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Attitudes Of Indiana SpecialEducation Teachers Towards The Use And Implementation Of Assistive Technology

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ATTITUDES OF INDIANA SPECIAL EDUCATION TEACHERS TOWARDS THE USE AND IMPLEMENTATION OF ASSISTIVE TECHNOLOGY

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ABSTRACT

This study examines the attitudes of special education towards the use and implementation of Assistive Technology (AT). The study attempts to determine a relationship between the attitudes of teachers and the presence of an Assistive Technology Coordinator/Committee, whether the school is part of the Individualized Classroom Accountability Network (ICAN) project, the type of disability, and grade level of the student. The study was influenced by Everett Rogers's Diffusion of Innovation theory.

The mixed-method research was conducted using special education teachers within the State of Indiana. A sample of 164 special education teachers responded to the quantitative survey. Each subject completed a 28 question survey which was used to determine their attitudes and the presence of elements of the Diffusion Theory. From this sample seven teachers volunteered to participate in a qualitative interview to further expand on the results of the quantitative survey. The surveys were used to expand on the results of the survey and further identify aspects of the Diffusion Theory that were present in each school.

The results of the study showed no significant relationship in the quantitative portion study between the attitudes of the teachers and the independent variables. The presence of an effective Assistive Technology Coordinator/Committee seemed to be the most important factor in determining the successful adoption of AT. The qualitative

interviews did show that when all the factors of the Diffusion Theory were present at the school, AT was successfully integrated into the classroom.

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INTRODUCTION

Statement of the Problem

In Title 511 IAC 7-17-5, of Article 7, Indiana State Board of Education, an "Assistive technology device means any item, piece of equipment, or product system, whether acquired commercially, modified, or customized, that is used to increase, maintain, or improve the functional capabilities of a student with a disability." In Title 511 IAC 7-17-6 of the same Article, "Assistive technology service means any service that directly assists a student with a disability in the selection, acquisition, or use of an assistive technology device." Not included in this definition are technologies necessary for everyday living and not specifically for educational purposes such as wheelchairs.

Assistive technologies and services, as defined above, are not being implemented to the fullest extent in helping special education students achieve their educational goals. We know that AT can help special education students (Cuban & Woodward, 2001; Raskind, 2004) and they are mandated by law to be considered for each student. Therefore, what factors are limiting their use? Despite many reported benefits of using AT with special education students, annual state child count reports identify a surprisingly small and consistently stable percentage of students in a special education

program who have AT listed on their Individualized Education Program (IEP; Campbell, Milbourne, Dugan, & Wilcox, 2006).

Assistive technology, if properly selected and implemented, can be a tremendous asset in helping children with learning disabilities succeed in today's schools and become functioning members of society at large. The technology of today works and will only get better; however, the educational system is lagging behind in selecting, implementing, and funding these technologies to take full advantage of the advances being made.

Today more and more children with learning disabilities are being asked to perform at higher than previous levels in order to be successful in their educational careers. In Indiana, as part of the No Child Left Behind (NCLB) Act, students with learning disabilities must pass the Indiana Statewide Testing for Educational Progress-Plus (ISTEP+) Graduation Qualification Examination (GQE) in order to receive their high school diploma. Students in a special education program take the same test, with only slight modifications in the test taking environment, as students in the general education curriculum. AT, if properly selected, can significantly help special education children master the material on the GQE as well as in their everyday classroom environment.

The amount of pressure put on children with learning disabilities is greater today than ever. Only 13% of Grade 10 special education students passed the GQE in fall of 2004 (Kirk et al., 2004). There is a major obstacle to achieving high standards and accountability for special education students within the general curriculum; the general curriculum is simply not designed for those students (Hitchcock & Stahl, 2003).

Technology exists today that can be leveraged to assist special education students to succeed in the main stream classroom. Unfortunately many educators today are not aware of the assistive technologies available to schools that can enhance the learning environment.

Whereas most students think of reading or writing as second nature, students in a special education program have to focus on this task so much that they cannot begin to accomplish the cognitive portions of the lessons. If a reading or writing deficiency has been identified the teacher can recommend the assistive technology, relieving the student of the stress of having to accomplish the mechanical task, and the learner can focus on the cognitive portion of the lesson. An individual's working memory can handle only a certain amount of information, and if the entire working memory is focused on reading or writing, there is little left to accomplish the actual task. This is just one example of the benefit of AT; it is important to remember that AT can be tailored to the individual learner.

The Office of Special Education's 24th annual report cited that 29.4% of students with disabilities dropped out of high school in the 1999-2000 school years, as opposed to 10.9% of all 16-24 year olds (U. S. Department of Education, 2002). For post secondary outcomes, 32% experience employment compared to 81% of their non-disabled peers (Hart, 2004).

AT can play an important role in the education of pupils with disabilities because many students in a special education program require a differentiated instructional treatment (Jackson, Poole & Sky-McIvain, 2004). It is important that we take advantage of the technologies and integrate them into the special education environment.

Otherwise, continued advances in technology will only accentuate the gap between what is typically taught to students with learning disabilities, and what individuals need to know in a world filled with computing devices (Montague & Woodard, 2002).

Advances in technology are making it more and more feasible to successfully integrate students who have any kind of disability into general education environment (Jackson et al., 2004). The overall trend indicates a progressive increase of least restrictive environment placements for students with disabilities, with elementary students being more likely to be served in the regular classroom than secondary students (U.S. Department of Education, 2002). Inclusion is the current trend of placing students in a special education program in regular classrooms, thus providing them with the least restrictive environment in order to help them succeed as students (Hopkins, 2005). Inclusion has forced educators to find the best way to integrate these children into the classroom, and AT is an excellent way to help. In addition to their academic and learning difficulties, these students are known to lack self-confidence in public as well as social and academic settings; AT can help alleviate these issues (Parette & Peterson-Karlan, 2005).

In order for AT to be successful, a combined effort must be established between the teacher, the special education advisor, and the assistive technology specialist within the school or the school corporation. There are a tremendous amount of assets available, which, if properly coordinated, may lead to a successful learning experience.

In order for AT to be assigned to a student in a special education program it must be indicated on the IEP. Unfortunately, members of case conference committee teams often are unprepared to implement this statute effectively and school districts are often

unprepared to provide AT support to the teams (Blunt, Carl, Davis, & Zabala, 2000). Special education teachers and case conference committee team members throughout the country are struggling to make appropriate decisions regarding AT for students with high incidence disabilities. Although numerous authors and organizations have developed tools to assist case conference committee teams when considering AT, the task can be overwhelming.

Successful AT programs utilize pre-assessment, collaborative problem-solving, effective implementation, and systemic evaluation (Marino, Marion, & Shaw, 2006). Each of these issues presents different challenges to special education teachers. Much of the AT that should be considered by IEP teams is readily met by available classroom technologies, many of which are relatively easy to use and are adaptable to the general education curriculum (Pucket, 2002). Technology can be used to bridge a portion of the gap between expectations for students in a special education program and general pupils. Finally, technology can help produce increased self-efficacy for students in a special education program (Jackson et al., 2004).

The characteristics of today's learners also lends very well to the use of assistive technologies. Defined as millennial students (Parette & Peterson-Karlan, 2005), they display three cultural technological dimensions that set them apart from previous generations. They are very comfortable with technology. They have grown up with the Internet, CD/DVD players and at least one computer in their home. They have always enjoyed connectivity to the world. If they have a question, Google and the Internet can answer just about anything. They recognize technology as a tool to advance their

learning, not just a system to play games on or for storing information, but often times do not know how it can specifically assist them in learning.

Information technologies are being used by school-age children with increasing frequency. According to Parrette and Peterson-Karlan (2005), technology for this generation "is like the air" (p. 39). Millennial children are so exposed to and comfortable with technology that it is transparent to them and a completely accepted part of their lives (Parette & Peterson-Karlan). This student attitude about technology was more recently noted in the U. S. Technology Plan (U.S. Department of Education, 2004), when it said "We have technology in our blood" (p. 10).

The appropriate application of AT may be one of the greatest equalizing forces in the education and meaningful inclusion of students with disabilities both in terms of promoting access to the general curriculum and in facilitating the ability of students to demonstrate mastery of that knowledge (McDermott & Michaels, 2003). There have been successes with AT. Some school districts are successfully using AT with disabled students attending all grade levels from Kindergarten through 12th grade (Jackson et al., 2004). AT must be made more prevalent across all school systems. If school professionals are not aware of these and other potential contributions AT can make in the lives of their students with disabilities, then those students with disabilities are unlikely to realize their full potential (Hourcade, Kemp, & Parette, 2000).

Integrating AT into the student's everyday educational setting is difficult. Research indicates that even the AT which is enhancing student performance is not well integrated into the goals and objectives of students with disabilities, suggesting that much work is yet to be done to integrate technology preference and choice into AT

consideration and then in to the IEP (Parette & Peterson-Karlan, 2005). Although technologies for students with challenging educational needs have become more readily available, without a thorough understanding of how these technologies can best assist specific students, they can be underused or completely ignored (Ehlert & Neal, 2006).

AT abandonment is very prevalent and can cause a major setback in the development of a student. Researchers have identified some of the barriers that have led to technology abandonment in the educational setting and other settings in general. Some of the barriers identified include the complexity of the equipment, peer acceptance, user proficiency in the use of the device, inadequate support or training for both students and educators, the physical environment in which the device is used, and the amount of physical assistance the user needs in setting up the device (Kassab, 2000).

The challenges to the students in a special education program are significant. For the special education teacher there are similar conditions that must be considered. With fewer students, the special education teacher is expected to organize learning for a highly diverse set of individuals; teach differently to each child; assess each student's individual progress; manage the paperwork generated by a host district; and constantly negotiate with general education teachers who also have their own students (Cuban & Woodard, 2001).

There are over 150 million people affected by disabilities that AT can aid (Cavanaugh, 2002). The application of AT is the equalizer and can make a significant difference in the world of the learning disabled student in both school and career.

Purpose of the Study

The goal of this study was to discover the attitudes of special education teachers toward the use of AT and their potential to help students in a special education program obtain a free and appropriate education in the least restrictive environment. This study explored the following quantitative and qualitative questions.

The following quantitative and qualitative research questions guided the study:

1. Is there a difference in perceptions of the effectiveness of assistive technology for special education students when the following are considered:
    - The presence of an AT Coordinator/Team
    - Being a member of the ICAN project
    - The school level (Elementary, Middle School, Jr/Sr High School, or High School)
    - The type of disability (cognitive, learning, or physical)
2. What factors from the Diffusion Theory are currently present when determining the implementation of AT for special education students (see Table 1.1)?

Significance of the Study

By identifying the attitudes of the special education teachers a better understanding can be obtained to determine why AT is not more prevalent in the school systems. AT expertise is limited and expensive. By identifying the benefit of having this expertise on staff, school corporations will be more likely to budget for this position and in the long run benefit the student in a special education program. By determining the most significant barriers to the implementation of AT and the most prevalent reasons for abandonment we can better ensure the success of AT over an extended period of time.

Table 1.01

Qualitative Survey Questions to Determine Diffusion Theory Factors

Factor	Qualitative Survey Questions
Relative Advantage	Does AT increase student performance when properly implemented?
	Is AT rather than curriculum and method of instruction more important for the success of special education students?
	In your opinion do you think one subject area lends itself better?
Compatibility	Does AT interfere with the central learning task of constructing meaning?
	Is the AT recommended for the student in the IEP always appropriate for the student? Please Explain.
	Do you feel teacher/student/parent collaboration in the selection of AT is critical to the success of the AT?
Complexity	Have you seen differences in success between low-tech and high-tech AT devices?
	Is there sufficient training involved in the implementation of high-tech devices?
	What is your experience in implementing high-tech devices?
Trialability	Would having different types of AT available for trial use increase the implementation of AT on the child's IEP?
	Are you familiar or have you heard of or used the PATINs project?
	Do you have AT available in your classroom for students to use in the classroom outside of their IEP?
Observability	Have you seen evidence that AT helps special education students achieve their benchmarks as delineated in IEPs?
	Do you think the current use of AT within the school system is appropriate?
	What do you feel is the primary reason AT does not work once implemented?

