

# THE ROLE OF ASSISTIVE TECHNOLOGIES IN TEACHING ENGLISH TO LEARNERS WITH DISABILITIES IN HOME-BASED EDUCATION

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**Abstract.** *This article examines the role of assistive technologies (AT) in facilitating English language instruction for learners with disabilities within home-based educational settings. As inclusive education continues to expand globally, home-based education has emerged as a viable alternative for students whose disabilities make traditional classroom attendance challenging. The integration of assistive technologies—ranging from screen readers and speech-to-text software to augmentative and alternative communication (AAC) devices—has significantly transformed the pedagogical landscape for these learners. Drawing on current literature, this paper explores the types of assistive technologies available, their effectiveness in improving English language skills (reading, writing, listening, and speaking), the challenges encountered by educators and families, and recommendations for optimizing AT-supported home-based English instruction. The findings suggest that when appropriately selected and implemented, assistive technologies can substantially enhance language learning outcomes, foster learner autonomy, and promote meaningful educational inclusion for students with disabilities.*

**Keywords:** *assistive technology, English language teaching, disabilities, home-based education, inclusive education, augmentative and alternative communication.*

## INTRODUCTION

The global movement toward inclusive education has catalyzed significant changes in how learners with disabilities access educational opportunities (UNESCO, 2020:12). While mainstream schooling remains the preferred model for many students, home-based education has become an increasingly important alternative for learners whose physical, cognitive, sensory, or developmental disabilities present substantial barriers to traditional classroom participation (Repetto et al., 2019:45). In such settings, the challenge of delivering effective English language instruction is compounded by the absence of conventional classroom infrastructure, peer interaction, and specialist support typically available in school environments.



Assistive technology (AT) has emerged as a critical mediating tool in bridging these gaps. Defined broadly as any device, software, or system that increases, maintains, or improves the functional capabilities of individuals with disabilities (Individuals with Disabilities Education Act [IDEA], 2004:sec.602), AT encompasses a wide spectrum of solutions—from low-tech tools such as adapted keyboards and visual schedules to high-tech innovations including artificial intelligence-powered language tutors and immersive virtual reality platforms (Edyburn, 2015:78). The application of these technologies to English language teaching (ELT) in home-based contexts represents a rapidly evolving field with significant implications for educational equity and learner outcomes.

The purpose of this article is to critically examine the intersection of assistive technologies, English language pedagogy, and home-based education for learners with disabilities. Specifically, the paper aims to: (a) identify and categorize the assistive technologies currently employed in home-based English instruction; (b) evaluate the evidence regarding their effectiveness across the four core language skills; (c) analyze the barriers and challenges that educators, families, and learners face in implementing AT; and (d) propose research-informed recommendations for enhancing practice. By synthesizing existing literature, this study contributes to the growing body of knowledge on technology-mediated inclusive education and underscores the transformative potential of AT in democratizing access to English language learning.

## MAIN PART

Assistive technology in education refers to any item, piece of equipment, or product system used to increase, maintain, or improve the functional capabilities of students with disabilities (Blackhurst, 2005:44). The Technology-Related Assistance for Individuals with Disabilities Act of 1988 first codified this definition in United States federal law, and subsequent legislation including the Assistive Technology Act of 2004 and IDEA (2004)—has reinforced the right of students with disabilities to access AT as part of their individualized education programs (IEPs). Within the context of home-based education, AT serves a dual function: it compensates for functional limitations imposed by a disability and simultaneously enhances the pedagogical environment by providing interactive, adaptive, and personalized learning experiences (Edyburn, 2015:82).



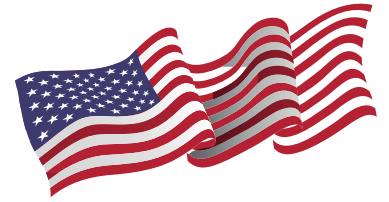
The categorization of AT typically follows a continuum from low-tech to high-tech solutions. Low-tech AT includes tools such as pencil grips, slant boards, color-coded materials, and picture communication boards. Mid-tech solutions encompass devices such as portable word processors, digital audio recorders, and basic speech-generating devices. High-tech AT includes sophisticated software applications, tablet-based learning platforms, speech recognition systems, and AI-driven tutoring programs (Lancioni & Singh, 2014:23). For English language instruction specifically, this continuum is particularly relevant, as the selection of appropriate AT must align with both the nature of the learner's disability and the specific language skill being targeted.

