



Assistive Technology and Universal Design for Learning

TOOLKITS FOR INCLUSIVE INSTRUCTION

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FOREWORD

I often think that “this is the best time in history to have a disability.” I really mean that, as a person with a disability who benefits every day from the progress we have been able to make over the last few decades. Focusing only on what is not working or could be done better is often easy, but it is also important to pause and express gratitude for the progress made. Living in the United States, I benefit daily from a legal framework that protects my civil rights, including the Americans with Disabilities Act (ADA) and Section 504 of the Rehabilitation Act of 1973. You will learn more about the developments that brought us to this important historical point in Chapters 1 through 3 of this book. As someone born and raised in another country, I am keenly aware of what it is like when these protections are not in place—I get reminded every time I visit my family in the Dominican Republic.

Along with legal protections, we are also living at a time of great promise regarding the development of accessible and assistive technologies. What used to be specialized, expensive tools with steep learning curves are now often just built-in options on many of the devices our students (and staff) use daily to look up information and interact with each other. We have a great foundation to build true inclusion in our society. As my friend David Berman has said, “For the first time in history, we have the power to include everyone.” So, what is getting in the way? It is not always working in a coordinated way to build the capacity to truly take advantage of the many advances we have made in the last four decades. That is where this book comes in. It will provide teachers and staff who support students with disabilities with the tools they need to make that promise a reality.

This book is incredibly timely. The National Educational Technology Plan was just released as a document setting national priorities for investments in technology to support learning. This plan focuses on three divides that need to be addressed for these investments to bear fruit in transforming the use of technology in education: use, design, and access. For learners with and without disabilities to participate as learners, employees, and citizens in an increasingly digital society, they will need to have equitable, sustained access to high-speed Internet connectivity, devices that can serve as access points to that connectivity, and high-quality and accessible digital content that is interoperable with the features on those devices. As stated in the plan, bridging the access divide also involves digital literacy, which includes digital health, safety, and citizenship, so that all learners can realize the benefits of digital life while avoiding some of its pitfalls (e.g., the potential for cyberbullying, the need to balance screen time with other pursuits that improve physical and mental health).

Preparing all learners to be digital citizens requires attention as early as possible because these are not skills that materialize out of thin air when needed. They are skills that require sustained attention and time for learners to practice and discover the options that work best for them. I am happy that Chapter 5 of the book provides toolkits for educators working in early childhood settings. The earlier we start sowing the seeds of digital literacy, the better. This chapter is followed by ones focusing on four key areas where students might need support to participate in not just their academics but the life of the community: literacy, writing, communication, and math. As someone whose career trajectory was altered by challenges with math (resulting from a language barrier when



I arrived in the United States), I appreciate the focus on math because it is foundational to careers in science, technology, engineering, and mathematics (STEM). With the toolkits shared in this book, learners with and without disabilities should be well prepared to succeed at school and in life.

The second divide addressed in the National Educational Technology Plan is the design divide, which focuses on the professional development and support educators and staff need to implement technology for learning successfully. Acknowledging this divide means recognizing not just the need for professional development but also for educators to have their load lightened a bit. Burnout is a thing, and if we are careful, we could retain some of our most qualified and passionate advocates for inclusion.

I have left the first divide addressed in the National Educational Technology Plan for last because it is the most important one. Including this divide in the plan is meant to acknowledge that not all technology use is equal. Many learners, often those in lower socioeconomic settings and those with disabilities, are provided access to technology without any transformation in the instructional paradigm in which technology use occurs. Technology use is thus passive or involves activities meant to promote compliance and obedience, such as completing worksheets or “interactive” point-and-click activities where learners complete the work with little engagement or passion for what they are learning.