One of the most important factors for the success of any new innovation is success stories and proof that the innovation does benefit the user. This is no different for the implementation of AT. Once it is shown that AT is consistently successful within the special education spectrum, the more likely schools will advocate AT and the learning experiences for the students will be enhanced. In order to have a coherent plan for the implementation it must first be identified what obstacles must be overcome for success.

Without a coherent implementation plan, AT will continue to be haphazard and students who could be successful through the use of AT will continue to fail and will not be able to fulfill their maximum potential within the school system.

Definition of Terms

Assistive Technology: Assistive technologies defined by Federal Law states that assistive technology is "any item, piece of equipment, or product system, whether acquired commercially off the shelf, modified, or customized, that is used to increase, maintain, or improve functional capabilities of children with disabilities" (Individuals with Disabilities Education Act of 2004, p. 4). This definition also includes assistive technologies for the physically handicapped such as sight and hearing impaired. Assistive technologies make situations easier to handle for individuals with disabilities whether by avoiding the task entirely or providing an opportunity to perform the task in a different manner (Parette & Wojcik, 2004).

Assistive Technology Service: Assistive technology service is defined as any service that directly assists a child with a disability in the selection, acquisition or use of an assistive technology device. The term includes:

a. The evaluation of the needs of a child with a disability, including a functional evaluation of the child in the child's customary environment.
b. Purchasing, leasing, or otherwise providing for the acquisition of assistive technology devices by children with disabilities;
c. Selecting, designing, fitting, customizing, adapting, applying, maintaining, repairing, or replacing assistive technology devices;
d. Coordinating and using other therapies, interventions, or services with assistive technology devices, such as those associated with existing education and rehabilitation plans and programs;
e. Training or technical assistance for a child with a disability or, if appropriate, the child's family; and
f. Training or technical assistance for professionals (including individuals providing education or rehabilitation services), employers, or other individuals who provide services to, employ, or are otherwise substantially involved in the major life functions of the child. (20 U.S.C. 1401(2))

Assistive Technology Specialist: The function of assistive technology specialists is to evaluate the needs of a child, research the technology options that are available for meeting those needs, select the most appropriate of these, and recommend acquisition (Bowe, 2005).

Case Conference Committee (Indiana Department of Education [2002], 511 IAC 7-17-10, Sec. 10): The case conference committee is the group of persons described in 511 IAC 7-27-3, including parents and public agency personnel, who are responsible for the following:

1) Reviewing evaluation data, identifying the existence of a disability, and determining a student's eligibility for special education and related services.
2) Developing, reviewing, and revising a student's Individual Education Program.
3) Determining the appropriate special education, related services and placement for a student and the setting or settings in which those services will be provided.
4) Determining other matters, including the provision of a free and appropriate public education, assigned to an IEP team by federal law or to a case conference committee by state law or any rule of the Indiana state board of education, including this article. (Article 7)

Case Conference Committee Participants (Indiana Department of Education [2002], 511 IAC 7-27-3, Sec. 3):

1) A representative of the public agency, other than the student's special education teacher, who has the following qualifications:
    a. Is qualified to provide or supervise the provision of specially designed instruction to meet the unique needs of students with disabilities.
    b. Is knowledgeable about the general education curriculum.
    c. Is knowledgeable about the availability of resources of the public agency.
2) The student's current teacher of record (or in the case of a student with a communication disorder only, the speech-language pathologist) or, for a student whose initial eligibility for special education and related services is

under consideration, a teacher licensed in the area of the student's suspected disability.

3) One (1) of the student's general education teachers, if the student is or may be participating in the general education environment.
4) The parent of a student less than eighteen (18) years of age, or the student, if the student is a least eighteen (18) years of age and has not been adjudicated incompetent.

Individualized Education Program (Indiana Department of Education [2002], 511 IAC 7-17-44, Sec. 44): The individualized education program is a written document, developed by the case conference committee, that describes how a student will access the general education curriculum and the special education related services needed to participate in the educational environment.

Special Education: Specially designed instruction provided by the school district or other local education agency that meets the unique needs of students identified as disabled (Bursuck & Friend, 2006).

Assumptions

It is assumed that the survey will accurately reflect the attitudes of the administrators. It is assumed that all survey subjects are truthful and accurate in the data that they provide.

Limitations

The study is limited to the State of Indiana which may affect the generalizability of the results.

Delimitations

The study was limited to the State of Indiana; however many of the regulations that are discussed are part of federal requirements to include No Child Left Behind Act.

Chapter 2

LITERATURE REVIEW

IDEA 2004 Requirements

The reauthorization of IDEA 2004 (Section 601(d)) states that the purpose of the law is:

> (1A) to ensure that all children with disabilities have available to them a free appropriate public education that emphasizes special education and related services designed to meet their unique needs and prepare them for further education, employment and independent living;
>
> (1B) to ensure that the rights of children with disabilities and parents of such children are protected;
>
> (1C) to assist States, localities, educational service agencies, and Federal agencies to provide for the education of all children with disabilities;
>
> (2) to assist States in the implementation of a statewide, comprehensive, coordinated, multidisciplinary, interagency system of early intervention services for infants and toddlers with disabilities and their families;
>
> (3) to ensure that educators and parents have the necessary tools to improve educational results for children with disabilities by supporting system

> improvement activities; coordinated research and personnel preparation; coordinated technical assistance, dissemination, and support; and technology development and media services; and
>
> (4) to assess and ensure the effectiveness of efforts to educate children with disabilities.

IDEA 2004 combined with NCLB Act of 2001 shows a clear mandate has been given that nearly all students, whether they have disabilities or other special needs, should be educated with the same curriculum and, in most instances, in classrooms with their peers without disabilities (Bursuck & Friend, 2006).

Indiana State Board of Education, Special Education rules, Title 511, Article 7, Rules 17-31 (Article 7) is the governing document for special education within the state of Indiana. This document is in line with the Individuals with Disabilities Education Act (IDEA) of 2004.

> Findings mentioned in the Individuals with Disabilities Education Improvement Act of 2004 and Article 7 stress the importance of ensuring children's access to the general education curriculum in the regular classroom, to the maximum extent possible, in order to meet developmental goals and, to the extent possible, the challenging expectations that have been established for all children, and be prepared to lead productive and independent adult lives. (§601 [c] [5] [A])

In this legislative context, IEP teams (from this point forward referred to as case conference committees) are required to consider AT with respect to meeting a student's goals and objectives (Alper & Raharinirina, 2006). This requirement is also included in Article 7 with the following statement:

A statement listing or describing any additional devices or services (including an intervention, accommodation, or other program modification) that the case conference committee determined, on the basis of the general and specific factors described in section 4(c) of this rule, that the student needs in order to receive a free and appropriate public education (p. 55).

Types of Disabilities

About 10% of public school students receive special education services, and half of these students are considered to have a learning disability (Bausch & Hasselbring, 2006). Article 7 defines 13 categories in special education:

a. Autism Spectrum Disorder - A lifelong developmental disability that includes autism, Asperger's Syndrome, and other pervasive developmental disorders. This term does not apply if a student's educational performance is adversely affected primarily because the student has an emotional disability.

b. Communication Disorder - A communication disorder is characterized by one of the following disorders that adversely affect educational performance:

(1) Articulation disorders that are incorrect productions of speech sounds, including omissions, distortions, substitutions, or additions.
(2) Fluency disorders that are disruptions in the rate or rhythm of speech that occur frequently and are markedly noticeable to the student or listener.
(3) Voice disorders that are abnormal productions of pitch, intensity, resonance, or quality.
(4) Language disorders that are impairments in the comprehension or expression of spoken or written language, including, impairments in one or more components of a language system, such as:

(A) language/auditory processing
(B) word retrieval
(C) phonology
(D) morphology
(E) syntax
(F) semantics
(G) pragmatics

(5) Severe communication deficits that may require the use of an augmentative communication system, such as:

(A) gestures
(B) sign language
(C) picture/word/sentence communication books or boards
(D) electronic devices
(E) any other system

Not included in the category is students with hearing impairments or learning disabilities who have language deficits or auditory processing difficulties are not eligible for services designed solely for students with communication disorders in lieu of services designed for students with hearing impairments or learning disabilities.

c. Deaf-Blind - means an impairment that:
(1) Is a concomitant hearing and vision impairment.
(2) Causes severe communication and other developmental problems.
(3) Adversely affects the student's educational performance.
(4) Cannot be accommodated by programs or services solely for students with hearing or visual impairments.

d. Developmental Delay (early childhood) - for students who are at least three years of age and not more than five years of age and not eligible to be enrolled in kindergarten means a delay that adversely affects daily life or educational performance of either two standard deviations below the mean in one of the following developmental areas or one and one-half standard deviations below the mean in any two of the following developmental areas:
(1) Gross or fine motor development.
(2) Cognitive development.
(3) Receptive or expressive language development.
(4) Social or emotional development.
(5) Self-help or other adaptive development.

e. Emotional Disability -is a condition that, over a long period of time and to a marked degree, consistently interferes with a student's learning process and adversely affects the student's educational performance. An emotional disability may include, but is not limited to, one or more of the following conditions:
(1) A tendency to develop physical symptoms or fears associated with personal or school problems.
(2) A general pervasive mood of unhappiness or depression.
(3) An inability to learn that cannot be explained by intellectual, sensory, or health factors.
(4) An inability to build or maintain satisfactory interpersonal relationships.
(5) Inappropriate behaviors or feelings under normal circumstances.

f. Hearing Impairment - a hearing loss that:

(1) With or without amplification adversely affects educational performance and developmental progress.
(2) May be permanent or fluctuating.
(3) May be mild to profound in nature.
(4) May be unilateral or bilateral.
(5) May also be referred to as hard of hearing or deaf.

g. Learning Disability - is characterized by severe specific deficits in perceptual, integrative, or expressive processes involved in understanding or in using language, spoken or written, that adversely affect the student's educational performance.

(1) Includes conditions referred to, or previously referred to, as:
(A) perceptual handicaps
(B) brain injury
(C) minimal brain dysfunction
(D) dyslexia
(E) developmental aphasia
(3) May be manifested in disorders of:
(A) listening
(B) thinking
(C) speaking
(D) reading
(E) writing
(F) spelling
(G) arithmetic
(4) Does not include learning problems due primarily to:
(A) visual
(B) hearing
(C) motor disabilities
(D) mental or emotional disability
(E) environmental, cultural, or economic disadvantage

h. Mental Disability - is demonstrated by significantly below average general intellectual functioning existing concurrently with deficits in adaptive behavior; and adversely affects educational performance.

(1) A student with a mild mental disability will generally exhibit:
(A) Measured intelligence two or more standard deviations below the mean or average of the testing instrument used.
(B) An adaptive behavior profile within the range of a mild mental disability.
(2) A student with a moderate mental disability will generally exhibit:
(A) Measured intelligence three or more standard deviations below the mean or average of the testing instrument used.

(B) An adaptive behavior profile within the range of a moderate mental disability.

(3) A student with a severe mental disability will generally exhibit:

(A) Measured intelligence four or more standard deviations below the mean or average of the testing instrument used.

(B) An adaptive behavior profile within the range of a severe mental disability.

i. Multiple Disabilities - means concomitant impairments (such as mental disability-visual impairment and mental disability-orthopedic impairment), the combination of which results in such severe educational needs that the student's needs cannot be accommodated with special education services solely for one of the impairments. The term does not include deaf-blind.

j. Orthopedic Impairment - is a physically disabling condition that is determined to be a serious impairment of a student's locomotion or motor functions, and that adversely affects educational performance. The term may include impairments caused by congenital anomaly, disease, or other causes, such as:

(1) cerebral palsy
(2) amputations
(3) fractures or burns that cause contractures

k. Other Health Impairment - means an impairment that adversely affects a student's educational performance and is manifested by limited strength, vitality, or alertness due to chronic or acute health problems. It may also be manifested by heightened alertness to environmental stimuli that results in limited alertness with respect to educational performance.

l. Traumatic Brain Injury - is an acquired injury to the brain caused by an external physical force, resulting in total or partial functional disability or psychosocial impairment, or both, that adversely affects a student's educational performance. The term applies to open or closed head injuries resulting in impairments in one or more areas, such as:

(1) cognition
(2) language
(3) memory
(4) attention
(5) reasoning
(6) abstract thinking
(7) judgment
(8) problem-solving
(9) sensory, perceptual, and motor abilities
(10) psychosocial behavior
(11) physical functions
(12) information processing

(13) speech

The term does not apply to brain injuries that are congenital or degenerative, or brain injuries induced by birth trauma.

m. Visual Impairment - is a vision loss that, even with best correction, adversely affects the student's educational performance. The term includes the following:
(1) The inability to successfully utilize vision as a primary channel for learning and exhibiting such a low degree or amount of visual acuity or visual field that vision is not considered as a primary mode of learning.
(2) A reduced visual acuity or limited visual field that inhibits optimal processing of information through the visual modality and generally requires modifications or specialized materials to enable the student to benefit from the educational program.
(3) Both partial-sightedness and blindness.

