Essential Elements of Implementing Assistive Technology for Students with Disabilities in grades 6-12

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The use of assistive technology is crucial for students, grades 6-12 with disabilities, as it promotes inclusive education and empowers them to actively participate in academic activities, ultimately enriching their overall educational experience. By acknowledging and addressing these essential needs, schools and educators can establish an inclusive and supportive learning environment that maximizes the potential of secondary students with disabilities. This research investigates the essential elements of implementing assistive technology for grades 6-12 students with disabilities in Iowa. A survey comprising 20 items was distributed to secondary teachers in three public school districts with computers and internet access in their classrooms. The results reveal favorable availability of assistive technology at their schools, high levels of teachers' knowledge and preparedness for assistive technology, and positive attitudes toward integrating assistive technology into their teaching. The study offers implications for schools to optimize the use of assistive technology in their educational practices.

Introduction

The integration of assistive technology (AT) in contemporary education is a transformative approach to creating inclusive and equitable learning environments, particularly for students with disabilities. Rooted in principles of equal access and individualized support, AT breaks barriers and enhances educational experiences through tailored tools and devices. In Iowa's secondary education, the focus is on understanding students' unique needs and leveraging AT to promote inclusivity and academic success. As secondary education evolves to embrace diversity, students with disabilities seek equitable opportunities that align with their learning styles. This research explores the essential elements of implementing AT in general and special education, aiming to inform local practices and contribute to broader discussions on fostering inclusive learning environments.

Literature Review

Assistive technology (AT), as defined by the Individuals with Disabilities Education Act (IDEA), is any item or equipment that enhances the functional capabilities of individuals with disabilities (U.S. Department of Education, 2007). The Iowa Center for Assistive Technology Education and Research (ICATER) categorizes AT devices into three levels:

1. Low-tech: Non-electronic tools requiring equipment outside the body (e.g., pencil grips).
2. Mid-tech: Battery-operated devices with simple functions.
3. High-tech: Advanced electronic devices with sophisticated processors.

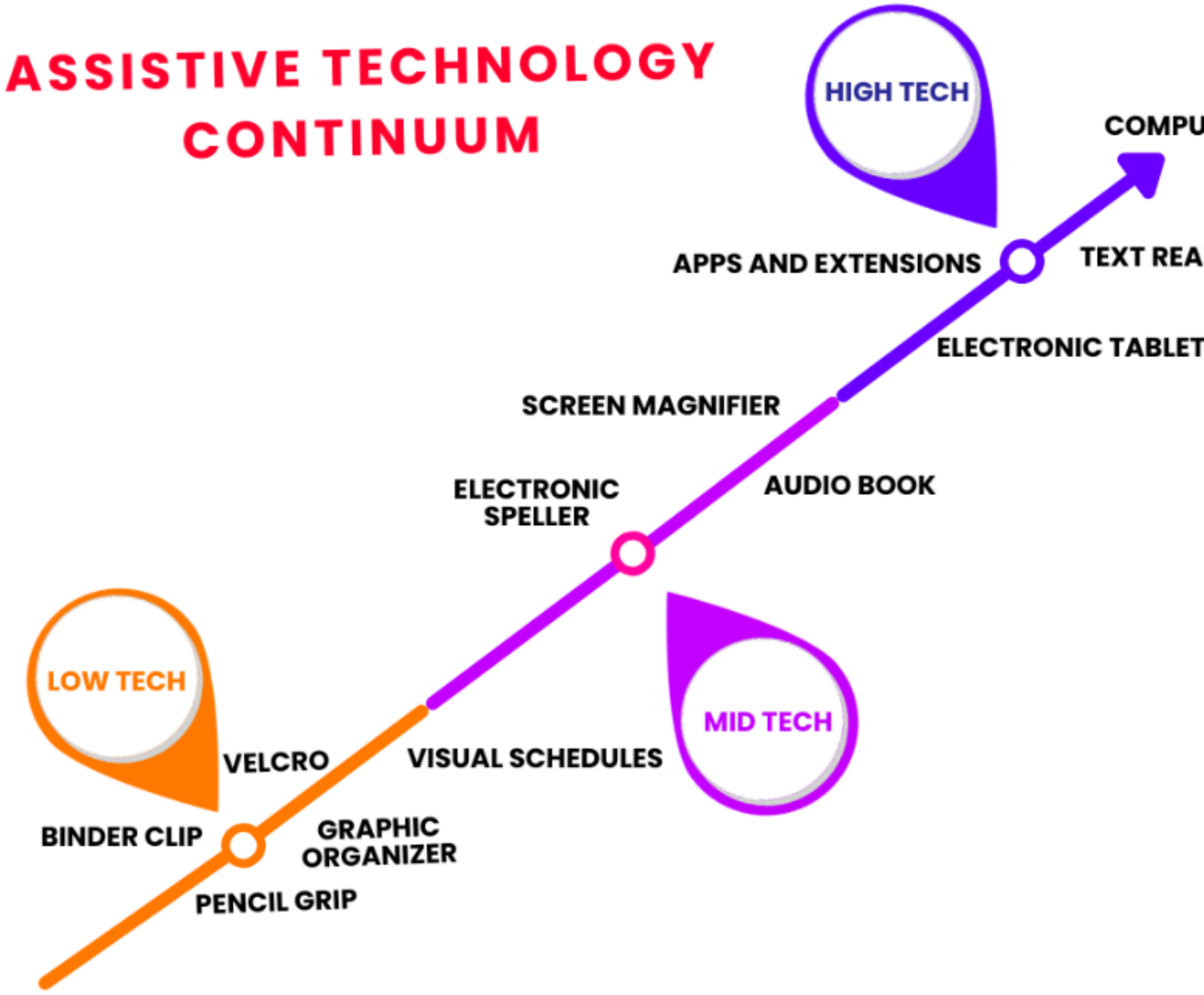
These categories represent a continuum of AT options adaptable to varying needs.