This book, in contrast, is grounded in a framework, Universal Design for Learning (UDL), that seeks to transform pedagogy so that it, in turn, transforms learners’ lives and prepares them to be active participants in their education, not bystanders. UDL is infused through many sections of the National Educational Technology Plan, representing a shift in thinking to make educational technology use more learner-centric. You will notice that throughout this foreword, I use the learner rather than the student, a change in my thinking that I owe to my mentor and colleague Kathleen McCloskey. A student’s education happens to them, whereas a learner actively participates in it. If we are to prepare leaders rather than followers, we need to do more than just provide technology toolkits that help learners and educators become more efficient at what they do. That efficiency must be in the service of something meaningful that affects their lives and their communities. For that to happen, we must consider all learners, including those with disabilities, codesigners, and co-owners of their educational experience.

UDL does that by transferring the responsibility for learning and sharing the power in the learning environment so that more of it resides in learners because that is what is going to truly “empower” (a term used in Chapter 1 of this book) them to be problem-solvers who change our society for the better. Although I find the three principles of UDL (multiple means of engagement, representation, and action and expression) helpful, the UDL guidelines’ power lies in the framework’s layers: access, build, and internalize. Starting with access, we consider barriers in the environment, not learners. Then, once we do our best to remove those barriers through accessible design, we start the hard work of building learning skills so that learners can take accessible information and turn it into usable knowledge. That involves using technology to personalize the learning experience with tools such as those included in the toolkits discussed in this book (including translation, text-to-speech, captions, and more). However, it also involves the development of executive functioning, comprehension strategies, and self-awareness that harnesses emotions to support learning.



I am honored to have been asked to write this foreword for a book that combines two of my passions: assistive technology and inclusive instructional design. As you explore the use of technology guided by the authors of each chapter, I hope you keep a quote I first heard from CAST founder David Rose in the back of your mind: “We do not want to provide access to boredom.” We want to use technology to ensure all learners, including those who have disabilities, multilingual learners, and others who have been marginalized in education, have access to educational opportunities that reflect their identities, interests, passions, creativity, and joy for living.

—Luis Perez, PhD
Disability and Digital Inclusion Lead, CAST





PREFACE

Welcome to a journey like no other—a journey into the uncharted territory where instructional technology meets assistive technology, creating a powerful synergy that can transform the landscape of education. Our textbook is not just a book; it is an invitation, a call to adventure for educators, administrators, and all those passionate about shaping the future of learning.

Picture a world where no learner is left behind, where technology becomes a catalyst for empowerment. Our textbook unravels the untapped potential within the intersection of instructional technology and AT. It is not just about learning; it is about illuminating the path forward, bridging the gap, and fostering a collective understanding of how these technologies can revolutionize education.



ABOUT THE AUTHORS



Kim K. Floyd, PhD, is a professor in the School of Counseling and Well-Being at West Virginia University. Her educational background includes degrees in special education and early childhood from East Carolina University and Old Dominion University. Dr. Floyd's interdisciplinary training in early childhood special education and assistive technology allows her to synthesize current research in these fields. Dr. Floyd has considerable experience working with assistive technology in classroom, community, and home environments. She has developed the Collaborative Assistive and Instructional Technology Education Lab at West Virginia University to support students in teacher preparation programs to learn about assistive technology in authentic environments. Dr. Floyd has collaborated on federal and foundation grants at East Carolina University and West Virginia University to support training of special education teachers, mental health, and counselor education. She has published numerous journal articles and book chapters for researchers and practitioners. Dr. Floyd's current research interests are assistive and instructional technology, rural special education, inclusive practices, and trauma-informed practices. She currently serves as the Coordinator for the Collaborative Assistive and Instructional Technology Education Lab and as Headquarters for the American Council on Rural Education.