Types of Assistive Technologies Available

Assistive devices include any items that individuals with disabilities might use to help them learn and function. There are over 4,000 assistive technologies designed with the number increasing on a daily basis (Bray, Brown, & Green, 2004). AT has two fundamental purposes. First, it can augment an individual's strengths so that his or her abilities counterbalance the effects of any disabilities. Second, technology can provide an alternate mode of performing a task so that disabilities are compensated for or bypassed entirely (Bannan-Ritland, Behrmann, & Jeffs, 2006).

O'Brian, Watts and Wojcik (2004) state the role of AT is further defined as being a cognitive prosthesis that can replace an ability that is impaired or as a cognitive scaffold that provides support needed to accomplish a task more effectively, efficiently, and independently than otherwise possible. There is a wide continuum of AT available that can be classified into the following categories:

- High-tech: Assistive devices are usually complex and programmable and include items that require computers, and/or electronics, to perform a function.

- Medium-tech: Assistive devices are also easy to operate but typically require a power source
- Low-tech: Assistive technology options are usually easy to use, have a low cost, and typically do not require a power source.
- No-Tech: Solutions that make use of procedures, services, and existing conditions in the environment without the use of devices or equipment.

Table 2.1 provides examples for each of the technologies.

Article 7 groups Assistive Technologies into the following seven categories:

a. Computer Aided Instruction
b. Assistive Listening Device
c. Alternative Input device (Joystick, Sip and Puff Switch, Direct Face Contact)
d. Speech Generation Device
e. Mobility Device
f. Augmentative and Alternate Communication Device
g. Vision and Direct Fact Contact

Written word technologies are probably the most familiar to the everyday use and teacher. The most prevalent written word technologies are word processors such as Microsoft Word that include a spell checker and grammar checker that will highlight and recommend correct verbiage to the learner (Higgins & Raskind, 1998). More developed technologies include outlining which provides a guide for the student to use when writing various documents in which the writer can simply follow the guide for paper structure. Word prediction gives suggestions to the learner on the correct word to use and will even

Table 2.01

Definitions of Devices

Device Category	Examples
High Tech	- Read any text printed on the computer screen to the user - Talking calculators that vocalize data and calculations through speech synthesis - Alternative Keyboards - Auditory Word Processors - Speech Recognition Software
Medium Tech	- Use transparent overlays to change background color of a page, or magnify a line of text for easier reading - Timers - Books on Tape - Tape Recorder - Electronic Spell Checker
Low-Tech	- Pencil grips - Slantboard to create slanted writing surface - Specialty Pens - Writing Guides - Ear Plugs

finish sentences the more the user uses the technology. Abbreviation expander allows the student to type in two letter codes which trigger the word processor to automatically write the word for the users saving time and key strokes for the learner. Research has revealed that the special education teachers who do integrate technology into their instruction often find the Internet to be a useful tool for transition services, career development,

developing technology competencies, and accommodating individual student needs (Jackson et al., 2004).

Speech recognition technologies can help both with reading and the written word. With reading, the learner can listen to material rather than reading. This technology saves millions of students from the prospect of not being able to make it through school without the aid of teachers and other students to help them read. This gives the students confidence and increases self-esteem which leads to higher graduation rates (Bausch & Hasselbring, 2006). For the written word, the learner's speech is automatically transcribed into a word processing program so minimal typing is necessary. Along with this can be included tape recorders in which the learner can record lectures to listen to later or to be transcribed into the written word.

The primary aide in math for learning disabled students is talking calculators that verbally indicate the number when pressed by the learner. Other computer-based programs are also being developed to assist the learners in word problem and algebraic calculations that will assist the learner in complicated calculations.

Collaborative Virtual Environment is another technology that can assist learners in communication and problem solving (Cheng, McGrath, Moore, & Powell, 2005). Using this technology, learners interact within a computer environment that allows them to communicate on their own terms and work through problems at their own pace. This is a smart technology that determines where the learner is at and if the learner can proceed further or stay at the same level of difficulty. This is just a sample of the many technologies available.

Choosing the Right Assistive Technology

Technology is prevalent in every aspect of society and this includes the lives of special education students. School-age children with cognitive disabilities use a wide range of technology devices at higher rates than their adult counterparts, including computers, the Internet, cell phones, and email (Parette & Wojcik, 2004). With this in mind, the goal of the AT is to compensate based on the individual's weaknesses (Raskind, 2004).

There are four domains that should be considered when deciding which AT to use for the student.

a. Child characteristics, does the device meet the needs of the child.
b. Family issues, does the device meet the family's expectation.
c. Technology features, does the device allow the child to participate in family tasks and routines?
d. Service system, what is the most cost-effective device for the family (Brotherson & Parret, 2004).

Technology itself is not the answer to all problems faced by people with learning disabilities or for their service providers. Those seeking technological assistance should not focus on the device, but what the device can do for the individual in need (Georgia Project for Assistive Technology, 2006). This task can be overwhelming due, in large part, to a critical shortage of AT specialists who help case conference committee teams make decisions regarding assistive technology for students with disabilities (Marino et al., 2006).

Employing assistive technology specialists is one way of bringing AT expertise to teachers, similar to the way related service personnel provides expertise to a school district. The role of the assistive technology specialist is to consult with teachers as they consider assistive technology, assess students to identify their specific needs, and teach the students, teachers, parents and other service providers to use selected AT (Lahm, 2003).

AT may be considered appropriate when it does any of the following things (Holt & Kelker, 2000):

- Enables an individual to perform functions that can be achieved by no other means.
- Ameliorates the limitations imposed by disability as well as the handicaps imposed by inaccessible environments.
- Provides access for participation in programs or activities which otherwise would be closed to the individual.
- Increases endurance or ability to persevere and complete tasks that otherwise are too laborious to be attempted on a routine basis.
- Enables an individual to concentrate on learning or employment tasks, rather than mechanical tasks.
- Provides greater access to information.
- Supports social interactions with peers and adults.
- Supports social interactions with peers and adults.
- Supports participation in the least restrictive educational environment.

Does Assistive Technology Work?

Special needs educators who have utilized AT have long known that technology can come close to working miracles in bringing many students with disabilities into the general education curriculum (Nelson, 2006). Substantial amounts of money and effort have been spent on research and development related to the use of technology with students with disabilities. These efforts often have demonstrated improved educational outcomes for a sample of students and thus offer meaningful and productive ways to use technologies with these students (Cuban & Woodward, 2001).

Technology can offer the same learning outcomes for students with disabilities as they do for students without disabilities (Tomei, 2003). The use of technology provides clear advantages to those who wish to provide flexible, supportive, and adjustable learning and productivity experiences to all learners (Hitchcock & Stahl, 2003).

Assistive technologies help students with disabilities to read, write, perform mathematics, "do" science and social studies, and much else including music and art (Bowe, 2005). The key for educators is to know who keeps up with this flood of information and where to turn to get the newest information in a form that teachers can readily use.

Measurement of assistive technology outcomes is difficult because many factors influence the successful use of the technology (Archer, 2005). As stated earlier millennial students have grown up in a world rich in technology complexity and availability, and are very comfortable using technology (Parette & Peterson-Karlan, 2005). This not only applies to general education students but also to special education students. School-age children with cognitive disabilities used a wide range of technology devices at higher

rates than their adult counterparts, including computers, the Internet, cell phones and e-mail (Parette & Peterson-Karlan).

There are numerous studies that provide evidence that assistive technologies do work in the special education environment. Sivin-Kachala reviewed 219 research studies from 1990-1997 and found that students in a special education program showed increased achievement in pre-school through higher education (Schacter, 1999). In 2005, Archer found the WordQ program was successful in helping participants improve on their writing scores. Various word processing programs that included components such as speech synthesis, word prediction, and spell checking yielded positive effects on measures of students' spelling accuracy and correction (Swanson, Wanzek, Wexler, & Vaughn, 2006). In a study of 205 students it was shown that hypermedia had positive results for students in a special education program (Cuban & Woodward, 2001). Finally, in 2007, Edyburn used Web-based tools to show a 40-50% increase in student performance in current events over an eight week period.

There are a myriad of factors that influence students' performance when using AT over time. These include:

a) the individual's abilities

b) the nature of the tasks a student completes

c) the context in which the task will be performed

d) the type of AT device the student is using (Marino et al., 2006).

Technology has proven to be an effective method of giving such students opportunities to engage in basic drill and practice, simulations, exploratory, or communication activities that are matched to their individual needs and abilities (Glaser & Hasselbring, 2000).

The potential of AT to improve the lives of school-age children with disabilities has been widely acknowledged in the U.S., and a broad array of AT devices and services is currently implemented in classrooms nationwide (Gray, Parette, & Smith, 2006). Several other authors have demonstrated positive results in using AT to enhance communication skills (Hadadian & Weikle, 2003).

The functional value of an AT product is one obvious benefit and usually the primary reason for institutions, individuals and families to acquire these products. This important functional role of AT often has a positive psychological influence on users and those who interact with them (Doe, 2002).

AT has the ability to increase student independence while at the same time advancing academic standing, as it can allow increased participation in classroom activities by students with special needs, letting them have equal access to the school environment and general curriculum (Cavanaugh, 2002). One of the ways AT can accomplish this is by freeing up working memory by doing the basic skills that come naturally to regular education students. Freeing up working memory allow students to focus more of their attention on more complex tasks (Cuban & Woodward, 2001).

A research base is clearly being established that provides insights about how technologies can provide enhanced opportunities for learning with all children, including those with disabilities (Hadadian & Weikle, 2003). Modern computer-based technology can add significant value to teaching and learning when it is integrated thoughtfully by teachers with strong commitment and support from school administrators at all levels (Jackson et al., 2004).

Assistive Technology Not Utilized

A persistent problem is that AT devices that are acquired for use by students with special needs tend to be discarded shortly after purchase. This is referred to as "technology abandonment" (Bowe, 2005, p. 298). A national survey on technology abandonment found the 29.3% of all devices that were obtained were abandoned (Riemer-Reiss &Wacker, 2000).

The body of literature is almost universally in agreement that the success of students with disabilities with AT is related directly to the AT knowledge, skills, and dispositions of special education teachers (McDermott & Michaels, 2003). Buying and not using a device because of dissatisfaction can be a devastating experience for all concerned. It is critical for parents and schools to proceed cautiously into the world of assistive technology and make purchases only after careful evaluation and trials with the new device (Holt & Kelker, 2000).

In 1996 the Oregon Department of Education listed five specific problems related to the successful implementation of assistive technologies into the classroom (Lahm, 2003):

1. Lack of skills of educators to access assistive technology;
2. Lack of skills among educators to employ assistive technology;
3. Lack of understanding regarding the best ways to address assistive technologies in IEPs;
4. Lack of resources available; and
5. Lack of information to educators on the best ways to teach technology skills to students.

As you can see technology is not the only issue, both educator and administrator education is indicated in four of the five problems. Better educating teachers and administrators in the higher education system on the availability and viability of assistive technologies will go a long way in successful implementation.

Unfortunately, members of the case conference committee teams often are unprepared to implement the statutes of IDEA 2004 and Article 7 effectively and school districts are often unprepared to provide assistive technology support to the teams (Blunt et al, 2000). Research shows that the majority of the tens of thousands of individuals who serve on case conference committee teams still have little or no experience with assistive technology decisions-making (Blunt et al, 2000). There is a lack of AT specialists who assist schools and school districts with answering questions related to AT (Edyburn, 2007). This leaves special educators in a position where they must make decisions in relative isolation (Marino et al., 2006).

