

## Chapter 28

# The Promise and Relevance of Emerging Technologies in the Education of Children With Autism Spectrum Disorder

**Edmon Begoli**

*Joint Institute for Computational Sciences (JICS), USA*

**Jeanine DeFalco**

*Columbia University, USA*

**Cristi Ogle**

*Knox County Schools, USA*

### **ABSTRACT**

*This chapter is a survey of the application areas of virtual reality (VR) and augmented reality (AR) technologies in the education and behavioral therapies for children and young adults with Autism Spectrum Disorder (ASD). This survey includes the most recent successful applications of social skill training through VR and AR for ASD populations. VR and AR technologies are rapidly increasing in popularity and availability due to the improved affordability and availability of high-performance devices. This chapter provides an overview of some of the most recent devices and tools that could be of use for educational and social skill development purposes.*

*When I design livestock facilities, I can test run the equipment in my imagination similar to a virtual reality computer program. I did not know that this was a special skill until I started interviewing other people about how they think. I was surprised to discover that the other non-autistic equipment designers could not do full motion test runs of equipment in their minds. – Temple Grandin (Grandin, 2009)*

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## **INTRODUCTION**

Autism spectrum disorder (ASD) is a complex neurodevelopmental disability characterized by repetitive patterns of behavior, and difficulties with social communication and general social interaction. The symptoms become visible in the early childhood, typically between ages two and three, and remain for life, affecting daily functioning. According to estimates from Center for Disease Control (CDC) Autism and Developmental Disabilities Monitoring (ADDM) Network, about 1 in 68 children (CDC, 2010) are identified with ASD, each with a unique set of intellectual challenges throughout the wide spectrum, each with varying manifestations, resulting in uneven, unique patterns of development and learning styles.

Typically, students are capable of rote memorization tasks, can perform mathematical tasks requiring counting and calculation, but struggle in social situations and in generalizing learning from one situation and setting to another, experiencing anxiety when interacting with other students and adults. For these reasons, instructions typically require repetition of the same instructional material in different formats, and with limited distractions and presence of other students or adults (Klin, 2000; White, 2007).

ASD students are frequently “visual learners” (Rao, 2006; Joseph, 2002) benefiting from the presentation of material in visual and pictorial formats. Further, a number of studies have shown that students with ASD both benefit and prefer to use computers in the learning process (Goldsmith, 2004). Computer-based environments offer predictable, controlled and structured environment that students with ASD prefer. Virtual and Augmented Reality technologies extend this experience by offering a technology-supported learning environment that is integrated with the natural environment, or that simulates natural, every-day situations and interactions in a safe and non-threatening manner.

## **THE CHARACTERISTICS OF INDIVIDUALS WITH AUTISM SPECTRUM DISORDER**

Students diagnosed with ASD have persistent deficits in social communication and social interaction across multiple contexts and settings. Previously classified separately, Autism, Childhood Disintegrative Disorder, and Pervasive Developmental Disorder Not Otherwise Specified are now incorporated into ASD; Asperger’s Syndrome, however, remains distinct from this grouping. The term “spectrum” used in ASD refers to the wide range of associated symptoms and the severity of each.

A developmental disorder that appears by age three, ASD is variable in its manifestations. Students diagnosed with ASD demonstrate mild to severe deficits in social-emotional reciprocity, nonverbal communication behaviors for social interaction and developing, and with maintaining and understanding relationships. In addition, students may exhibit two or more of the following behaviors: restrictive, repetitive patterns of behavior, interests or activities; stereotyped repetitive motor movements, use of objects or speech; insistence on sameness, inflexible adherence to routines or ritualized patterns of verbal or nonverbal behavior; highly restricted, fixated interests that are abnormal in intensity or focus; hyperactivity or hypoactivity to sensory input or unusual interest in sensory aspects of environment (American Psychiatric Association, 2013).

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