Tara Jeffs, PhD, provides technical assistance in the areas of accessible educational materials, assistive technology, instructional technology, Universal Design for Learning, and virtual/online

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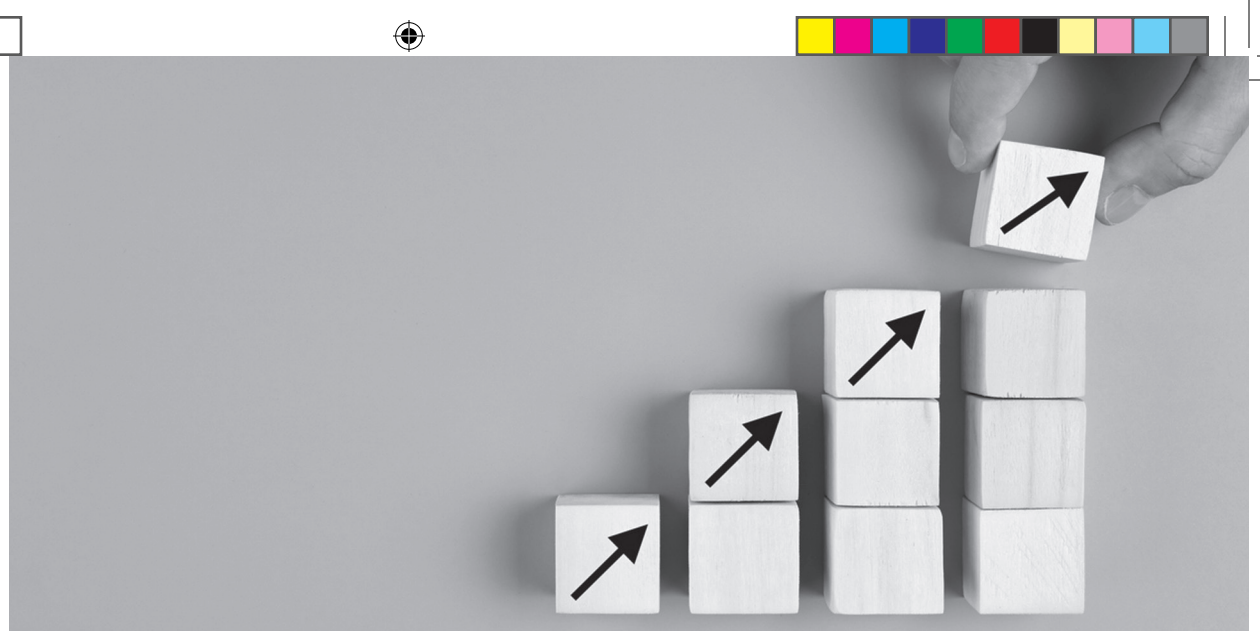
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1

INTRODUCTION

Kim K. Floyd and Tara Jeffs



LEARNING OUTCOMES

After reading this chapter, you should be able to:

- Define assistive technology and related terminology.
- Describe the history of and rationale for assistive technology.
- Describe the assistive technology continuum and how it is used as a tool to evaluate devices and make decisions.
- Identify the need for assistive technology for an individual and the potential benefits.
- Describe components of an assistive technology toolkit.

Rationale for Assistive Technology

Assistive technology (AT) has become an essential tool in modern education, breaking down barriers and empowering learners with varying abilities. Recognizing and responding to students' diverse needs is imperative for educators. AT emerges as a powerful tool in this endeavor. Through the seamless incorporation of tools such as text-to-speech software, speech recognition programs, or adaptive learning platforms, educators can craft a customized learning experience tailored to individual learning styles, thereby promoting academic success for all students.

Embracing AT is not merely an act of meeting compliance standards; it is a commitment to the fundamental principles of equity and inclusion in education. By acknowledging the varied ways in which students access, process, and demonstrate knowledge, educators harness the power of AT to transcend traditional limitations, fostering an enriched and inclusive learning environment that equips all students for success in a diverse and evolving world. Integrating AT in classrooms is no longer an optional supplement but an essential tool for every teacher, contributing to creating an educational ecosystem that values equity, embraces diversity, and sets the stage for a more inclusive and empowering future.