In addition, Todis (1996) found that students' educational and social needs could be successfully met only if the following factors were present:

a) the student's education program was based on the family's goals and values;

b) AT and student's goals were linked;

c) family, student, and professionals work collaboratively;

d) communication is ongoing;

e) equipment is replaced or modified as needed; and

f) problems were immediately resolved as soon as they arose.

Training is often focused on technology operations, not on effective implementation. Educational teams frequently struggle with the sensitivity of this

association, and have difficulty correlating the educational objectives with the specific areas in which AT can augment the student's skills (Shuster, 2002). New teachers may be tech ready, but curricular materials, classrooms, and standards, are not (Gray et al., 2006). When a viable AT device has been identified, it is the special educator's responsibility, unless otherwise noted, to ensure proper AT implementation (Marino et al., 2006). Many special education teachers do not possess sufficient knowledge to select services or devices, do not have sufficient knowledge of possible tools, do not have the necessary resources, or do not have sufficient knowledge to develop evaluation criteria for the selection and use of assistive technology (Pucket, 2002). Funding of the AT device is also an enormous issue, especially with the increasing costs of these technologies. Districts are understandably reluctant to try new technology for fear the parents will demand its purchase and exclusive use for the individual student (Pucket).

Conversely, education professionals are less informed on the wide variety of assistive technologies available to children with learning disabilities. Less than half of today's institutions of higher education that prepare teachers have stringent technology requirements for student teaching and graduation (Lahm, 2003). With the lack of instruction during their education, their busy daily schedules, and the requirements of external examinations, educators have little time to do the research to educate themselves on what is available and how they can acquire it for their learners. Teachers must establish the environment in order for the assistive technology to be effective. If well thought out procedures are not taken the technology will fail, not because it is not effective, but because the learner chooses it not to be effective and does not receive the proper support (Evans & Johnston, 2005).

Timing of the use of the AT is also a critical factor. Early intervention is crucial so students have the time to develop familiarity with the AT devices. For many students, waiting until high school may be too late since such supports may be necessary for success in elementary, middle and high school and may determine what accommodations may be provided during high stakes testing (Hitchcock & Stahl, 2003).

Although many special education students are cognitively challenged, they are still very much aware of their surroundings and what is considered socially acceptable. Cosmesis in a general sense is the preservation or restoration of beauty. For special education students it is the belief that the technology is "cool" in relation to the way the user perceives it or the way the user perceives that others perceive it (Parette & Peterson-Karlan, 2005). An iPod or PDA/Cell phone is cool; other less attractive or more cumbersome technologies are not as well received. This is very similar to a student getting glasses for the first time. If the student likes the glasses and perceives them as stylish, they will be worn. If the student perceives the glasses as unattractive, even though they may look fine, there is a lot less likely chance the glasses will be worn.

Once the need for an assistive technology is identified the teacher must determine which technologies are the most appropriate, and how they can be introduced to the learner to ensure success. Matching theory (Evans & Johnston, 2005) hypothesizes that when an individual has the opportunity to choose between two or more responses (in this case the response is the choice of the technology) the learner will choose the response that he or she feels to be most efficient. Efficiency is based on the following: Rate of reinforcement, Quality of Reinforcement, Response effort, and Immediacy of reinforcement.

It is also critical to remember that assistive technologies cannot solve the problems by themselves. They are simply tools that teachers can incorporate into their instruction to enhance their students' performance in the classroom.

Integration of the assistive technology device/service for both the learners and their peers into the classroom is critical. The learner must be trained on the particular technology prior to use or even more frustration can result on the part of the learner. In addition, the peers of the learner should be informed as to why the technology is necessary and the benefits the learner will receive by using the technology. The key is careful preparation by all parties to ensure successful integration of the assistive technology device.

Diffusion Theory of Innovations

The Diffusion of Innovations theory was put forward by Rogers (2003). His book *Diffusion of Innovations* is now in its fifth edition (Rogers). Rogers defines an innovation as "an idea, practice or object that is perceived as new by an individual or another unit of adoption" (p. xvii). He also states that "An innovation presents an individual or an organization with a new alternative or alternatives, with new means of solving problems" (p. xvii).

There are five concepts from the diffusions of innovation theory that apply to the recommendation and implementation of assistive technologies in a special education setting. The concepts are relative advantage, compatibility, complexity, trialability and observability (Rogers, 2003). The concepts are examined in more depth below.

a. Relative Advantage – The degree to which an innovation is perceived as better than the idea or device that it supersedes (Rogers). This

concept relates directly to the assistive technology itself and how it can improve the performance of students in a special education program. It also relates to three of the four most important criteria (effectiveness, operability, durability) that are used to asses assistive technologies (Riemer-Reiss & Wacker, 2000).

b. Compatibility – The degree to which an innovation is perceived as being consistent with existing values, past experiences and the needs of potential adopters (Rogers). In the framework of assistive technology compatibility will ensure adoptions of the assistive technology and more importantly continued use of the device.
c. Complexity – The degree to which an innovation is perceived as difficult to understand and use (Rogers). This concept is important both in terms of use by the special education student but also implementation by the special education teachers and the student's family.
d. Trialability – The degree to which an innovation may be experimented with on a limited basis (Rogers). With the expense of the devices and time limitations students in a special education program are often not given the opportunity to test devices out before purchasing the device (Riemer-Reiss & Wacker).
e. Observability – The degree to which the results of an innovation are visible to others (Rogers). The more research concludes that assistive

technologies are effective increases the likelihood that they will be adopted by individuals and school corporations.

The foundation of the Diffusion Theory is that innovations perceived to have greater relative advantage, compatibility, complexity, trialability and observability will be rapidly adopted and slowly discontinued over time. In the case of this study the innovation will be assistive technologies and the perceptions will be that of the special education teachers.

Innovation decisions may also be influenced by a change agent (professional support). According to Rogers (2003), a change agent is an individual who influences clients' innovation decisions in a direction that increases the use of the innovation. The primary change agent that is examined in the study will be the AT coordinator that may or may not be present in the school corporation. Figure 2.1 shows the relationship between the Diffusion Theory and the implementation of AT within the special education classroom.

Individualized Classroom Accountability Network (ICAN)

In January 2000, the Indiana Department of Education (IDOE), Division of Exceptional Learners established a grant to fund the ICAN Project with the mandate to provide a comprehensive network of individualized classroom accountability tools that could be offered to all Indiana educators (IDOE, 2007).

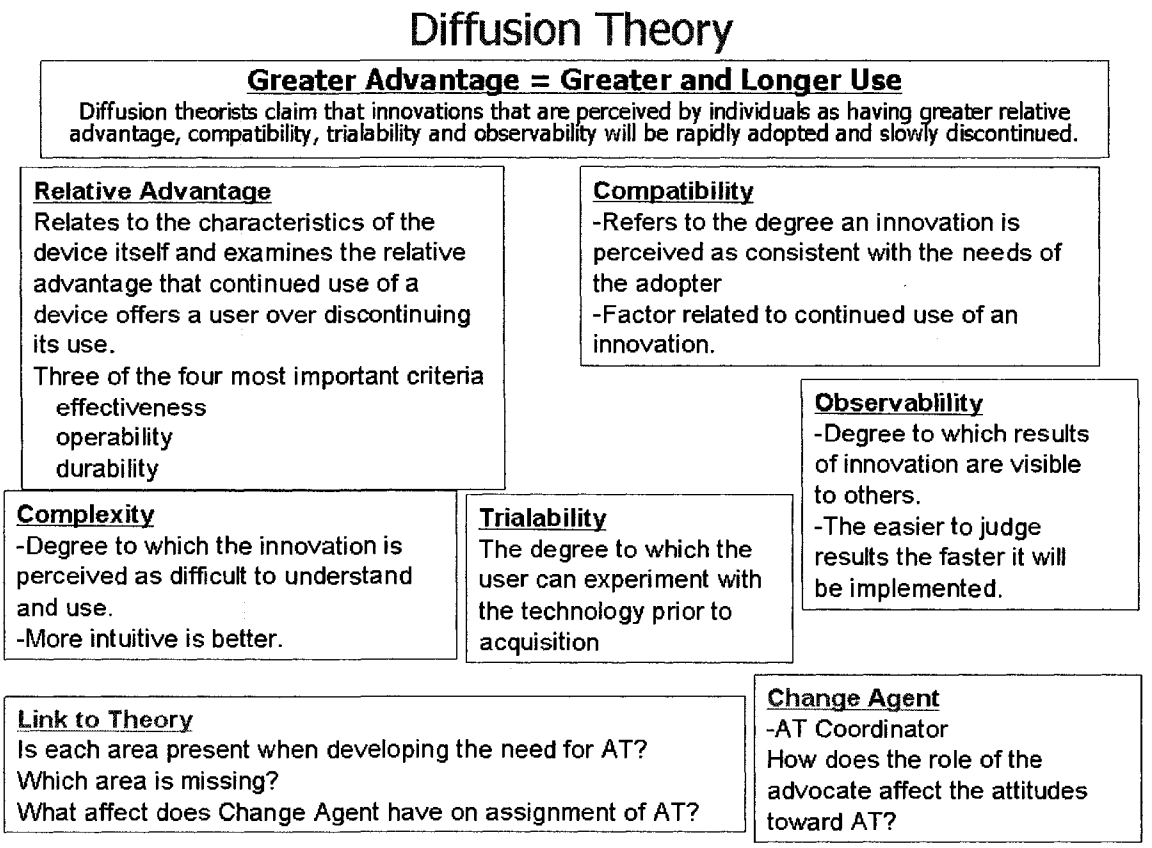

Figure 2.01. Diffusion Theory and assistive technology

The ICAN project is a web-based software system which supports instructional accountability through referencing the Indiana Academic Standards, Functional Achievement Indicators and elements of assessment at all points of the instructional process: design; documentation; and reporting. The mission of ICAN is to partner with educators and families to promote standards-referenced, data-driven curriculum, planning, and assessment so as to facilitate the continuous progress of all students (IDOE, 2007).

The ICAN project software is free to school corporations within Indiana on a voluntary basis and there are currently 80 School Corporations and organizations that

utilize the software. A key component of the software is that it electronically tracks special education students' IEPs to include whether or not the students are assigned an assistive technology.

Summary

Assistive Technologies have shown great potential to level the playing field for special education students with their general education peers. This is evidenced by clear requirements in both IDEA 2004 at the national level, and Article 7 at the state level in Indiana. The next step in the process is to ensure the potential and the requirements are implemented to the greatest extent possible at the classroom level.

Matching the disability with the proper AT and ensuring proper implementation are extremely difficult problems which are compounded by the dearth of AT specialists available to the schools. The training, time required, and cost of the AT will only worsen the problem for all parties involved.

Using the Diffusions of Innovations Theory as a guide to implementation and programs such as the ICAN project to provide better tracking data, schools can move toward more efficiency in the process. As models are developed that work and more expertise added at the classroom level we can ensure that AT is used to the greatest extent possible in the special education environment.

Chapter 3

METHOD OF RESEARCH

This study represents a sequential quantitative-qualitative mixed method design. The researcher used the sequential explanatory design when analyzing the data. The priority for the data was the quantitative data and the results were integrated in the interpretation phase of the study. The quantitative portion of the research method consisted of a survey group of the special education teachers across the state of Indiana to determine their attitudes toward AT. The qualitative portion of the research method consisted of semi-structured interviews with seven special education teachers to provide a more in-depth explanation for their attitudes toward the use of assistive technologies within their classrooms and with their students.

Research Questions

The following Quantitative and Qualitative research questions guide this study:

1. Is there a difference in perceptions of the effectiveness of Assistive Technology for Special Education students when the following are considered?
    - The presence of an AT Coordinator/Team
    - Being a member of the ICAN project

- The school level (Elementary, Middle School, Jr/Sr High School, or High School)
- The type of disability

2. What factors from the Diffusion Theory are currently present when determining the implementation of AT for Special Education students?

The subjects for the quantitative survey were composed of special education teachers from throughout the state of Indiana. The list was provided by the Indiana Special Education Administrators' Services (ISEAS). At the end of the quantitative survey the researcher asked for volunteers to participate in a thirty-minute qualitative interview to gain further insights into AT implementation. The researcher conducted seven qualitative interviews.