Research highlights the significant benefits of integrating computer technologies for students with special needs, with many requiring adaptive software or hardware to effectively use technology. Bouck (2016) states that the Individuals with Disabilities Education Act (IDEA) mandates the consideration of assistive technology (AT) in students' Individualized Education Plans (IEPs). Teacher attitudes, awareness, and training are crucial for successful AT integration in general education classrooms. From their studies, Satsangi et al. (2019) and Heiman et al., (2012) show that teachers with sufficient training and hands-on experience are more confident in utilizing AT, emphasizing the need for professional fluency in available tools and strategies.

When implementing AT for secondary students with disabilities, educators should prioritize tools that support students' goals and promote independence. Examples include probeware for science, graphic organizers, tactile manipulatives, talking calculators, and digital graphing tools, which enhance understanding and problem-solving in math and science. Ok and Rao (2019) outlined various instructional technologies designed to address the diverse academic needs of students with disabilities effectively (Figure 1). Effective use of AT across low-tech, mid-tech, and high-tech levels significantly improves learning outcomes for students with disabilities throughout their educational journey.

Figure 1

Assistive Technology Continuum (adapted by Ochola & Dao, 2024)



Method

Instrument

This quantitative study used a 20-item survey, including multiple-choice and Likert-scale questions, created in Qualtrics. Participants were secondary teachers from three Iowa public school districts with classroom internet and computer access, located near the state's assistive technology research center.

Data collection procedures

Participants reviewed and consented to join the study before receiving the survey, which was distributed to 2,705 individuals. After one month, 129 instructors from rural, suburban, and urban areas completed it. The survey, conducted on Qualtrics, was analyzed using SPSS's descriptive features. It collected demographic data and evaluated AT availability, teachers' knowledge, preparedness, and attitudes through nine targeted items. The results are summarized in the next section.

Findings

The results emphasize the importance of integrating Assistive Technology (AT) into teaching and learning in three public school districts, focusing on four key areas: availability, teachers' knowledge, preparedness, and attitudes, which are crucial for effective AT implementation.

AT Availability

The availability of assistive technology (AT) in schools significantly enhances education by addressing the needs of students with disabilities, fostering inclusivity, and enabling personalized learning experiences. AT also prepares students for a technology-driven future by equipping them with essential skills. Instructors use various tools, including light pens, adaptive desks, Neo portable keyboards, and assistive listening devices, to maximize teaching and learning activities.

According to Table 1:

- 86% of participants reported access to AT in their schools.
- 79% actively utilized AT with their students.
- AT availability included 62% low-tech, 39% mid-tech, and 81% high-tech resources.

These findings demonstrate that schools offer diverse and sufficient AT resources, providing instructors and students with ample opportunities to enhance learning outcomes through technology.

Table 1

AT availability at schools in Iowa. Numbers 1,2,3 mean the order numbers of the survey items.

N=129	Variables	Frequency (n)	Percentage (%)
	1. Have access to AT	111	86
	1. Have used AT with students	103	79
	1. Types of AT available at schools 1. Low-tech 2. Mid-tech 3. High-tech	80 50 104	62 39 81

Teachers' Level of AT Knowledge

Instructors' proficiency with assistive technology (AT) is crucial for creating inclusive and effective learning environments. Their knowledge enables the use of various tools, from low-tech (e.g., pencil grips, adaptive desks) to high-tech (e.g., Neo portable keyboards, audio books, and assistive listening devices), to support diverse student needs and enhance communication, engagement, and accessibility.

Table 2

Teachers' Level of AT Knowledge at their schools. Numbers 4 means the order number of the survey item.