AT and Universal Design for Learning (UDL) principles reinforce each other's rationale for integration into pedagogical practices. UDL, with its emphasis on flexible learning environments, aligns seamlessly with the inclusive goals of AT. Integrating these technological tools within the UDL framework enhances accessibility and ensures every student can access and engage with the curriculum.

The seven principles of universal design shaped the framework of UDL. These principles guide design of buildings and products for equitable, flexible, simple, and intuitive use to ensure that diverse abilities and preferences shape a product that is easy to understand, regardless of the user's experience, knowledge, language skills, or concentration level (Center for Excellence in Universal Design, n.d.). Additionally, when designing an item, one must communicate the perceptible information regardless of conditions or the user's sensory abilities. The design must be tolerant of error and require low physical effort, keeping in the forefront the appropriate size and space provided for approach, reach, and use regardless of the user's size, posture, or mobility. This holistic approach cultivates a culture of inclusivity that celebrates diversity and when placed in the realm of designing instruction recognizes the unique strengths each learner brings to the classroom. Chapter 3 provides more breadth and depth about UDL.

Definition and History of Assistive Technology

To comprehend the significance of AT in modern education, it is essential to explore its history. The roots of assistive technology can be traced back to the mid-20th century when technological advances began to offer innovative solutions for individuals with disabilities. Early examples include simple devices such as large-print books and hearing aids. As technology progressed, so did the capabilities of assistive devices, evolving into a diverse range of tools, from communication devices to computer software tailored to specific needs. The historical trajectory of AT reflects a

commitment to fostering inclusivity and providing students with disabilities the means to achieve their academic and life goals.

Early Innovations (1950s–1960s)

The initial stages of AT can be traced back to the mid-20th century, marked by a surge in technological innovations to address the needs of individuals with disabilities. During this era, simple yet groundbreaking advances such as large-print books and hearing aids emerged as early examples of assistive tools. These rudimentary solutions laid the foundation for the more sophisticated technologies that would follow.

The Emergence of Computer-Based Solutions (1970s–1980s)

As computers became more prevalent, the 1970s and 1980s witnessed a significant shift in the landscape of AT. Innovations like screen readers and communication devices started to empower individuals with visual or communication impairments. The advent of personal computers and specialized software further expanded the possibilities, allowing for customized solutions tailored to specific disabilities.

Legislation and Formal Recognition (1990s)

The 1990s marked a crucial period for AT, with legislative initiatives recognizing its pivotal role. The Individuals with Disabilities Education Act (IDEA) of 1990 emphasized the importance of AT in providing a free and appropriate public education (FAPE) to students with disabilities. This legislative backing was crucial in mainstreaming AT into educational practices (Figure 1–1).

The Americans with Disabilities Act (ADA) is a landmark piece of legislation enacted in 1990 in the United States, aimed at ensuring equal rights and opportunities for individuals with disabilities. This comprehensive law prohibits discrimination against people with disabilities in various aspects of public life, including employment, transportation, public accommodations, communications, and governmental activities. The ADA mandates reasonable accommodations to provide individuals with disabilities access to the same opportunities and services as others. By promoting accessibility and inclusivity, the ADA seeks to empower individuals with disabilities to fully participate in society, fostering a more equitable and diverse community for all. Federal legislation defines that AT encompasses any item, equipment, or product system, whether commercially acquired off the shelf, modified, or customized, that is designed to increase, maintain, or improve the functional capabilities of children with disabilities (IDEA, 2004, Section 602). The term excludes surgically implanted medical devices and their replacements, such as cochlear implants. Mandated by the IDEA, AT is pivotal in the Individualized Education Program (IEP) or Individualized Education Plan, ensuring that every student eligible for exceptional education has access to appropriate tools and resources (Section 300.308 of Title 34, CFR).