Survey Instruments

The survey for the quantitative study is located at Appendix A. There were no published surveys available so for the purpose of this study so the instrument was designed by the author and field tested with members of the Covered Bridge Special Education district in Indiana. The input from the field test was integrated into the final version of the instrument. To measure perceptions, the instrument used a Likert-style format to give the respondents a range of options. The instrument was broken into four parts. The first part (Questions 1-4) helped determine the independent variables. Question 3 had twelve options, however, when SPSS analysis was done the options were divided into seven categories, Cognitive (Autism Spectrum disorder, Mental Disability, Traumatic Brain Injury, Developmental Delay, Other Health Impairment), Learning (Learning Disability, Communication Disorder, Emotional Disability), and Physical

(Deaf-Blind, Multiple Disabilities, Orthopedic Impairment, Hearing Impairment, Visual Impairment), dual combinations, and all types. The 12 disabilities are the disabilities that are categorized in Article 7.

Part two of the survey (Questions 5-17) measured the professional perceptions of the special education administrators. The questions were designed based on a review of literature, with the options of Agree or Strongly Agree associated with a positive attitude toward assistive technology. Part three of the survey (Questions 18-22) measured the factors of the Diffusion Theory. The final part of the survey (23-28) provided background data to assist in the final analysis. The questions were placed at the end of the survey to ensure the subject was most alert during the critical phase of measuring attitudes. Table 3.2 provides details for the sources that were used to develop each question to determine administrator perceptions.

Below is a summary of the changes made to the Instrument after it was field tested:

Question 2 – Changed "ISTAR/ICAN" to only "ICAN" since all school districts use ISTAR as an evaluation method for low functioning students.

Question 6 – Replaced "unnecessary" to "unfair".

Questions 13 – Replaced "Enhance" with "Has the Potential to Enhance"

Question 19 – Changed replaced "English" with "Language Arts" to better describe the current curriculum.

Table 3.02

Foundation for Survey Questions

Question	Literature Support
5. AT is a useful tool in the integration of cognitively delayed students into the regular curriculum.	Alper & Raharinirina (2000) Cavanaugh (2002)
6. AT does not give special education students with cognitive delays an unnecessary advantage over students in the regular curriculum.	Cavanaugh (2002) Pugach (as cited in Cuban & Woodward, 2001)
7. Assistive technology increases student performance when the AT is properly implemented.	Brotherson & Parrett (2004) Cuban & Woodward (2001)
8. The passing of IDEA 2001/2004 has had a positive impact on the amount of AT recommended for cognitively delayed special education students.	Alper & Raharinirina (2000)
9. Special education students should be able to use AT in the classroom to improve the coursework to enhance their ability to receive a diploma waiver.	Bannan-Ritland et al. (2006) McDermott & Michaels (2003)
10. Assistive technology does not interfere with the central learning task of constructing meaning	Gersten, Schiller & Vaughn (2000)
11. The technology rather than curriculum and method of instruction are more important for the success of special education students.	Kozma (1991)
12. The curriculum and method of instruction rather than the technology is more important for the success of special education students.	Clark (1983)
13. Assistive technology enhances learning for special education students.	Brotherson & Parrett (2004)
14. The assistive technology recommended for the student in the IEP is always appropriate for the student.	Bannan- Ritland et al. (2006)
15. Teacher/student/parent collaboration in the selection of AT is critical to the success of the AT.	Bannan-Ritland et al. (2006)
16. The use of Assistive Technology within special education should be increased.	Lange, McPhillips, Mulhern & Wylie (2006) McDermott & Michaels (2003)
17. Assistive technologies are critical in helping special education students achieve their benchmarks as delineated in the IEP.	Gray et al. (2006)

Question 19 – Added "In" at the beginning of the question.

Question 21 – Changed selection "f." to "Vision and Direct Fact Contact"

Materials and Equipment

The survey was web-based, with initial letters sent via e-mail to the special education administrators who in turn sent them to the special education teachers. The Center for Instruction, Research, and Technology (CIRT) from Indiana State hosted the web form. The researcher established a SNAP account with Indiana State and received assistance from CIRT in both the development of the survey and the posting of the survey to the web.

Procedure

Survey

A letter with the link to the survey was sent to all special education coordinators across the state of Indiana. The participants were asked to and completed the survey within 14 days of receiving the survey. All correspondence was by e-mail.

Interview

At the end of the quantitative survey the researcher asked for volunteers to participate in a thirty-minute qualitative interview to gain further insights into AT implementation. The researcher received sixteen volunteers and conducted seven qualitative interviews. The researcher used telephonic interviews with the participants. The length of the interviews generally lasted thirty minutes. The principle investigator took notes during the interview session and shared them with the subject to ensure accuracy.

Design

The design for the quantitative data was a descriptive ex post facto survey. It was cross-sectional and self-administered.

For each subject, the data from the instrument was analyzed based on the subject's attitudes toward AT. SPSS 14.0 was used for statistical analysis. An alpha level of .05 was used as a level of confidence for all statistical tests. This level provided a balance between the possibility of Type I and Type II errors, and was commonly used in analysis of this type.

To determine if there is a statistical difference in attitudes based on the presence of an AT specialists, participation in the ICAN project, type of disability and grade level an ANOVA was run. If significant differences were found, a pairwise technique was to be used comparing obtained differences between two means versus critical differences required for significance. If the difference obtained is greater than or equal to the critical difference, it was significant.

The data for the qualitative interviews was developed into themes, categorized and then indexed accordingly. After all the data was indexed it was compared first internally against the other subjects, and then against the survey results to see if there was commonality or a significant difference in the data.

Chapter 4

RESULTS

Rogers (2003) identifies five characteristics of innovations that if met, in conjunction with the Change Agent, should predict the success of an adoption on an innovation. The characteristics, that if all present, he determined to most likely predict the success of the innovation was Relative Advantage, Compatibility, Complexity, Trialability and Observability. The Change Agent, which in the case of this research is the AT Coordinator or AT Committee, must ensure all characteristics are present, and if not, take on the role of facilitator for the process.

The results of the research are presented by first looking at the independent variables for the 164 respondents to the survey. After presenting the initial data each independent variable is linked to the attitudes of the teachers toward AT and each of the factors in the Diffusion Theory.

The instrument used in the study measures the attitudes of special education teachers and how they are affected by the presence of an AT coordinator or team in the school, if the school was part of the ICAN project, the type of disability, and the grade level. After the on-line survey was completed, seven special education teachers were interviewed to expand on the results of the study and determine if the diffusion

characteristics were met within the school that successful AT implementation did occur within the school.

The on-line survey was sent to the special education districts within Indiana requesting that special education teachers participate in the survey. The last question of the survey asked the subjects if they would participate in an in-depth interview. There were 164 subjects who completed the on-line survey. A total of 15 teachers indicated they would be interested in a follow-on in-depth interview on AT. From the initial 15 who volunteered for the interview, the researcher was able to coordinate with the teachers for seven interviews. A breakdown of the seven teachers and the results of the interviews are addressed later in the chapter.

The instrument used a Likert format to determine the attitudes of the teachers toward the potential of AT and their thoughts on the current implementation of AT. The options on the Likert scale were numbered 1 to 4, with 4 indicating a very positive attitude, and 1 indicating a very negative attitude.

Demographics of the Participants

Figure 4.1 shows the breakdown for the first independent variable, the presence of an AT Coordinator within the School, School Corporation, or Special Education district. Ninety-five respondents indicated an AT Coordinator was present at their school while 69 indicated there was not an AT Coordinator with their school.

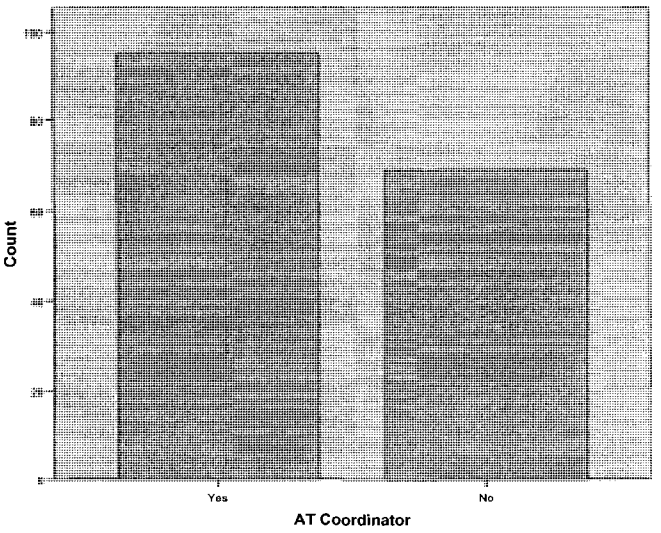

Figure 4.01. Presence of AT coordinator at the school

Figure 4.2 shows the breakdown for the second independent variable, whether or not the school was part of the ICAN project described in Chapter 2. 112 respondents indicated they participated in the ICAN project, 52 indicated their school did not participate in the project.

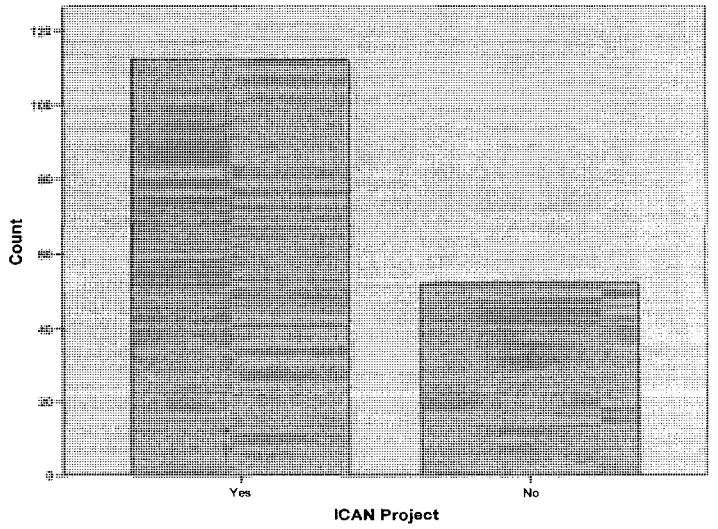

Figure 4.02. ICAN project participation

Figure 4.3 shows the breakdown for the third independent variable, Type of Disability. There are 13 types of disabilities defined in Article 5. One of the disabilities, Early Childhood Development, is outside the scope of this study; hence, 12 disabilities were listed on the survey. The respondents could choose which disabilities were present in their classroom. Many of the respondents had multiple disabilities, so the items were grouped into seven responses; Cognitive; Learning; Physical; Cognitive and Learning; Cognitive and Physical; Learning and Physical; All Types. Ninety-three of the respondents had all three disabilities with the remainder of the options represented in the figure.

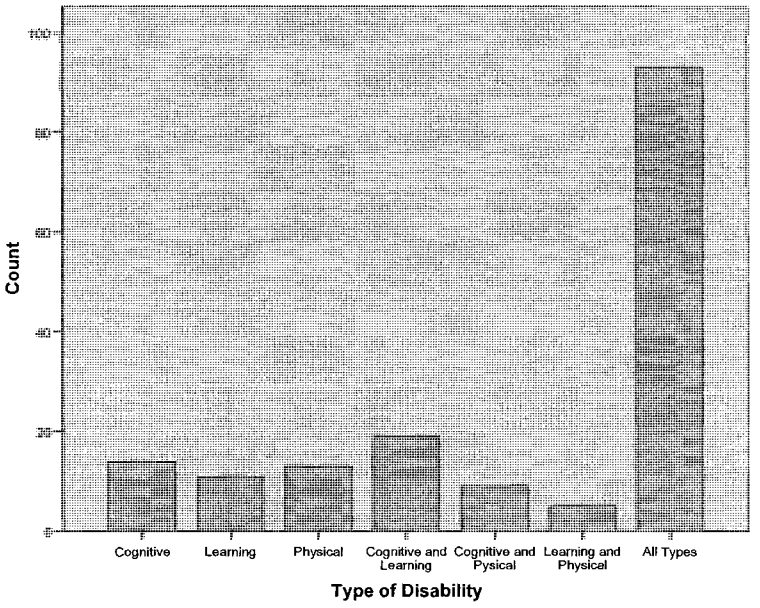

Figure 4.03. Type of disability present in the classroom

Figure 4.4 shows the breakdown for the fourth independent variable, Grade Level. Ninety-eight of the respondents indicated they taught at the K-5 level, 42 taught in the equivalent of Middle School (grades 6-8), 18 taught at the High School level, 6 taught in a smaller school system that combined High School/Middle School (grade 6-12).

