Chapter 11
Technological Tools and Interventions to Enhance Learning in Children with Autism

Anurag Sharma
CT Group of Institutions, India

Arun Khosla
Dr. B. R. Ambedkar National Institute of Technology, India

Mamta Khosla
Dr. B. R. Ambedkar National Institute of Technology, India

Yogeswara Rao M.
Cognolabs Systems, India

ABSTRACT

Recent years have witnessed an alarming rise in the number of children diagnosed with Autism Spectrum Disorder (ASD). These children have special needs and hence require different kind of learning mechanisms as well as access to technological interventions that offer extra means of building links for an individual. This heightened focus includes services and interventions combined with technological advances that redefine how support and instruction can be provided. This chapter presents an overview of emerging technology tools such as Virtual Environment (VE)/Collaborative Virtual Environment (CVE), therapeutic robots, language tools, multimedia handheld devices, floor/table top projectors along with different interventions that have been used to enhance different learning skills in children with ASD.

1. INTRODUCTION

The word “autism” comes from the Greek word ‘self’ and describes that sufferer seems to lack interest in other people. Autism is a pervasive neurodevelopment disorder that is characterized by deficits in social interaction, communication and restricted interests and/or repetitive behaviors. The term “spectrum” in ASD refers to a wide range of symptoms, skills and levels of impairment ranging from mild to severe. As every day, new technology is changing human’s lives in ways we never imagined and the domain of autism is not an exception. The use of technology to teach students with ASD is not a new concept. In

fact, technology has been used to teach students with ASD for over 42 years, when Colby (1973) examined the use of computers to teach students with ASD. Technological interventions are very helpful for training children with ASD because these interventions can be easily customized, take less time to design and reduce the cost of therapist.

The main objective of this chapter is to give an overview of different technological tools viz., VE/CVE, therapeutic robots, software language tools, multimedia handheld devices and table/floor projectors for improving several forms of autism impairments. Different studies are presented, where these tools have been used in helping autistic children and their parents to improve their lives. This chapter is organized into several sections based on the type of tools used. In the first section, a brief overview of technological tools is presented that is followed by more detailed explanations in the subsequent sections. The role of VE and CVE to support learning of children with ASD is discussed in Section 3 whereas, Section 4 is organized around improving several areas of impairment using robots viz. social skills, joint attention and motor skills. Section 5 gives an overview of some of the currently available language software designed to enhance communication skills. Section 6 examines how current advancements in handheld electronic gadgets (smart phone, tablet etc.) with different applications facilitate children with ASD to learn social imaginations, communication etc. In section 7, the focus is on interventions using interactive projection systems and their use for teaching social skills and face recognition to children with ASD. Finally the conclusions and the scope for future work are presented.

2. DIFFERENT TECHNOLOGICAL TOOLS TO ENHANCE LEARNING SKILLS IN CHILDREN WITH ASD

This section presents a brief description of various technological tools that have been used to enhance learning skills of the children with ASD. Most popular of them are VE, robots, language software, mobile devices and apps, floor/table projectors etc. Boser I.K. et al. (2013) reviewed some technological tools available for teaching of autistic students. This chapter provides a comprehensive survey of technological tools with the objective of addressing several autism impairments. Also, the effectiveness of these tools has been discussed based on research findings available in the literature.

VE can simulate a virtual world that is interactive, customized and safe. It offers the prospective for users to discover social situations and understand different behavior responses for a range of simulated social interactions. It has been seen that VEs are particularly useful for children with ASD and may provide the most suitable method for social skills training (Yogeswara et al., 2013). In spite of huge potential of VE, this environment has not been widely adopted into the learning centers.

Robotic technology has been revealed to be appealing to children with ASD (Esubalew et al., 2013). Robots are easy to interact with than humans, can reiterate games with infinite patience and can also record the information for further study and that is changing the way ASD children learn new skills. The robots could be used to sense different conditions under which some social prompts would need to be shared. These can be programmed accordingly and allow children to interact steadily in a customized environment.

Communication deficit is one of the major impairment of children with ASD. Enhancements in language functionality may improve educational inclusion, enlarge social circle and ultimately, increase independence (Finn et al., 2005). Language remediation software is readily available and convenient