As mandated by the IDEA, AT must be a critical consideration in developing the IEP. This ensures that students have access to the necessary tools that align with grade-level standards and facilitate their participation in all educational activities. By embedding AT within the IEP framework,

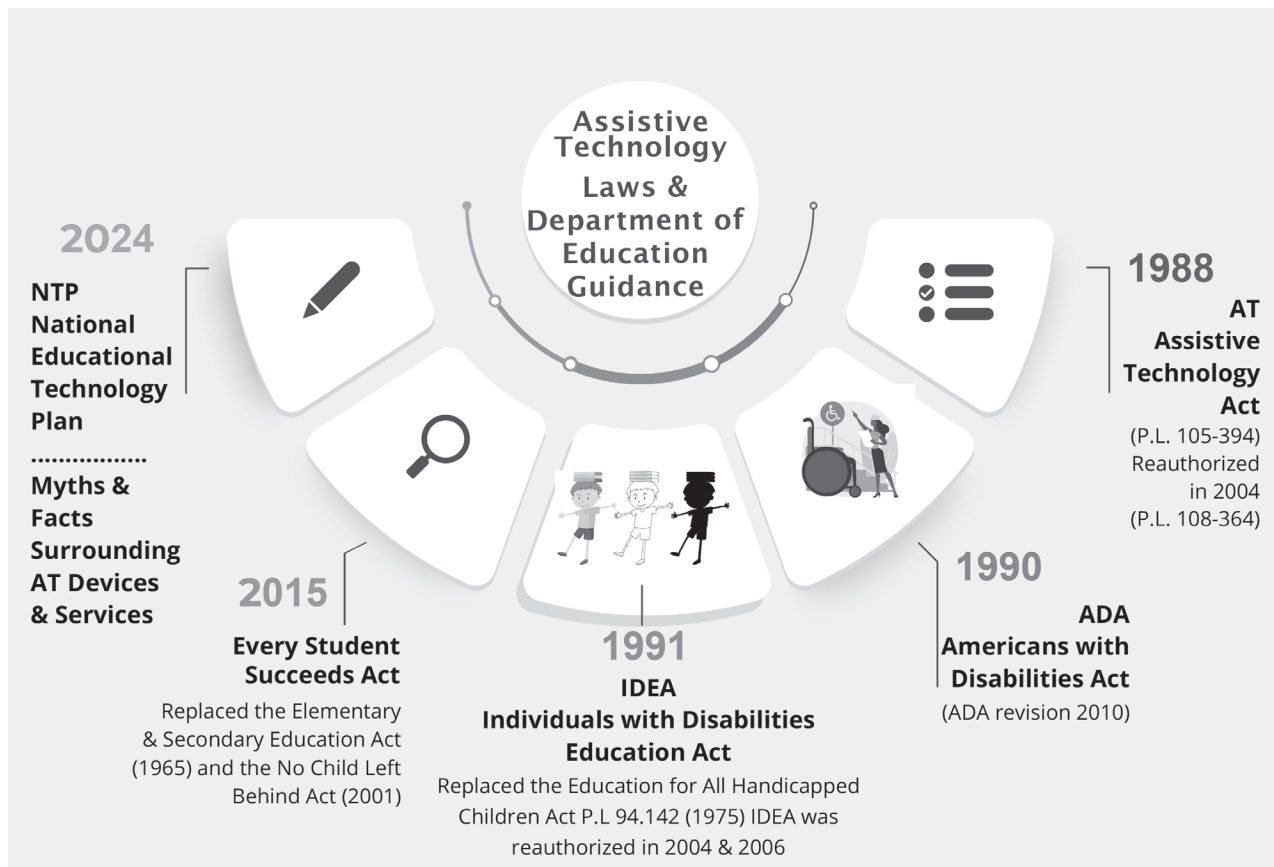


FIGURE 1–1. Assistive technology laws and Department of Education guidance.

educators strive to create an environment that not only complies with legal requirements but also promotes the overarching goal of providing students with disabilities the tools and resources they need to thrive academically.