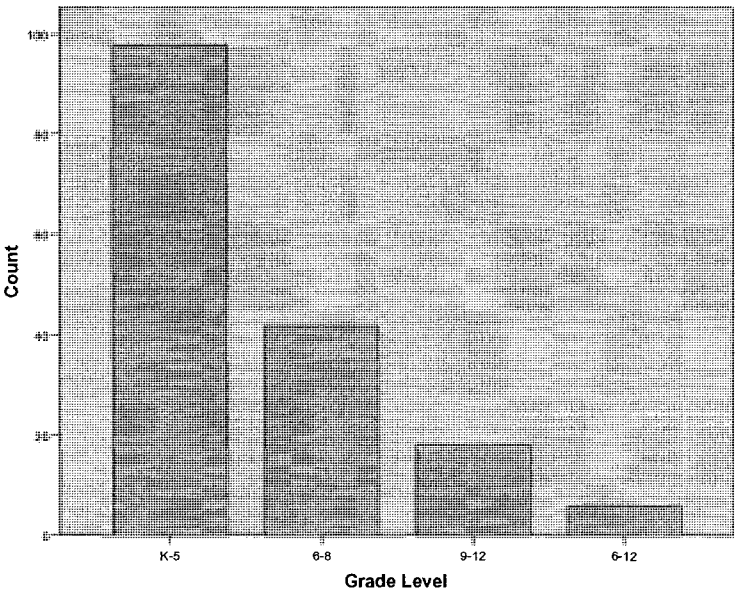

Figure 4.04. Participants by grade level

Statistical Results for Attitude Toward AT

The results discussed for the quantitative portion of the study will delineate the main effects only. There were no significant results for the interactions between the variables. When the respondents were asked if "The current use of assistive technology within the school is appropriate," the mean answer was 2.43, and 56.7% disagreed or strongly disagreed with the statement. There was no significant difference when the Analysis of Variance was run for the question when taking into consideration the four independent variables. The results of the ANOVA are in Table 4.1. The presence of an AT Coordinator within the school, while not significant, was the closest of the independent variables to be significant with a significance of .119. The mean for the presence of the AT Coordinator was 2.58, the highest among the independent variables.

Table 4.01

Dependent Variable: Current Use of AT Within the School is Appropriate

Source	Df	*F*	Sig.
AT Coordinator In the School	1	2.468	.119
School Part of ICAN Project	1	.280	.598
Type of Disability	6	1.028	.411
Grade Level	3	.258	.855

When the respondents were asked if "AT is a useful tool in the integration of special education students into the regular curriculum" the mean answer was 3.09 and 89.6% of the respondents either agreed or strongly agreed with the statement. There was no significant difference when the Analysis of Variance was run for the question when taking into consideration the four independent variables. The results of the ANOVA are in Table 4.2. The independent variables Type of Disability and Grade Level were closest to being significant. Learning and Physical disabilities averaged 3.3 and 3.4 respectively, whereas Cognitive disabilities averaged 2.64. Under grade level the mean for K-5 and 9-12 was 3.1 and 3.3 respectively whereas the mean for 6-8 was 2.9.

Table 4.02

AT is a Useful Tool in the Integration of Special Education Students into the Regular Curriculum

Source	Df	*F*	Sig.
AT Coordinator In the School	1	.049	.825
School Part of ICAN Project	1	.052	.820
Type of Disability	6	1.262	.281
Grade Level	3	1.259	.292

When the respondents were asked if "AT enhances learning for special education students" the mean answer was 3.25 and 95.2% of the respondents either agreed or strongly agreed with the statement. There was no significant difference when the Analysis of Variance was run for the question when taking into consideration the four independent variables. The results of the ANOVA are in Table 4.3. The independent variable AT Coordinator in the school was the closest to being significant. The mean for the presence of an AT coordinator was 3.3, whereas the mean for the lack of an AT coordinator was 3.1. The independent variable Grade Level was consistent with the previous dependent variable with the mean for K-5 and 9-12 higher than grades 6-8.

Table 4.03

AT Enhances Learning for Special Education Students

Source	Df	*F*	Sig.
AT Coordinator In the School	1	2.867	.093
School Part of ICAN Project	1	.672	.414
Type of Disability	6	1.344	.244
Grade Level	3	1.685	.174

When the respondents were asked if "The use of AT within special education should be increased." the mean answer was 3.07 and 74.2% of the respondents either agreed or strongly agreed with the statement. There was no significant difference when the Analysis of Variance was run for the question when taking into consideration the four independent variables. The results of the ANOVA are in Table 4.4. The presence of the AT Coordinator was again the closest to being significant with a Sig. of .091.

Table 4.04

The Use of AT Within Special Education Should be Increased

Source	Df	*F*	Sig.
AT Coordinator In the School	1	2.903	.091
School Part of ICAN Project	1	.148	.701
Type of Disability	6	.222	.969
Grade Level	3	.812	.490

One of the final questions the participants answered was "Which of the following is the greatest barrier to AT?" The results are in Table 4.5. Funding was identified as the greatest barrier, followed by Time to Research/Acquire/Implement, and AT Knowledge/ Background of the IEP team.

Table 4.05

Greatest Barrier to the Use of Assistive Technolog.

Barrier to AT	Frequency	Valid Percent
AT Knowledge/Background of IEP Team	28	17.1
Funding	63	38.4
Time to Research/Acquire/Implement	39	23.8
Assessment of AT Need	9	5.5
Family Support	6	3.7
Training	8	4.9
Complexity of AT	11	6.7

Statistical Results for Characteristics of the Diffusion Model

The next section focuses on the descriptives of the Diffusion Theory factors that are currently present at the schools of the participants of the survey. The presence of each of these factors and the affect it can have on a school are addressed more in-depth during the qualitative portion of the results. The information below provides data on the questions from the quantitative survey as they relate to each of the factors.

Relative Advantage

There were three questions in the survey that relate to this factor, Tables 4.6-4.8 provide a breakdown of the frequencies and percentages for each question. The first question was "AT increases student performance when it is properly implemented." The mean answer was 3.26, 57.9% agreed with the question and 34.8% strongly agreed with the statement. The second question was "Special education students should be able to use AT in the classroom to improve chances for a diploma waiver." The mean answer was 3.23, 57.9% agreed with the question and 34.8% strongly agreed with the statement. The final question was "AT does not give special education students an unfair advantage over general education students." The mean answer was 3.29, 51.8% agreed with the question and 40.9% strongly agreed with the statement.

Table 4.06

AT Increases Student Performance When it is Properly Implemented

	Frequency	Valid Percent
Strongly Disagree	6	3.7
Disagree	4	2.4
Agree	95	57.9
Strongly Agree	59	36.0

Table 4.07

Special Education Students Should Be Able to Use AT in the Classroom to Improve Chances for Diploma Waiver

	Frequency	Valid Percent
Strongly Disagree	8	4.9
Disagree	4	2.4
Agree	95	57.9
Strongly Agree	57	34.8

Table 4.08

AT Does Not Give Special Education Students an Unfair Advantage Over General Education Students

	Frequency	Valid Percent
Strongly Disagree	7	4.3
Disagree	5	3.0
Agree	85	51.8
Strongly Agree	67	40.9

The final area for Relative Advantage relates to the subject areas where teachers thought AT was most prevalent. The results are in Table 4.9, 76.2% of the teachers indicated AT provided the greatest advantage in Language Arts.

Compatibility

There were three questions in the survey that relate to this factor, Tables 4.10-4.12 provide a breakdown of the frequencies and percentages for each question. The first question was "AT does not interfere with the central learning task of constructing

Table 4.09

Effectiveness of Assistive Technology by Subject Area

Subject	Frequency	Valid Percent
Math	14	8.5
Science	1	.6
Language Arts	125	76.2
Other	24	14.6

meaning." The mean answer was 3.14, 67.1% agreed with the question and 24.4% strongly agreed with the statement. The second question was "The AT recommended for the student on the IEP is always appropriate for the student." The mean answer was 2.43, 37.2% agreed with the question and 4.3% strongly agreed with the statement. The final question was "Teacher/student/parent collaboration in the selection of AT is critical to the success of the AT." The mean answer was 3.45, 47% agreed with the question and 49.4% strongly agreed with the statement.

Table 4.10

AT Does Not Interfere With the Central Learning Task of Constructing Meaning

	Frequency	Valid Percent
Strongly Disagree	3	1.8
Disagree	11	6.7
Agree	110	67.1
Strongly Agree	40	24.4

Complexity

There was one question in the survey that addressed this factor, Table 4.13 provides a breakdown of the frequencies and percentages for the question. The question was "The complexity of AT can hinder rather than enhance the learning experience." The mean answer was 2.72, 60.4% agreed with the question and 7.3% strongly agreed with the statement.

Table 4.11

The AT Recommended for the Student on the IEP is Always Appropriate for the Student

	Frequency	Valid Percent
Strongly Disagree	5	3.0
Disagree	91	55.5
Agree	61	37.2
Strongly Agree	7	4.3

Table 4.12

Teacher/Student/Parent Collaboration in the Selection of AT is Critical to the Success of the AT

	Frequency	Valid Percent
Strongly Disagree	1	0.6
Disagree	5	3.0
Agree	77	47.0
Strongly Agree	81	49.4

Table 4.13

The Complexity of AT Can Hinder Rather Than Enhance the Learning Experience

	Frequency	Valid Percent
Strongly Disagree	5	3.0
Disagree	48	29.3
Agree	99	60.4
Strongly Agree	12	7.3

Trialability

There was one question in the survey that addressed this factor, Table 4.14 provides a breakdown of the frequencies and percentages for the question. The question was "Having different types of AT available for trial use would increase the implementation of AT on IEPs." The mean answer was 3.38, 50% agreed with the question and 45.1% strongly agreed with the statement. There were two other questions that indirectly addressed trialability. The first asked participants if they were familiar with the Promoting Achievement Through Technology and Instruction (PATINS) project in Indiana. The PATINS project has AT lending closest throughout Indiana that teachers can request certain devices. The next questions asked the participants whether they have AT readily available in their classroom for general use. The results for both questions are in Tables 4.15-4.16

Table 4.14

Having Different Types of AT Available for Trial Use Would Increase the Implementation of AT on IEPs

	Frequency	Valid Percent
Strongly Disagree	3	1.8
Disagree	5	3.0
Agree	82	50.0
Strongly Agree	74	45.2

Observability

There were two questions in the survey that relate to this factor, Tables 4.17-4.18 provide a breakdown of the frequencies and percentages for each question. The first question was "The more likely the AT can provide immediate, observable results the more likely it will be adopted." The mean answer was 3.14, 68.1% agreed with the question and 28.2% strongly agreed with the statement. The second question was "AT is critical in helping special education students achieve their benchmarks as delineated in the IEP." The mean answer was 2.43, 71.3% agreed with the question and 12.8% strongly agreed with the statement.

Table 4.15

Are You Familiar With the PATINS Project in Indiana?

	Frequency	Valid Percent
Yes	114	69.5
No	50	30.5

Table 4.16

Are There Assistive Technologies Available in Your Classroom for General Use?

	Frequency	Valid Percent
Yes	93	56.7
No	71	43.3

The final element of the Diffusion Theory is the presence of a Change Agent that can assist the further use of the technology. The Change Agent in this study is the Assistive Technology Coordinator. There were three areas where this was addressed in the survey; Tables 4.19-4.20 provide a breakdown of the frequencies and percentages for each question. The first, "Does your School Corporation/Special Education District have a full-time Coordinator/AT Committee," was addressed earlier in this section. The next question was "The availability of an AT Coordinator would increase the use of AT among special education students." The mean answer was 3.14, 57.9% agreed with the question and 28.7% strongly agreed with the statement. The final question asked if there was an AT specialist on each case conference committee.

Table 4.17

The More Likely the AT Can Provide Immediate, Observable Results the More Likely it Will be Adopted

	Frequency	Valid Percent
Strongly Disagree	1	0.6
Disagree	5	3.1
Agree	111	68.1
Strongly Agree	45	28.2

Table 4.18

AT is Critical in Helping Special Education Students Achieve Their Benchmarks as Delineated in the IEP

	Frequency	Valid Percent
Strongly Disagree	0	0
Disagree	26	15.9
Agree	117	71.3
Strongly Agree	21	12.8

Table 4.19

The Availability of an AT Coordinator Would Increase the Use of AT Among Special Education Students.

