Chapter 8
AI-Powered Interventions Revolutionizing Support for Students With Sensory Impairments: Challenges, AI Solutions, AI, and Accessibility

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ABSTRACT

Students with sensory impairments worldwide face significant obstacles in accessing equitable educational opportunities. These obstacles include limited access to adapted learning materials, communication barriers, and challenges navigating physical and social environments. Artificial intelligence (AI) offers a transformative potential to address these challenges, providing innovative, personalized, and

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accessible solutions that empower these students to thrive. This chapter provides a comprehensive exploration of AI-driven interventions designed to support students with visual and hearing impairments, including assistive technologies such as screen readers, tactile learning materials, real-time transcription tools, and AI-powered navigation tools. It examines the application of these interventions across core academic areas, particularly in STEM fields, and explores their role in fostering inclusive learning environments through collaborative and multi-modal learning experiences.

INTRODUCTION

Students with sensory impairments, including those with visual and auditory disabilities, encounter significant barriers to accessing equitable and engaging educational opportunities. Traditional educational approaches often struggle to provide the personalized support necessary to overcome these barriers, leaving many students underserved and at risk of academic underachievement. In recent years, artificial intelligence (AI) has emerged as a powerful catalyst for change in education, offering innovative solutions that address these long-standing challenges. AI-powered tools, such as adaptive learning platforms, assistive technologies, and automated support systems, hold immense potential to transform how students with sensory impairments interact with academic content, fostering greater inclusion, independence, and a richer learning experience.

The transformative impact of AI in special education is evident across three key dimensions: accessibility, personalization, and inclusion. AI-powered tools dynamically adapt to individual sensory needs—such as converting visual content into tactile graphics for blind students or providing real-time sign language translation for deaf students—ensuring equitable access to learning (Basham et al., 2020). Studies show that these interventions improve academic outcomes; for example, students using AI captioning tools demonstrate a 40% increase in comprehension (Houston et al., 2020). Beyond functionality, AI fosters social inclusion by enabling collaborative learning between students with and without disabilities, bridging gaps that traditional methods cannot (Rose et al., 2018). However, this potential must be balanced with ethical considerations, including algorithmic bias and data privacy, to ensure equitable implementation (Anderson & Rainie, 2022).

The impact of AI in special education is profound. Its capacity to personalize learning experiences, enhance accessibility, and bridge communication gaps represents a fundamental shift in educational practices. For example, AI-driven transcription services and tactile feedback devices have demonstrated remarkable effectiveness in making classroom content accessible to students with sensory impairments (Smith