Technological Advancements (2000s–Present)

As we entered the 21st century, rapid technological advancements ushered in a new era for AT. The proliferation of digital devices, mobile applications, and cloud-based solutions expanded the toolkit available to individuals with disabilities. This era witnessed the development of cutting-edge innovations, including speech-to-text applications, augmented reality tools, and wearable devices, further enhancing AT capabilities.

Integration Into Inclusive Education (Present)

Presently, AT has become an integral component of inclusive education. The emphasis on individualized learning and the recognition of diverse learning styles have propelled the integration of AT into educational frameworks. The evolving landscape continues to witness the emergence of innovative solutions, ensuring that individuals with disabilities have equal access to educational opportunities.

The history of AT reflects a journey from humble beginnings to an era of sophisticated, user-centric solutions. As technological innovations continue to shape the landscape, the story of AT is one of continuous evolution, marked by a commitment to inclusivity and a belief in the transformative power of technology to break down barriers and empower individuals with disabilities. This historical backdrop sets the stage for a deeper exploration of AT's applications and implications for education.

Why Assistive Technology Toolkits?

AT toolkits serve as indispensable educational resources, offering a multifaceted approach to addressing the diverse needs of individuals with disabilities. The concept of AT toolkits encompasses a curated set of tools, applications, and devices designed to enhance accessibility, promote inclusivity, and empower individuals with disabilities in various educational settings. This overview delves into the work reported from the field, shedding light on the evolving landscape of AT toolkits and their transformative impact. The heart of AT toolkits lies in their ability to provide tailored solutions that cater to the unique requirements of learners with diverse abilities. These toolkits go beyond one-size-fits-all approaches, recognizing the need for individualized support to facilitate effective learning experiences.

Current research underscores the collaborative efforts to bridge the digital divide and promote digital equity. AT toolkits are crucial in ensuring that individuals with disabilities have equitable access to educational resources and opportunities. Through ongoing research and practical implementation, the field has witnessed the positive impact of AT toolkits in fostering a more inclusive educational landscape. The versatility of AT toolkits extends beyond traditional classroom settings, encompassing remote and online learning environments. The recent surge in virtual and hybrid learning modalities has amplified the importance of these toolkits, providing remote learners with the necessary support to navigate digital platforms, engage with content, and participate fully in virtual educational experiences.

At its core, the goal of AT is to foster independence and enable the full participation of students with disabilities in all facets of academic and social life. AT empowers students to reach their academic and life goals by providing options for gaining access and promoting independence.

Multitiered Support System

School districts across the United States use a multi-tiered support system (MTSS). This evidence-based model uses data-based problem-solving to integrate academic and behavioral instruction and intervention to maximize student outcomes. A multitiered model of instruction or intervention is fundamental to an effective MTSS. Although the number of tiers might vary, the three-tiered model based on increasing levels of intensity matched to student needs is the most common. Instruction is often intensified by increasing time, narrowing the focus to specific barrier skills, or reducing the group size. The three typical tiers are discussed next.

Tier 1

Tier 1 refers to classroom-wide instruction and support provided to all students to demonstrate mastery of grade-level expectations. These interventions often use universal tools and inclusive technology supports that can be commonly found. Accessible educational materials (AEM) is a type of inclusive technology. The Center for Inclusive Education defines accessible educational materials as materials that are designed to be usable by all. Such items could include closed captions, alt tags for images, and high contrast visuals.

Tier 2

Tier 2 interventions are often considered a supplemental level of instructional supports focused on a skill area to address any gaps within a skill level. They are usually delivered to small groups of students with progress monitored over time. Tier 2 support is provided along with Tier 1 instruction for students to get and remain on track toward mastery of grade-level expectations. Inclusive technologies at the Tier 2 level of supports include accessible technologies. Accessible technologies are universal or common tools with built-in features that provide alternative access to the learning content. Such tools include screen readers, speech-to-text application, and text-to-speech and text highlighting capabilities.