	Frequency	Valid Percent
Strongly Disagree	2	1.2
Disagree	20	12.2
Agree	95	57.9
Strongly Agree	47	28.7

Table 4.20

Is There An AT Specialist on Each Case Conference Committee?

	Frequency	Valid Percent
Yes	6	3.7
No	158	96.3

Results from Qualitative Interviews

In order to get a more in-depth perspective on the results of the quantitative survey seven special education teachers from Indiana were interviewed. The teachers indicated on the survey that they were interested in further discussion and the researcher contacted them at the numbers/e-mails indicated on the survey. Since the design of the research is a sequential explanatory design, the interviews were conducted after the quantitative survey was completed and the results compiled.

The purpose of the interviews were to determine what factors from the Diffusion Theory were present at the schools and what the perception was of the overall assistive technology program in the school. The results of the interview will be grouped by the responses to the questions as they relate to Relative Advantage, Compatibility, Complexity, Trialability, and Observability.

The demographics of the respondents are in Table 4.21. Of the seven participants three teach at the K-5 level, two teach at the 6-8 level, and two teach at the 9-12 level. Two of the participants teach at a large school, three at medium schools, and two at small schools. The range of teaching experience ranged from five years to over 33 years experience.

Table 4.21

Demographics of Teachers Interviewed

Years Experience	Grade Level	School Size
26	K-5	Large
25	K-5	Medium
36	K-5	Small
33	6-8	Medium
5	6-8	Large
23	9-12	Medium
33	9-12	Small

Relative Advantage

All seven participants strongly stated that AT provides a significant relative advantage for their students. Each participant believed the purpose for AT was to allow the child to compensate for their disability to allow them to maximize their abilities both within a contained classroom and in the general education environment. Statements such as "level the playing field" and "augment weaknesses" were common throughout the interviews. The particular way the AT provided this capability as indicated by the teachers included the following:

- Helps with organization
- Compensates for poor writing
- Makes it easier for students to express thoughts
- Maximizes visual and auditory skills
- Assists with both verbal and written communication

All seven participants felt Language Arts was the area the students were able to maximize the benefit of AT, followed by mathematics. This is consistent with the quantitative survey.

Compatibility

There was a range of responses to this question. All felt compatibility was the key to long term use, but had varying degrees of success meeting this requirement. Two of the participants (Different School Corporation/Special Education Planning District) had an AT team available that would do in-depth interviews with the students and teachers to gather the needs of the students and identify limitations the students may have in using the equipment. Once the fact finding was completed an assistive technology was recommended and a trial period was established to ensure the device met the needs of the students. In addition to the initial interview a member of the AT team was required to sit in on the case conference committee meetings and write a formal evaluation on how the technology was used and the success or failure of the AT.

Other techniques from the teachers who did not have the benefit of the AT team included developing checklists when exploring the possibility of using an AT device. The checklist was developed over the years and helped the teacher recommend the proper device. As the teacher stated, "Part of this was ensuring the student had'Comfortability' with the device that was difficult to quantify but was readily noticeable when it occurred."

The final aspect of compatibility that was a common theme was getting buy-in from the entire case conference committee. This included the parents so the device is used at home while doing homework and preparing for the next day. Including the

general education teachers is also critical so they understand the benefit of the device and how it can be best integrated it into the classrooms.

Complexity

Complexity, measured in the framework of AT, states that the more complex the technology the less likely it will quickly adopted and used for an extended period of time. Six of the seven participants tended to focus more on high-tech devices rather than low-tech devices. The one exception was the teacher who had primarily K-1 students. Two reasons given by the teacher for this was the general level of technical proficiency of the students at this level and the ability of the students to properly care for the technology. In other words, the kids were too hard on the equipment. The teacher who advocated for lower-tech devices would slowly integrate higher-tech solutions as they progressed through the class. Another advantage stated by the teacher is the lower-tech devices could more easily be brought home and needed less support from the parents for the student to use them. Finally, lower-tech devices were easier to integrate into the general education classroom. A general comment by all the teachers was that the lower tech options were easier to access and implement.

The teachers who advocated for more high-tech devices focused on the power of the device to help the student make up for their disability. All stressed that in order to be successful the teacher, student, and parents must receive the proper training to maximize the capabilities of the devices.

Some of the drawbacks of the high-tech devices were the expense, the time required developing the proposals for the devices, and the required steps for implementation discouraged the use of the devices. The more high-tech the device the

more specific it was to the individual learner. Since it was very specific to the learner it was less likely to be used by other students in the classroom. Finally, high-tech devices met more resistance from general education teachers because some felt it gave the student too much of an advantage over other students in the class.

Most of the high-tech devices were specific to Language Arts. There was a lack of these devices to assist the students in math, science and other subjects the students were involved in.

Trialability

All of the seven participants agreed that having devices on-hand for the student to use on a trial basis was invaluable. One of the teachers had no access to devices on a trial basis. Of the other six teachers four said they could access the devices, but the process they had to go through to get the devices discouraged the use. In one instance, in order to get the device from the lending closet it had to be in the child's IEP. Yet the teacher was reluctant to put it on the IEP without knowing if the device could benefit the child in the classroom. The time it took to get the devices was also discouraging. In one example, by the time the device was actually delivered to the classroom the student had moved to a different subject and could no longer use the device. As stated earlier, two of the teachers had a wide range of devices readily available that they could get from their AT teams to use on a trial basis.

Two of the teachers said parents were reluctant to invest in the device without knowing if it would benefit their child. One of the teachers said it was often "necessary to get an 'ah-ha' moment with a device to get full buy-in by the student and other teachers." Once this moment was achieved, the success of using the device increased significantly.

Often this "ah-ha" moment could not be achieved because the device was not available for trial use.

Observability

Observability, seeing immediate results from the innovation, was the final factor of the Diffusion Theory that was discussed with the participants. Observability was discussed in two ways. The first was how the student performed with the AT, and the second was the outside appearance of using the device, or what was termed as the "Cool Factor" by one of the participants and also mentioned in much of the literature. The more accessible and non-obtrusive the device was the better chance for success. One of the teachers also stated it was critical to provide coping skills for the student in the event a student was given a negative experience by either a teacher or fellow classmates. By providing the skills the student could overcome the initial apprehension of using the device and become successful.

All seven participants felt it was critical to see immediate results from the assistive technology by everyone involved in the decision making process. The benefit was discussed from a number of different perspectives. From the student perspective it was getting excited about the device and continuing its use and even experimenting with the device to get even better results. From a parent perspective, one of the teachers stated it would get them more involved and more supportive of the entire educational program. From an administration point of view it was important to show that investing the limited dollars available was improving the educational experience for the students.

The final part of Observability mentioned was following up with written feedback on the IEP on the effectiveness of the device. Two of the teachers stated the requirement

to provide written feedback during the case conference committee review of the IEP forced everyone to pay particular attention to how the device was or was not performing and how it affected the student's success.

Change Agent

Six of the seven participants had full-time AT Coordinators/AT Teams either at their school or within the School Corporation/Special Education Planning District. The one school that did not have a full-time coordinator employed a teacher part-time as the AT Coordinator.

The effectiveness of the AT Coordinator varied with each school. Three of the participants' schools had only one coordinator for the school corporation and was spread too thin to be effective. In previous years each of the schools had a more robust capability such as using a special education teacher whose sole responsibility was to focus on AT and coordinate with the School Corporation AT Coordinator. When this occurred there was a significant increase in the knowledge and use of AT within the school. The next year the position was cut due to budget constraints and the status quos returned. Within one of the schools the teacher was very aggressive about requesting the AT coordinator, setting up a meeting with the case conference committee, determining the needs of the child, but due to the length of the process and no follow-through there was limited success.

Another participant's school had a first year full-time AT Coordinator who was very young, just out of school, and ambitious but lacked the background of AT in general, and how more specifically how it can impact special education students. She had

yet to make an impact but the participant felt there was future potential if the individual stayed in the position.

The school with the part-time coordinator had very limited success with obtaining and gaining knowledge of assistive technologies. In the past, two full-time coordinators were employed and there was a significant increase in the use and effectiveness of the AT. For this teacher the key was getting funding and having the time get money from outside sources by either donations or writing and following through on grants.

Two of the participants had significant success with their AT Coordinators/AT Teams. The teachers were from different School Corporations/Special Education Planning Districts and taught at different levels (K-5, 6-8) but had very familiar stories. Whenever a possible need for AT was identified the AT Team would conduct and in-depth interview with the student, teachers, and parents to determine the best fit for the child. The AT coordinator would them come back with a recommendation and assist in implementing the device. Follow-up was conducted on the IEP during the case conference committee and the success or lack of success was documented.

Chapter 5

DISCUSSION AND RECOMMENDATIONS

Assistive Technology Implementation and Effectiveness

Although none of the overall findings indicated significance among the independent variables, there are still important factors within the quantitative data that are worthy of further discussion especially when combined with the information obtained in the qualitative interviews.

Consistent with earlier research by Nelson (2006), Cuban and Woodward (2001), and Tomei (2003) the study indicated that almost 90% of the teachers felt AT was beneficial to the special education student. This also was consistent with the qualitative interviews where every teacher interviewed strongly advocated for the continued and increased use of AT within the classroom. In the words of one of the teachers interviewed, "AT makes it easier for the students to express their thoughts and compensate for their disability."

While it is almost universally agreed that AT can help the special education students, almost 60% of the teachers did not feel the current use of AT within the schools was appropriate. Five of the seven participants in the qualitative interviews also indicated that the current use within the schools was not at an appropriate level.

The most prevalent factors for this discrepancy discovered in both the qualitative and quantitative portions of the study was lack of funding, lack of assistive technology knowledge on the part of the case conference committee, lack of time on the part of the teacher to properly research and implement the assistive technology, and lack of knowledge on the part of parents on how to advocate for their children. The factors are consistent with the study done by the Oregon Department of Education in 1996 (Lahm, 2003) except resource constraints were ranked fourth in that study as opposed to being the most common factor in this study.

Having a full-time Assistive Technology Coordinator, while not significant, had an impact on how the teachers perceived AT. This variable is discussed in more depth later, but what was discovered is that the mere presence of a coordinator does not automatically lead to an increase in the positive perception of the technologies. Much of the coordinator's impact is based on the amount of training they have, the number of years in the position, their aggressiveness in obtaining the technologies, and their span of responsibility. When one of the teachers was asked about the technology level of newer teachers the participant stated "The newer teachers have a better understanding of technology in general, but very limited knowledge of assistive technology and what is available and can benefit the special education student." Every teacher the researcher spoke with indicated their proficiency in using AT was due to their experience and self-initiative to gain a better understanding of the technologies. The level of professional development available to the teachers is decreasing to the point that much of their future development will be depend on their initiative.

The fact the school was a participant in the ICAN Project had very little impact on the attitude toward AT and the prevalence within the school. The automated features of the program did provide some level of convenience for the teachers but beyond that it had little impact in regards to the study. The primary reason that merely being in the project was not a factor is that the success and implementation of AT is more dependent on other factors such as the AT knowledge, skills, and dispositions of special education teachers (McDermott & Michaels, 2003).

The impact of grade level was minimal for the quantitative survey, but the findings during the qualitative survey provided a unique perspective on the technologies. There was a good cross section of teachers who participated in the interviews. Three were K-5, two were 6-8 and two were 9-12. A very common theme that emerged was how the different grade levels viewed the cosmetic and functional aspects of the technologies. The K-5 level was much more focused on discovering new ways to communicate and participate in the regular classroom. One teacher indicated, "For the elementary school students the ability to first communicate through the use of an assistive technology is very powerful and the energy runs through the student." Once the students discovered this ability it significantly increased their enthusiasm for the technology. The 6-8 or Middle School environment appeared to present the greatest challenge for the use and implementation of AT. The novelty of the technology had worn off and the need to not stick out and be more like their peers became more important. The ability for the teacher to recommend and implement the technology was much more difficult. This is consistent with the "cool" factor that was discussed earlier in the paper in relation to the way the user perceives it or perhaps, more importantly, the way the user perceives that others

perceive it (Parette & Peterson-Karlan, 2005). One teacher interviewed stated, "For Middle School students, external appearance is much more important. However, if the student is properly prepared with coping skills to deal with possible negative perceptions of the students the chance of success is much higher." As students moved into High School, the realization of the necessity of the technologies for the student to be successful after High School increased the use of the technology regardless of the attention it brought upon the student.