N=129	Variables	Frequency (n)	Percentage (%)
	4. Levels of AT Knowledge		
	1. No knowledge	10	8
	1. Little Knowledge	30	23

1. Some Knowledge	49	38
1. Good Knowledge	40	31
1. Extensive Knowledge	0	0

According to Table 2:

- 38% of instructors had proficient AT knowledge.
- 31% had moderate knowledge.
- 23% had limited knowledge.

These findings indicate that most instructors possess the foundational knowledge needed to integrate AT into their teaching practices, demonstrating strong potential for effective and inclusive classroom implementation.

Teachers' AT Preparedness

Thorough preparation in assistive technology (AT) equips instructors with the confidence, skills, and positive attitudes needed to integrate AT into their teaching practices effectively. Training through college or graduate courses, workshops, and in-service programs enables instructors to use tools like adaptive desks, Neo portable keyboards, smart boards, and assistive listening devices to meet diverse student needs and foster inclusive, efficient learning environments.

Table 3.

Instructors AT Preparedness

N=129	**Variables**	**Frequency (n)**	**Percentage (%)**
	5. Number of college or graduate level courses you have taken in which assistive technology was covered in detail. a. None b. 1-2 c. 3-4 d. 5 or more	70 49 9 0	54 39 7 0
	6. number of workshops or in-services you have attended pertaining specifically to assistive technology. a. None b. 1-2 c. 3-4 d. 5 or more	51 55 17 6	39 43 13 5
	7. How prepared do you feel in providing assistive technology service to your students? a. Not all prepared b. Poorly prepared c. Somewhat prepared d. Adequately prepared e. Extremely prepared	10 31 57 29 1	8 25 44 22 1

According to Table 3:

- 46% of participants gained AT preparation through 1-4 college or graduate courses.

- 61% received training via 1-5+ workshops or in-service programs.
- 67% of participants reported being extremely, adequately, or somewhat prepared.

This strong foundation in AT preparation underscores its importance in helping instructors successfully adapt their teaching to create supportive and inclusive classrooms.

Teachers' Attitudes toward Using AT with Students

Instructors' positive attitudes toward assistive technology (AT) significantly impact the success of inclusive education. Many instructors have experience using various AT tools, such as adaptive desks, Neo portable keyboards, smart boards, and assistive listening devices, and they show enthusiasm for integrating AT to meet diverse student needs and create dynamic learning environments.

Table 4

Teachers' Attitudes toward Using AT with Students

N=129	Variables	Frequency (n)	Percentage (%)
	8. How interested are you in learning how to use AT to meet student needs?	33	26
	a. Very interested	81	63
	b. Somewhat interested (do not know but will think about it	15	11
	c. Not interested		
	9. Preferred method to learn about AT	30	23
	a. one-on-instruction	96	74
	b. Hands-on instruction in group setting	67	52
	c. attending workshops or conference sessions	22	17
	d. Formalized courses	0	0
	e. Others		

According to Table 4, eighty nine percent of instructors expressed high or moderate interest in incorporating AT, while only 11% showed no interest. To enhance their proficiency, instructors demonstrated a strong commitment to professional development:

- 23% preferred one-on-one instruction.
- 74% favored hands-on group sessions.
- 52% expressed interest in workshops or conferences.
- 17% planned to take formal courses.

This proactive approach highlights instructors' dedication to improving their skills, fostering inclusivity, and enriching education with technology.

Discussion

This research on implementing assistive technology (AT) for students with disabilities in grades 6-12 across three Iowa public school districts highlights its critical role in both general and special education. The study found that AT is widely available, with strong teacher support, high levels of knowledge, and positive attitudes toward its integration, emphasizing its importance in fostering inclusive and equitable education. AT plays a multifaceted role in secondary education, supporting students with disabilities in accessing educational materials while enriching the learning environment for all through personalization, collaboration, and innovation. The study identified four essential elements for AT implementation:

1. Availability: 86% of teachers reported access to AT resources.
2. Knowledge: 92% of teachers had at least some understanding of AT.
3. Preparedness: Teachers gained AT training through college courses (46%) and workshops or training sessions (61%).
4. Positive attitudes: 89% showed high or moderate interest in using AT in teaching.

These findings address the research question and provide valuable insights for advancing AT practices in secondary education.

Implications

Teachers recognize AT's benefits in helping students perform at grade level but often lack formal training in its use. None claimed extensive AT knowledge, yet many believe AT negatively impacts skill development despite acknowledging its positive effects. Future research could explore these contradictions, particularly in secondary schools near the state research center for AT. Differences between special and general educators in AT knowledge, preparedness, and attitudes exist, but collaboration and professional development can bridge these gaps, improving inclusive education for all students.

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