Home-based education encompasses a range of instructional models in which the primary learning environment is the student's home. This may include formal homeschooling directed by parents, hospital or homebound instruction provided by school districts for medically fragile students, and increasingly, virtual or remote learning programs facilitated through online platforms (Jolly et al., 2020:156). For learners with disabilities, home-based education may be necessitated by severe physical limitations, chronic health conditions, sensory impairments, autism spectrum disorder, or other conditions that make consistent school attendance impractical or contraindicated (Cook & Hussey, 2002:34).

The shift to home-based learning, accelerated dramatically by the COVID-19 pandemic, has highlighted both the opportunities and limitations of remote instruction for students with disabilities (Schuck & Lambert, 2020:89). Research indicates that while home-based settings offer the advantages of individualized pacing, reduced sensory overload, and a familiar environment, they also present challenges including social isolation, limited access to specialized services, and increased demands on family caregivers as de facto educators (Burdette & Greer, 2014:67). English language instruction in these contexts requires careful planning, appropriate materials, and—critically—the strategic deployment of assistive technologies to ensure meaningful learning.

### Reading Skills.

Reading is often the most challenging language domain for learners with disabilities, particularly those with visual impairments, dyslexia, or intellectual disabilities. Assistive technologies for reading instruction in home-based settings include screen readers such as JAWS and NVDA, which convert digital text to synthesized speech for learners with



visual impairments (Alnahdi, 2014:112). Text-to-speech (TTS) software, including NaturalReader and Read&Write, supports learners with dyslexia by providing auditory reinforcement of written text, adjustable reading speeds, and word highlighting features that synchronize visual and auditory input (Stetter & Hughes, 2010:404). Optical character recognition (OCR) technology enables the digitization of printed materials, making them accessible through screen readers and TTS applications. Research by Engel et al. (2020:78) demonstrated that TTS software significantly improved reading comprehension among students with learning disabilities in home-based settings, with effect sizes comparable to those observed in classroom interventions.

#### Writing Skills.

Writing instruction for learners with disabilities benefits from a range of assistive technologies designed to address motor, cognitive, and linguistic challenges. Speech-to-text (STT) software, such as Dragon NaturallySpeaking and Google Voice Typing, allows learners with physical disabilities or dysgraphia to compose text through voice dictation (MacArthur, 2009:233). Word prediction software, including Co:Writer and Ghotit, supports learners with spelling difficulties by offering contextually appropriate word suggestions as the student types (Peterson-Karlan, 2011:47). Graphic organizers such as Inspiration and Kidspiration facilitate pre-writing planning for students with executive function challenges, providing visual frameworks for organizing ideas before composing text (Sturm & Rankin-Erickson, 2002:132). Research by Williams (2019:89) found that the combined use of STT and word prediction software in home-based settings led to measurable improvements in both the quantity and quality of written output among adolescents with learning disabilities.

#### Listening Skills.

Listening comprehension is a foundational language skill that presents unique challenges for learners with hearing impairments, auditory processing disorders, or attention deficit disorders. Assistive technologies for listening instruction include frequency modulation (FM) systems and hearing loop technologies that enhance audio clarity in home learning environments (Smaldino & Flexer, 2012:56). Captioning and subtitle tools, available through platforms such as YouTube and specialized educational software, provide visual text accompaniment to audio content, supporting comprehension for learners who benefit



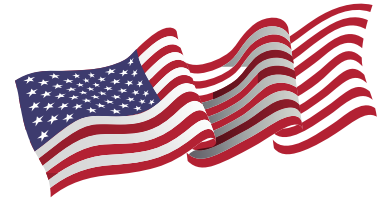
from multimodal input (Gernsbacher, 2015:200). Interactive listening applications, including Listenwise and ESL Pod, offer adjustable playback speeds, repeat functions, and embedded comprehension questions that allow home-based learners to practice at their own pace (Vandergrift & Goh, 2012:145). Studies by Daud and Husin (2020:334) have shown that technology-enhanced listening activities significantly improve both listening accuracy and learner engagement among students with disabilities.