The final independent variable to be discussed is the type of disability. This had very little impact in both the quantitative and qualitative portions of the study. Certain physical needs that enabled the students to attend school were not considered because it was necessary for them to be in the classroom for the teachers to instruct. Beyond the basic functioning, the teachers interviewed focused more on how to give the maximum benefit to the students in an academic setting. They focused more on identifying needs rather than looking at the type of disability. One teacher said, "Regardless of the type of disability, I try to determine what technology can help the student compensate for their disability and bring them up to a normal level of functioning." This is also consistent with Bannan-Ritland et al. (2006) who stated that independent of the disability, assistive technology has two fundamental purposes. First, it can augment an individual's strengths so that his or her abilities counterbalance the efforts of any disabilities. Second, technology can provide an alternate mode of performing a task so that disabilities are compensated for or bypassed entirely.

The barriers to the implementation of AT were consistent for the quantitative survey and the qualitative interviews. Funding was the greatest barrier identified in the

survey with almost 40% of the survey participants listing it as the greatest barrier, followed by 24% identifying time to Research/Acquire/Implement, and 17% indicating AT Knowledge/Background of the case conference committee. Funding was also the greatest barrier to implementation during the qualitative interviews, followed equally by the time to research, and AT Knowledge/Background of the case conference committee.

During the course of the interviews it became apparent that while funding was identified as the greatest barrier, it really came down to having the necessary time to obtain funding. One teacher noted "Without a dedicated individual to research what technologies and funding sources are available, teachers have to do their research outside the classroom on their own time." Time was also a key factor in the ability to conduct research as well as developing a thorough knowledge of what types of technologies were available and would work the best in various situations. If the researcher was able to conduct follow-up inquiries with all of the survey respondents a similar pattern may develop. There were some great vignettes provided by the teachers on obtaining outside funding. One teacher provided the following, "I would go to local businesses with success stories of how the technologies benefit the children and asking for donations or scholarships for the students." In addition, the majority of the teachers interviewed spent their own money at one time or another to fund projects. These are exceptions, and the level of dedication required to continue at that level without additional assistance, such as an AT Coordinator, was difficult for the teachers.

Diffusion Theory

For each of the five elements (Relative Advantage, Compatibility, Complexity, Trialability, and Observability) of the Diffusion Theory the quantitative survey reinforced

the importance for each. What the researcher was able to do during the qualitative interviews was not only confirm the importance of each, but also determine which of the elements existed in the schools and why, and if the elements were present was there an increased prevalence of AT use within the school.

As stated earlier, two of the teachers who were interviewed stated that the level of AT use within the school was appropriate. It was in these two schools that all the elements of the Diffusion Theory were present and there was an effective Change Agent. In both cases the Change Agent was accessible and involved in the decision to implement or not implement an AT. The ability of the Change Agent to be present from inception to implementation and follow-up was present in both cases. In both cases the AT team often went above and beyond the requirements of the teacher and would recommend technologies based on their observation of the classroom. As one teacher stated, "I will send a list of the needs of the child to the team and they will do their best to match the needs, and sometimes go beyond the requirements. It saves a tremendous amount of time that I simply don't have." The AT teams involvement through the initial interviews with the teacher and student, the ability to provide technologies for trial use, and the formal evaluation on the IEP during case conference committee meeting ensured each element of the Diffusion Theory was considered and present.

The presence of a Change Agent, in this case the AT Coordinator/Committee, as discovered in the interviews, did not guarantee a better environment for the implementation of AT. The five teachers who thought that AT provided a relative advantage, but thought the use of AT was underutilized, had Change Agents present at their school or in their Special Education Planning district, four full-time, one part-time,

but they lacked the effectiveness of the other two schools. The three primary reasons given were a lack of experience on the part of the coordinator, too wide a span of control, and lack of support from the administration. One teacher during the interview stated, "There is one AT Coordinator at the School Corporation who is a real go-getter but she is spread too thin to make a real impact." The final point, lack of support from the administration, was not necessarily a negative attitude towards AT, but more of a function of the tremendous pressure on the schools from a lack of funding and the requirements of No Child Left Behind. This was emphasized by one of the teachers during the interview who stated, "The current administration faces a lot of challenges and the pressure of NCLB, the stress to become a 4-Star school makes obtaining AT for special education students a lower priority."

Limitations

There were two limitations that may affect the validity of the study. The first is a lack of a central data base on the use of AT within the state of Indiana. The ICAN Project provides this capability but use of the system is voluntary and only 80 schools within the state are currently using the system. Having a central data base would provide more accurate data that could assist in the analysis if the effectiveness of AT. The second limitation that may affect generalizability is the study was confined to the state of Indiana. While IDEA 2004 provides general nationwide guidance, each state in turn develops their particular method of implementing this guidance. In the case of Indiana the implementing guidance is Article 7.

Recommendations

There are three recommendations that come from this study. The first is to empower the AT Coordinators within the schools. According to Rogers (2003), an effective Change Agent influences clients' innovation decisions in a direction that increases the use of the innovation. Their ability to facilitate the process and commit the required time necessary to establish a successful program is critical. The AT Coordinator can also help overcome many of the primary barriers discovered during the study and also identified by Lahm (2003), by identifying alternate funding sources, conducting research on the best fit for AT devices, and educating the case conference committee. As shown throughout the study, the mere presence of the AT Coordinator does not ensure success, they must be empowered.

The second recommendation is education of the parents of special education children on the benefits of AT and how they can best advocate for their children. Todis (1996) found that family, student, and professionals working collaboratively enhanced the chances of successful AT implementation. The level of parent involvement during the recognition of the need for an AT and the follow-on recommendation and implementation was very low for each of the teachers interviewed, to include the schools that had very successful programs. The teachers mainly attributed this to a lack of knowledge on the behalf of the parents. The basic special education system can be overwhelming for a parent not familiar with the process, add to this the possibility of AT and the level of anxiety only increases. IDEA 2001/2004 requires that AT be addressed on the IEP, the teachers interviewed stated this is often a "check the box" drill and is glazed over during the case conference committee meeting.

The third recommendation is to provide more AT for trial use in the classroom. Riemer-Reiss and Wacker (2000) stated with the expense of the devices and time limitations students in a special education program are often not given the opportunity to test devices out before purchasing the device. Most AT are expensive and teachers and parents are reluctant to purchase these systems if they are not sure if the system will work. While one of the teachers interviewed was very supportive of the PATINs project, which maintains a stock of technologies for Indiana schools to be use on a trial basis, the others indicated the technologies were for severely handicapped children and the process to request the systems was very lengthy and cumbersome.

Future Research

This study identified the attitudes of special education teachers towards the use of AT and how the Diffusion Theory influenced the implementation process. It would be interesting to research the attitudes of parents toward the identification, recommendation and implementation of AT to look at the problem from a different perspective. Brotherson and Parret (2004) identified four areas that must be considered when deciding to use AT. Family issues, does the device meet the family's expectation, was the second most important factor when deciding to implement AT. What is the parent's knowledge level of AT and how do they fit within the special education process and the case conference committee meetings?

Another interesting research area would be to do an in-depth Case Study of both a successful implementation of AT and a case where an AT was not recommended or one in which the AT was implemented but failed to achieve the desired results. Marino et al. (2006) determined there are there are a myriad of factors that influence student's

performance when using AT over time including, the individual's abilities, the nature of the tasks a student completes, the context in which the task will be performed, and the type of AT device the student is using. The cases could be compared and contrasted using these factors for each step of the way to identify key areas that lead to the success versus the failure.

The final research area is to identify the challenges of AT for each grade level to determine the best strategies for each. Parette and Peterson-Karlan (2005) identified the "cool" factor associated with AT devices and the impact it had on adoption. During the qualitative interviews difference were also identified with how AT was perceived at each grade level. By exploring the differences more in-depth it could be determined whether schools could alter the strategies for each grade level to increase the effectiveness of their AT program.

Summary

There is some excellent work currently being done in the schools to integrate AT into the classroom. Special education teachers and administrators at all levels are working to improve the educational experiences of their students. Much of this progress is due to the initiative and enthusiasm of the teachers and frequently on their own time and expense. The passion and excitement of the teacher during the interviews was very uplifting.

Yet with the good work being done there is still a large gap that still must be filled between the perceived benefit of the technology (90%) and the amount of teachers who feel AT is not being properly utilized within the school (60%). The problem is compounded by the constant pressure placed on the schools to achieve NCLB standards

combined with continuing budget issues. Every dollar and amount of time spent on AT must be maximized. Education among both teachers and parents combined with an effective Change Agent empowered by the administration can help in bridging the gap.

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APPENDIX A

Survey Instruments

Quantitative Survey

1. Does your School Corporation/Special Education District have a Full-Time AT Coordinator/AT Committee?

Yes
No

2. Is your School Corporation/District part of the ICAN project?

Yes
No

3. What type of disability is most recommended for use of AT?

1) Autism Spectrum disorder
2) Mental Disability
3) Communication Disorder
4) Multiple Disabilities
5) Deaf-Blind
6) Orthopedic Impairment
7) Other Health Impairment
8) Emotional Disability
9) Traumatic Brain Injury
10) Hearing Impairment
11) Visual Impairment
12) Learning Disability

4. What level do you teach at:

a. Students in K-5
b. Students in 6-8
c. Students in 9-12
d. Students in 6-12

5. AT is a useful tool in the integration of cognitively delayed students into the regular curriculum.

Strongly disagree
Disagree
Agree
Strongly agree

6. AT does not give special education students with cognitive delays an unfair advantage over students in the regular curriculum.

Strongly disagree
Disagree
Agree
Strongly agree

7. Assistive Technology increases student performance when the AT is properly implemented.

Strongly disagree
Disagree
Agree
Strongly agree

8. The passing of IDEA 2001/2004 has had a positive impact on the amount of AT recommended for cognitively delayed special education students.

Strongly disagree
Disagree
Agree
Strongly agree

9. Special education students should be able to use AT in the classroom to improve the coursework to enhance their ability to receive a diploma waiver.

Strongly disagree
Disagree
Agree
Strongly agree

10. Assistive technology does not interfere with the central learning task of constructing meaning.

Strongly disagree
Disagree
Agree
Strongly agree

11. The technology rather than curriculum and method of instruction is more important for the success of special education students.

Strongly disagree
Disagree
Agree
Strongly agree

12. The curriculum and method of instruction rather than the technology is more important for the success of special education students.

Strongly disagree
Disagree
Agree
Strongly agree

13. Assistive technology enhances learning for special education students?

Strongly disagree
Disagree
Agree
Strongly agree

14. The assistive technology recommended for the student in the IEP is always appropriate for the student.

Strongly disagree
Disagree
Agree
Strongly agree

15. Teacher/student/parent collaboration in the selection of AT is critical to the success of the AT.

Strongly disagree
Disagree
Agree
Strongly agree

16. The use of assistive technology within special education should be increased.

Strongly disagree
Disagree
Agree
Strongly agree

17. Assistive Technologies are critical in helping special education students achieve their benchmarks as delineated in the IEP.

Strongly disagree
Disagree
Agree
Strongly agree

18. The complexity of AT can hinder rather than enhance the learning experience.

Strongly disagree
Disagree
Agree
Strongly agree

19. Having different types of AT available for trial use would significantly increase the implementation of AT on the child's IEP.

Strongly disagree
Disagree
Agree
Strongly agree

20. The current use of AT within the school system is appropriate.

Strongly disagree
Disagree
Agree
Strongly agree

21. The more likely AT can provide immediate, observable results the more likely it will be adopted.

Strongly disagree
Disagree
Agree
Strongly agree

22. The availability of an AT Coordinator would increase the use of AT among special education students.

Strongly disagree
Disagree
Agree
Strongly agree

23. Is there an AT Specialist on each case conference committee?

Yes
No

24. Are you familiar with the PATINS Project in Indiana?

Yes
No

25. Are there assistive technologies available in your classroom for general use?

Yes
No