4.0000	4.1000	4.7500	0.7500

H2

Round 3: National Panel Factors in In-Service Training That Encourage Implementation of AT by Median

Rank	Item	Item no.	*N*	Quart1	Median	Mean	Quart3	IQR
1	Hands-on practice using the AT products	1	12	5.0000	5.0000	4.8333	5.0000	0.0000
2	Practical Implementation strategies, ideas and applications	5	12	5.0000	5.0000	4.8333	5.0000	0.0000
3	Expertise, knowledge of workshop leader	12	12	4.2500	5.0000	4.7500	5.0000	0.7500
4	Interactive presentation: encouragement to ask questions	3	12	4.0000	5.0000	4.6667	5.0000	1.0000
5	Quality documentation/ handouts that support the instruction	4	12	4.0000	5.0000	4.6667	5.0000	1.0000
6	Examples from personal experiences & real-life to specific applications	6	12	4.0000	5.0000	4.6667	5.0000	1.0000
7	Effective communication - presented in "layman's terms"	7	12	4.0000	4.5000	4.5000	5.0000	1.0000
8	Effective demonstrations	2	12	4.0000	4.5000	4.3333	5.0000	1.0000
9	Information/support available following workshop: through electronic community of practice (eCoP)	11	12	4.0000	4.5000	4.3333	5.0000	1.0000
10	The one-on-one attention: personal, caring approach	10	12	3.0000	4.0000	4.0000	5.0000	2.0000
11	Exposure to a variety of equipment/ software, exploration of options	9	12	3.0000	3.5000	3.6667	4.7500	1.7500
12	Comprehensive instruction about the features available in AT products	8	12	2.2500	3.0000	3.2500	4.0000	1.7500

H3

Round 3: Local Panel Barriers to Implementation of AT by Median

Rank	Item	Item no.	*N*	Quart1	Median	Mean	Quart3	IQR
1	Getting fellow professionals to use AT with students consistently	4	10	4.2500	5.0000	4.7000	5.0000	0.7500
2	Teachers and parents lack of AT knowledge and unwillingness to try it	3	10	4.0000	5.0000	4.4000	5.0000	1.0000
3	Not enough training	1	10	4.0000	5.0000	4.3000	5.0000	1.0000
4	Students lack skills and time to use AT independently	2	10	3.2500	4.0000	3.8000	4.0000	0.7500
5	AT Software/hardware lacks adaptability and is difficult to use.	11	10	2.2500	4.0000	3.5000	4.0000	1.7500
6	Not enough time.	8	10	2.5000	4.0000	3.5000	4.0000	1.5000
7	Equipment breaks down & repairs take too long	7	10	2.0000	3.5000	3.2000	4.0000	2.0000
8	Lack of financial support	6	10	2.0000	3.0000	3.0000	4.0000	2.0000
9	Lack of administrative support	12	10	2.0000	3.0000	3.0000	4.0000	2.0000
10	Technical problems and computer & network glitches.	9	10	2.0000	3.0000	2.9000	3.7500	1.7500
11	Unresponsiveness of IT support team.	10	10	2.0000	3.0000	2.9000	3.7500	1.7500
12	Not having enough computers available in my setting	5	10	2.0000	2.5000	2.9000	4.0000	2.0000

H4

Round 3: National Panel Barriers to Implementation of AT by Median

Rank	Item	Item no.	*N*	Quart1	Median	Mean	Quart3	IQR
1	Not enough training	1	12	4.2500	5.0000	4.5833	5.0000	0.7500
2	Getting fellow professionals to use AT with students consistently	4	12	4.0000	5.0000	4.5833	5.0000	1.0000
3	Not enough time.	8	12	4.0000	5.0000	4.5000	5.0000	1.0000
4	Teachers and parents lack of AT knowledge and unwillingness to try it	3	12	4.0000	4.0000	3.9167	4.7500	0.7500
5	Lack of administrative support	12	12	2.2500	4.0000	3.5000	4.0000	1.7500
6	Students lack skills and time to use AT independently	2	12	2.0000	3.5000	3.1667	4.0000	2.0000
7	Technical problems and computer & network glitches.	9	12	2.0000	3.5000	3.1667	4.0000	2.0000
8	AT Software/hardware lacks adaptability and is difficult to use.	11	12	2.2500	3.0000	3.0000	4.0000	1.7500
9	Not having enough computers available in my setting	5	12	1.0000	2.5000	2.7500	4.0000	3.0000
10	Unresponsiveness of IT support team.	10	12	2.0000	2.5000	2.7500	4.0000	2.0000
11	Equipment breaks down & repairs take too long	7	12	2.0000	2.0000	2.6667	3.7500	1.7500
12	Lack of financial support	6	12	2.0000	2.0000	2.3333	2.0000	0.0000

Appendix I

Ranking of Factors and Barriers, Round 3 Ranked by Median

Ranking of Factors/Barriers Round 3 Ranked by Interquartile Range

Table I1
Round 3: Local Panel Factors in In-service Training that Encourage Implementation of AT by IQR