#### Speaking Skills.

Speaking is perhaps the skill most directly impacted by disability, as learners with speech and language disorders, autism spectrum disorder, or severe physical impairments may have limited or no functional speech. Augmentative and alternative communication (AAC) devices—including both unaided systems (sign language, gestures) and aided systems (speech-generating devices such as Tobii Dynavox and Proloquo2Go)—play a central role in enabling communicative participation for these learners (Beukelman & Light, 2020:103). For learners with milder speech difficulties, pronunciation training software such as ELSA Speak and SpeechAce provides real-time feedback on articulation, intonation, and fluency through AI-driven speech recognition algorithms (Golonka et al., 2014:78). Video conferencing platforms, including Zoom and Microsoft Teams, facilitate synchronous speaking practice with remote tutors or peers, offering features such as closed captioning and screen sharing that enhance accessibility (Hampel & Stickler, 2015:112). Research by McNaughton and Light (2013:209) underscores the importance of integrating AAC with language instruction to promote both communicative competence and English language development.

The empirical evidence regarding the effectiveness of AT in English language instruction for learners with disabilities is growing, though the field remains characterized by methodological diversity and a preponderance of small-scale studies. A meta-analysis by Svensson et al. (2021:312) examined 47 studies on technology-assisted reading interventions for students with learning disabilities and found a moderate positive effect on reading fluency ( $d = 0.52$ ) and comprehension ( $d = 0.48$ ). Similarly, a systematic review by Ok et al. (2017:1) identified 30 studies demonstrating the efficacy of computer-assisted instruction for students with learning disabilities across multiple academic domains, including English language arts.

In the specific context of home-based education, Stetter and Hughes (2010:415) reviewed studies on TTS and electronic text and concluded that these technologies were



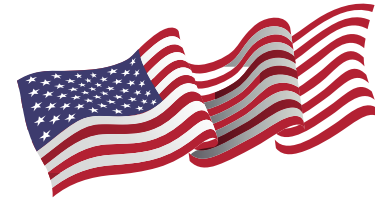
consistently associated with improved reading outcomes, particularly when combined with explicit reading instruction. Williams (2019:93) reported that home-based writing interventions using STT software resulted in significantly longer and more syntactically complex compositions compared to handwritten or standard keyboard conditions. For listening and speaking, the evidence base is more limited but promising; Daud and Husin (2020:340) found that technology-enhanced listening instruction improved comprehension scores by an average of 22% among secondary students with hearing impairments, while McNaughton and Light (2013:215) documented meaningful gains in communicative participation among AAC users receiving home-based English instruction.

It is important to note, however, that the effectiveness of AT is not determined solely by the technology itself but by the broader ecosystem of implementation. Factors including the quality of professional development for educators, the adequacy of technical support, the appropriateness of AT selection relative to the learner's needs, and the level of family engagement all mediate outcomes (Edyburn, 2015:95). As Blackhurst (2005:52) observed, technology is a tool, not a teacher; its value is realized only when embedded within a coherent instructional framework.

Despite the documented benefits of AT in home-based English instruction, significant challenges persist. Financial barriers represent a primary concern; many high-quality AT devices and software programs are costly, and families of children with disabilities often face disproportionate economic burdens (Lancioni & Singh, 2014:35). While legislation in some countries mandates the provision of AT through educational systems, enforcement is inconsistent, and home-based learners may fall outside the scope of institutional support (Repetto et al., 2019:52).

Technical challenges also impede implementation. Many families lack reliable internet connectivity, adequate hardware, or the technical literacy required to configure and maintain AT systems (Schuck & Lambert, 2020:95). The rapid pace of technological change means that devices and software may become obsolete quickly, requiring ongoing investment. Moreover, the sheer diversity of available AT options can be overwhelming for families attempting to identify the most appropriate solutions for their child's specific needs without professional guidance (Jolly et al., 2020:162).