Tier 3

Tier 3 interventions are the most intensive level of support, usually provided more often and in smaller groups. They may require additional assessments to identify specific strengths and weaknesses. Through further assessments if a student is found eligible for exceptional student education they receive their specially designed instruction as part of this same tiered instructional system. Inclusive technologies at that Tier 3 level of supports include AT. AT refers to specialized devices or software designed to address specific barriers. Some accessible technologies might be AT. A feature becomes AT when it is considered a need and documented in the IEP. Inclusive technology should be employed across all three tiers and build on levels of support.

During the problem-solving process in designing the tiers of support, it is essential to build an infrastructure of universal tools and inclusive technologies that decrease the barriers of the curriculum and compensate for skill areas of difficulty students might face. This involves AEM, accessible technologies, and AT. Educators need to have the knowledge and skills to implement such tools.

How This Book Is Organized

The remaining chapters aim to deepen the understanding of the multifaceted definition of AT and its historical evolution, laying the foundation for subsequent exploration into its applications in inclusive educational practices. Summaries of information in each chapter are highlighted next.

Chapter 2

Chapter 2 recognizes the importance of providing every administrator, educator, related service provider, and school-based staff member involved in day-to-day educational decisions with the

knowledge needed to assist students in considering, selecting, and using AT. The roles and responsibilities of determining the need for AT and the steps within the consideration process to ensure students' needs are met begin with the IEP team selecting appropriate technology.

Chapter 3

Chapter 3 highlights that universal design and UDL are grounded in accessibility and inclusivity for all learners. Universal design emphasizes the creation of environments, products, and systems usable by people of diverse abilities, ages, and backgrounds without adaptation or specialized design. UDL, on the other hand, is a framework for designing instructional materials and environments that proactively address the variability of all learners by providing multiple means of representation, engagement, and expression. Common principles of UDL, such as providing multiple means of representation to accommodate diverse learning styles and preferences, directly align with research on how the brain processes information, supporting optimal learning for all students. Incorporating UDL into practice involves designing curriculum, instruction, and assessments that offer multiple means of engagement, expression, and representation to maximize access and learning for diverse learners. Providing access to curricula, media, and materials through UDL involves adopting accessible formats, such as digital and multimedia resources, and implementing strategies like captioning, alternative text, and adjustable reading levels to ensure equitable access for all learners.

Chapter 4

Chapter 4 highlights how the educational team plays a critical role in the assessment process for AT decision-making by bringing together diverse expertise to ensure comprehensive evaluation and informed decision-making. This interdisciplinary team typically includes educators, special education professionals, therapists, parents or caregivers, and sometimes even the students themselves. Each member contributes unique insights into the learner's needs, abilities, and preferences. Strategies employed by the team involve systematically gathering information through various assessment tools, including observations, interviews, and formal assessments, to gain a holistic understanding of the learner's strengths, challenges, and learning goals. By analyzing these data collaboratively, the team can design an AT intervention plan tailored to the individual's needs and preferences, ensuring effective support for learning and participation. Matching the developmental needs of learners with available software and adaptive access devices requires careful consideration of the features and functionalities offered by these tools. The team evaluates how these features align with the learner's specific challenges and goals, selecting technologies that provide appropriate support levels while promoting independence and skill development. This iterative assessment, planning, and implementation process ensures that AT interventions are personalized, effective, and supportive of the learner's overall development.

Chapter 5

Chapter 5 recognizes that in early childhood settings, preschoolers are expected to develop foundational skills across various domains, including cognitive, social, emotional, and physical development, while facing challenges such as limited attention spans and emerging communication

skills. Developing friendships can be challenging due to evolving social dynamics and communication abilities; however, technology can facilitate interactions through video calls and social networking apps, providing opportunities for virtual playdates and social skill development. Physical environment barriers, such as inaccessible play areas or limited mobility equipment, can hinder inclusive participation; addressing these challenges involves ensuring the environment is universally designed, with features like ramps, sensory-friendly spaces, and adjustable furniture. Additionally, self-help barriers, including difficulties with tasks like dressing or feeding, can be overcome with the aid of technology tools like visual schedules, interactive apps for skill reinforcement, and adaptive equipment tailored to individual needs, promoting independence and autonomy among preschoolers.