Rank	Item	Item no.	*N*	Quart1	Median	Mean	Quart3	IQR
1	Hands-on practice using the AT products	1	10	5.0000	5.0000	4.9000	5.0000	0.0000
2	Effective demonstrations	2	10	5.0000	5.0000	4.9000	5.0000	0.0000
3	Practical Implementation strategies, ideas and applications	5	10	5.0000	5.0000	4.9000	5.0000	0.0000
4	Effective communication - presented in "layman's terms"	7	10	5.0000	5.0000	4.9000	5.0000	0.0000
5	Expertise, knowledge of workshop leader	12	10	5.0000	5.0000	4.9000	5.0000	0.0000
6	Interactive presentation: encouragement to ask questions	3	10	5.0000	5.0000	4.8000	5.0000	0.0000
7	Examples from personal experiences & real-life to specific applications	6	10	4.2500	5.0000	4.7000	5.0000	0.7500
8	Comprehensive instruction about the features available in AT products	8	10	4.0000	4.0000	4.3000	4.7500	0.7500
9	Exposure to a variety of equipment/ software, exploration of options	9	10	4.0000	4.0000	4.2000	4.7500	0.7500
10	Information/support available following workshop: through electronic community of practice (eCoP)	11	10	4.0000	4.0000	4.1000	4.7500	0.7500
11	The one-on-one attention: personal, caring approach	10	10	4.0000	5.0000	4.5000	5.0000	1.0000
12	Quality documentation/ handouts that support the instruction	4	10	4.0000	4.5000	4.4000	5.0000	1.0000

Table I2
Round 3: National Panel Factors in In-service Training that Encourage Implementation of AT by IQR

Rank	Item	Item No.	N	Quart1	Median	Mean	Quart3	IQR
1	Hands-on practice using the AT products	1	12	5.0000	5.0000	4.8333	5.0000	0.0000
2	Practical Implementation strategies, ideas and applications	5	12	5.0000	5.0000	4.8333	5.0000	0.0000
3	Expertise, knowledge of workshop leader	12	12	4.2500	5.0000	4.7500	5.0000	0.7500
4	Interactive presentation: encouragement to ask questions	3	12	4.0000	5.0000	4.6667	5.0000	1.0000
5	Quality documentation/ handouts that support the instruction	4	12	4.0000	5.0000	4.6667	5.0000	1.0000
6	Examples from personal experiences & real-life to specific applications	6	12	4.0000	5.0000	4.6667	5.0000	1.0000
7	Effective communication – presented in "layman's terms"	7	12	4.0000	4.5000	4.5000	5.0000	1.0000
8	Effective demonstrations	2	12	4.0000	4.5000	4.3333	5.0000	1.0000
9	Information/support available following workshop: through electronic community of practice (eCoP)	11	12	4.0000	4.5000	4.3333	5.0000	1.0000
10	Exposure to a variety of equipment/ software, exploration of options	9	12	3.0000	3.5000	3.6667	4.7500	1.7500
11	Comprehensive instruction about the features available in AT products	8	12	2.2500	3.0000	3.2500	4.0000	1.7500
12	The one-on-one attention: personal, caring approach	10	12	3.0000	4.0000	4.0000	5.0000	2.0000

Table I3

Round 3: Local Panel Barriers to Implementation of AT by IQR

Rank	Item	Item no.	N	Quart1	Median	Mean	Quart3	IQR
1	Getting fellow professionals to use AT with students consistently	4	10	4.2500	5.0000	4.7000	5.0000	0.7500
2	Students lack skills and time to use AT independently	2	10	3.2500	4.0000	3.8000	4.0000	0.7500
3	Teachers and parents lack of AT knowledge and unwillingness to try it	3	10	4.0000	5.0000	4.4000	5.0000	1.0000
4	Not enough training	1	10	4.0000	5.0000	4.3000	5.0000	1.0000
5	Not enough time.	8	10	2.5000	4.0000	3.5000	4.0000	1.5000
6	AT Software/hardware lacks adaptability and is difficult to use.	11	10	2.2500	4.0000	3.5000	4.0000	1.7500
7	Technical problems and computer & network glitches.	9	10	2.0000	3.0000	2.9000	3.7500	1.7500
8	Unresponsiveness of IT support team.	10	10	2.0000	3.0000	2.9000	3.7500	1.7500
9	Equipment breaks down & repairs take too long	7	10	2.0000	3.5000	3.2000	4.0000	2.0000
10	Lack of financial support	6	10	2.0000	3.0000	3.0000	4.0000	2.0000
11	Lack of administrative support	12	10	2.0000	3.0000	3.0000	4.0000	2.0000
12	Not having enough computers available in my setting	5	10	2.0000	2.5000	2.9000	4.0000	2.0000