Pedagogical challenges are equally significant. Parents and caregivers serving as primary educators in home-based settings frequently lack training in both special education methodologies and AT implementation (Burdette & Greer, 2014:72). The absence of a



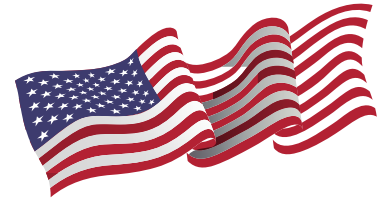
multidisciplinary team—speech-language pathologists, occupational therapists, assistive technology specialists—that would typically support AT use in school settings means that home-based learners may not receive the comprehensive support necessary for optimal outcomes. Furthermore, the social dimensions of language learning—conversational practice, collaborative tasks, cultural exchange—are inherently more difficult to replicate in isolated home environments, even with the mediating presence of technology (Cook & Hussey, 2002:41).

Based on the synthesis of current literature, several recommendations emerge for enhancing the use of assistive technologies in home-based English instruction for learners with disabilities. First, AT selection should be guided by a thorough assessment of the learner’s individual needs, preferences, and goals, conducted by qualified professionals in collaboration with the family (Edyburn, 2015:100). The SETT Framework (Student, Environments, Tasks, and Tools) developed by Zabala (2005:1) provides a useful structured approach to ensuring that AT decisions are contextually appropriate and learner-centered.

Second, professional development and family training are essential components of successful AT implementation. Research consistently shows that the provision of AT without adequate training results in device abandonment and suboptimal outcomes (Blackhurst, 2005:56). Training programs should address not only the technical operation of AT devices but also their pedagogical integration into English language instruction, including strategies for scaffolding, differentiation, and formative assessment.

Third, ongoing technical support and mentorship should be available to families engaged in home-based education. This may include remote consultation with AT specialists, access to online communities of practice, and partnerships with local disability organizations and educational institutions (Repetto et al., 2019:58). Fourth, policymakers should ensure that funding mechanisms and legislative protections extend to home-based learners, guaranteeing equitable access to AT regardless of educational setting.

Finally, the field would benefit from more rigorous, large-scale research examining the long-term outcomes of AT-supported English language instruction in home-based settings. Longitudinal studies, randomized controlled trials, and mixed-methods investigations are needed to build a more robust evidence base and inform best practices (Svensson et al., 2021:320).



## CONCLUSION

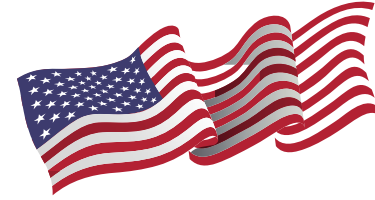
Assistive technologies hold transformative potential for English language instruction among learners with disabilities in home-based educational settings. From screen readers and speech-to-text software to AAC devices and AI-powered pronunciation tools, the range of available technologies offers unprecedented opportunities for individualized, accessible, and engaging language learning. The evidence reviewed in this article indicates that when thoughtfully selected, properly implemented, and supported by trained educators and engaged families, AT can significantly improve outcomes across all four language skill domains—reading, writing, listening, and speaking.

However, the realization of this potential is contingent upon addressing the persistent barriers of cost, technical access, professional training, and policy support. The promise of assistive technology will remain unfulfilled if it is available only to those with the financial resources and technical expertise to access it. Achieving equitable, high-quality English language education for all learners with disabilities—regardless of their educational setting—requires a coordinated effort among educators, families, technology developers, researchers, and policymakers.

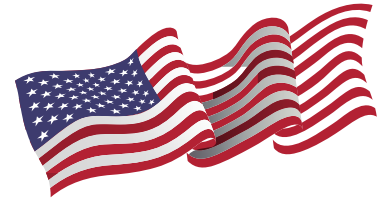
As the landscape of home-based education continues to evolve, particularly in the aftermath of the COVID-19 pandemic, the strategic integration of assistive technologies into English language instruction must be recognized as not merely a supplementary convenience but a fundamental component of inclusive educational practice. The right to learn—including the right to learn a language—belongs to every student, and assistive technology is among the most powerful instruments we have for ensuring that this right is realized.

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