Chapter 40
Practical Examples of Using Switch-Adapted and Battery-Powered Technology to Benefit Persons With Disabilities

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ABSTRACT

Handmade switch-adapted toys and LED lights were created by a first grader student as part of a makerspace activity to aid a person with disabilities. Commercial toys and light strings were adapted for ease of use by interrupting the electrical current by use of a handmade battery interrupter and the addition of remote switches. In addition, an illuminated glove was created using conductive thread, LED lights, and an Arduino LilyTiny controller to enable the person with disabilities to signal turns on a disability scooter using hand signs. Basic information on the creation of these materials and their possible use are presented in this chapter.

INTRODUCTION

This chapter will examine how switch-adapted battery-powered technology may be utilized to help persons with disabilities. The authors show how to create switch-adapted toys and battery-powered switches that interface with adapted toys and other battery-powered devices such as LED lights. They also show how battery-powered, conductive-thread stitched wearable technology can be used for wearable devices to aid those with disabilities. The chapter includes descriptions of a first grader learning to create these technologies with the authors. These technologies can function as activities for elementary-age activities involving assistive technology (AT) and the makerspace movement.

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This chapter will feature three initiatives of the authors to create assistive technology that blurs the line between low-end special education technology and high-end special education technology. These initiatives were done with the authors' granddaughter, a first grader who was learning to use makerspace technology to create circuits using both wearable technology and various wiring connections, including soldering wires to terminals. One of her activities was done with one of the authors, her grandfather, adapting battery-operated toys to be controlled with external adaptive switches. The first grader also created adaptive switches that could be used for either the adapted toys or the LED lights on the glove or scooter.

BACKGROUND

Special education technology is defined by IDEA (US Congress, 2004) as any item, piece of equipment, or product system, whether acquired commercially off the shelf, modified, or customized, that is used to increase, maintain, or improve functional capabilities of a child with a disability. The definition implies an array of categories into which special education technology can be placed. Parette and Murdick (1998) outline at least 10 different categories for special education technology, "(a) mobility (e.g., wheelchairs and scooters); (b) electronic communication (i.e., devices which produce artificial or real life speech for talking with others); (c) visual (e.g., magnification devices for reading tasks); (d) assistive listening (e.g., hearing aids); (e) environmental access (e.g., infrared control unit for manipulating a TV or stereo); (f) computers (e.g., game software enabling cooperative play with others); (g) leisure/recreation (e.g., hand-held electronic toys used for independent play); (h) independent living (e.g., buttoning or reaching devices for children with physical disabilities); (i) positioning (e.g., vinyl-covered rolls and bolsters used to maintain proper body alignment); and (j) adaptive toys (e.g., battery-powered toys which are switch-controlled by the child). Bryant and Bryant (2003) divide assistive technology into seven categories: positioning, mobility, augmentative and alternative communication, computer access, adaptive toys and games, adaptive environments, and instructional aids.

Today's special education technology devices are expanding to bridge the gap between low-end technology and high-end technology and even incorporate wearable technology. High- end computer-based technology can be supplemented with low-end technology methods to help achieve a more normal learning environment for individuals with disabilities. Many individuals and organizations are using this connection between high-end and low-end technology to benefit those with disabilities while incorporating a makerspace educational opportunity. Makerspace activities use both low-end and high-end technology to create things that incorporate a constructivist learning environment for all students but are also serving as an opportunity for these makerspace learners to develop assistive devices for those with disabilities (ATMakers, n.d.).

But what are makerspace activities? The following quote from MakerEd.org gives a good first look at the thinking behind a makerspace.

Let's being with memory and imagination. Think back on some of your earliest, fondest memories of making something. Was it building with blocks? Tunneling in the sand? Writing lines of code or singing your own silly songs? Drawing, painting, or telling a story?