Table I4
Round 3: National Panel Barriers to Implementation of AT by IQR

Rank	Item	Item no.	*N*	Quart1	Median	Mean	Quart3	IQR
1	Lack of financial support	6	12	2.0000	2.0000	2.3333	2.0000	0.0000
2	Not enough training	1	12	4.2500	5.0000	4.5833	5.0000	0.7500
3	Teachers and parents lack of AT knowledge and unwillingness to try it	3	12	4.0000	4.0000	3.9167	4.7500	0.7500
4	Getting fellow professionals to use AT with students consistently	4	12	4.0000	5.0000	4.5833	5.0000	1.0000
5	Not enough time.	8	12	4.0000	5.0000	4.5000	5.0000	1.0000
6	Lack of administrative support	12	12	2.2500	4.0000	3.5000	4.0000	1.7500
7	AT Software/hardware lacks adaptability and is difficult to use.	11	12	2.2500	3.0000	3.0000	4.0000	1.7500
8	Equipment breaks down & repairs take too long	7	12	2.0000	2.0000	2.6667	3.7500	1.7500
9	Students lack skills and time to use AT independently	2	12	2.0000	3.5000	3.1667	4.0000	2.0000
10	Technical problems and computer & network glitches.	9	12	2.0000	3.5000	3.1667	4.0000	2.0000
11	Unresponsiveness of IT support team.	10	12	2.0000	2.5000	2.7500	4.0000	2.0000
12	Not having enough computers available in my setting	5	12	1.0000	2.5000	2.7500	4.0000	3.0000

Appendix J

Results of Test of Marginal Homogeneity

Results of Test of Marginal Homogeneity

Table J1.
Test of Marginal Homogeneity: Local Panel Factors Rounds 2 and 3
Monte Carlo Test for Significance ($p \leq 0.05$)

Local factor no.	Mean MH statistic	Standard MH statistic	Significance *p*-value
1	0.000	0.000	1.000 **
2	0.000	0.000	1.000 **
3	0.000	-1.000	0.317
4	0.000	0.000	1.000 **
5	0.000	0.000	1.000 **
6	8.500	1.342	0.501
7	0.000	0.000	1.000 **
8	0.000	0.000	1.000 **
9	3.500	-1.000	1.000
10	0.000	0.000	1.000 **
11	7.000	0.000	1.000
12	7.500	1.342	0.501

** Exact results provided instead of Monte Carlo Test

Table J2.
Test of Marginal Homogeneity: National Panel Factors Rounds 2 and 3
Monte Carlo Test for Significance ($p \leq 0.05$)

National factor no.	Mean MH statistic	Standard MH statistic	Significance *p*-value
1	0.000	0.000	1.000
2	5.000	1.000	1.000 **
3	1.000	1.000	0.317
4	0.000	0.577	0.564
5	0.000	1.000	0.317
6	0.000	-0.577	0.564
7	8.000	0.000	1.000
8	5.000	1.000	1.000
9	13.000	1.667	0.246
10	10.000	1.414	0.495
11	7.000	0.000	1.000
12	0.000	0.000	1.000 **

** Exact results provided instead of Monte Carlo Test

Table J3.
Test of Marginal Homogeneity: Local Panel Barriers Rounds 2 and 3
Monte Carlo Test for Significance ($p \leq 0.05$)

Local barrier no.	Mean MH statistic	Standard MH statistic	Significance *p*-value
1	8.000	0.000	1.000
2	6.500	-0.447	1.000
3	0.000	0.000	1.000 **
4	3.000	-1.000	1.000
5	1.000	-1.000	1.000
6	2.000	-1.000	1.000
7	0.000	0.000	1.000 **
8	3.000	-1.000	1.000
9	0.000	0.000	1.000 **
10	5.000	-0.447	1.000
11	3.000	-1.000	1.000
12	9.000	0.000	1.000

** Exact results provided instead of Monte Carlo Test

Table J4. Test of Marginal Homogeneity: National Panel Barriers Rounds 2 and 3
Monte Carlo Test for Significance ($p \leq 0.05$)

National barrier no.	Mean MH statistic	Standard MH statistic	Significance *p*-value
1	0.000	0.000	1.000 **
2	5.000	0.000	1.000
3	11.000	-0.577	1.000
4	7.000	-1.414	0.494
5	1.500	1.000	1.000
6	4.500	1.000	1.000
7	2.500	1.000	1.000
8	15.000	-2.000	0.120
9	9.000	0.000	1.000
10	6.000	1.414	0.494
11	17.500	-0.258	1.000
12	3.000	-1.000	1.000

** Exact results provided instead of Monte Carlo Test

Appendix K

Comparison of Survey Results to Joyce and Showers (2002) Model

Comparison of Factors from Dunamis Training Identified by Local and National Panels as Having Significant Impact on AT Use to Ideal Structure for In-Service Training Described by Joyce and Showers (2002)

Components of Successful In-Service Training Joyce & Showers (2002)	Factors Identified by Local & National Panels (Dunamis Training)
Theory (direct instruction & dialogue)	Practical Implementation strategies Expertise, knowledge of workshop leader Effective communication Quality documentation and handouts
Modeling & Demonstration	Effective Demonstrations Examples based upon real-life experience
Practice	Hands-on Practice
Feedback	Interactive Presentations
Coaching	Electronic CoP