Chapters 6 Through 9

Chapters 6 through 9 describe specific AT and UDL support for academic content areas. AT serves as a crucial support system for learners facing barriers by granting them access to educational materials and fostering independence in their learning journey. Specific AT tailored to various academic content areas bolsters inclusivity and engagement. For instance, text-to-speech software aids students with reading difficulties, speech-to-text tools assist those with writing challenges, graphing calculators equipped with auditory feedback accommodate students with visual impairments, interactive software provides personalized learning experiences, and multimedia presentations cater to visual and auditory learners. Implementing these technologies seamlessly integrates them into lesson plans, providing training and support for educators and students and fostering a culture of accessibility and inclusivity in the classroom.

Chapter 10

Chapter 10 illustrates how various technologies play a pivotal role in bolstering the creation of evidence-based strategies for classroom management. These include data analytics platforms, which help educators analyze student behavior patterns and assess the effectiveness of interventions, as well as learning management systems that facilitate communication and collaboration among teachers, students, and parents. Additionally, video observation software allows teachers to reflect on their instructional practices and refine their approach accordingly. Moreover, teachers and administrators can harness technology to cultivate a positive school climate by using communication platforms to foster transparency and collaboration among stakeholders, implementing digital citizenship programs to promote responsible online behavior, and leveraging social-emotional learning apps to support students' emotional well-being. Furthermore, students can use technology tools to enhance self-management and self-awareness by using digital planners and organizers to manage their time effectively, participating in online mindfulness and reflection exercises to develop self-awareness, and engaging with gamified educational apps promoting goal-setting and self-regulation skills.

Chapter 11

Chapter 11 illustrates how ensuring ADA compliance in K–12 distance education involves guaranteeing accessibility across online platforms, content, and resources, facilitating equitable

participation. A comprehensive understanding of distance education concepts is vital, encompassing tailored pedagogical strategies, instructional design, and student engagement. Creating a barrier-free online learning environment entails employing universally designed materials and adaptable technologies. Educators must use diverse tools like learning management systems, multimedia platforms, and collaboration tools for effective online instruction. Accessibility tools such as screen readers and captioning software are essential for accommodating all students. Additionally, identifying necessary technology tools for student learners involves considering hardware, software, and connectivity requirements to support seamless participation in distance learning.

Chapter 12

Chapter 12 explores the dynamic realm of emerging technologies within the context of AT and UDL in education. It underscores the transformative potential of innovative technologies in enhancing learning opportunities for students with diverse needs. The integration of these technologies within the UDL framework is emphasized, highlighting their role in promoting accessibility and inclusivity in educational settings. The chapter provides an overview of recent technological developments and their specific applications in special education. Additionally, it offers sample lesson plans and presents three case studies that illustrate successful implementations of these technologies, showcasing their practical impact on teaching and learning.

All educators must plan when and how technology will be used in their classrooms. More than just deciding when to use a video, they must understand the purpose of the technology and how students will engage in the curriculum being taught. Many educators enter the classroom without realizing that AT is essential to student success. Excellent educators learn and understand the purpose and the power that technology provides to the student. Educators realize that if a student is struggling or failing, it is important to fix the curriculum or the learning process, not the student.

You are reading this book because you want to be an outstanding educator. You always strive to understand the learning process and how to engage students to reach their academic and life successes. Technology has reshaped society and the classroom, so it is essential to understand inclusive technologies. The purpose of this book is to provide you with classroom examples, student perspectives, and implementation of inclusive technologies. As you work your way through the chapters, realize that every learner needs options.

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