Chapter 3
Sounding Out Science:
Using Assistive Technology for Students with Learning Differences in Middle School Science Classes

Clement Vashkar Gomes
Teachers College, Columbia University, USA

Felicia Moore Mensah
Teachers College, Columbia University, USA

ABSTRACT

With the current focus to have all students reach scientific literacy in the U.S, there exists a need to support marginalized students, such as those with Learning Disabilities/Differences (LD), to reach the same educational goals as their mainstream counterparts. This chapter examines the benefits of using audio assistive technology on the iPad to support LD students to achieve comprehension of science vocabulary and semantics. This research is composed of quantified data supported by qualitative information. Significant statistical evidence from pretest and posttest ANCOVA analysis reveals that audio technology is beneficial for seventh grade LD students when learning unfamiliar science content. Analysis of observations and student interviews support the quantified findings. This chapter provides useful information for the rising number of identified LD students and their parents and teachers by providing the benefits of using audio assistive technology to learn science. Audio assistive technology can be the tool to bridge the gap for LD students to achieve scientific literacy.

INTRODUCTION AND PURPOSE

In-tro-duc-tion. That is how most children are taught to break down the word and sound it out. But what if you did not know, could not remember, or were not sure of what sound "in" or "tro" makes or maybe you were not sure how "duc" would sound? How can you figure out the meaning of the word if you struggle with what sound it makes when you read it? This is the common challenge with many students

DOI: 10.4018/978-1-4666-9616-7.ch003

who struggle when learning through reading and writing (Lovett, Borden, DeLuca, Lacerenza, Benson, & Brackstone, 1994).

Phonemes, small units of sound, correspond to graphemes, printed characters, allowing us to transform the letters we see on the page into the spoken words we hear (Richardson, Thomson, Scott, & Goswami, 2004). Auditory and visual processing are two key components to assess for the presence of language-based learning disabilities (Shaywitz, 1998). Hearing the word "introduction" may cause a student with dyslexia or another Language Learning Impairment (LLI) to struggle to break down and spell the word, especially if the individual is unaware of, unfamiliar with, or has difficulty remembering the phonemes. When asked to write down a word such as "introduction," the student will turn to simpler, familiar sight words to compose larger and more complex words, for example, by transliterating the spelling of "introduction" into a form that "sounds" the way they hear it, namely "*introduckshin.*" The difficulty in formulating the connection between sounds and written words can make learning and retaining new vocabulary very arduous for a person with dyslexia (Lovett et al., 1994).

With the growing diversity of students in American classrooms, it is important for educators to understand and modify their teaching to accommodate individual needs. Each student walks into a classroom with different life experiences and modes of thinking and learning. Whether it is due to ethnicity, culture, family, lifestyle, gender, medical history, or personality, particularly in a country as heterogeneous as the United States, we are all very different beings. This adds to the beauty of the diverse and unique world we live in. With these differences comes the struggle of teaching young minds new disciplinary knowledge when there are so many approaches and methods necessary for each individual (Faggella-Luby, Graner, Deshler, & Drew 2012).

Students with Learning Disabilities (LD) are a marginalized group that has often been overlooked. LDs are more appropriately termed "Learning Differences" and can affect the way students learn, retain, and understand written and spoken language. LDs can affect reading and comprehension as well as writing and speech, even though the students are of average intelligence and cognitive ability (Shaywitz, 1998, 2003). The most common language-based LD is dyslexia. In recent years, more focus has been placed on students who have dyslexia and how to better assist them (Turnbull, Huerta, & Stowe, 2006).

In the past, many LD students were placed in classrooms that were not supportive of their needs, which is a disservice to their learning. These students should be provided an appropriate and modified educational setting that will allow for learning (Salvia, Ysseldyke, & Bolt, 2010). As the neurologic, linguistic, and educational communities continue to learn and understand LDs, new and innovative supports are being developed to assist this marginalized group of individuals.

One of the advances that has had great positive impact on students with LDs is technology. Technology has been assisting individuals with disabilities for many decades now. With innovations such as hearing aids, wheelchairs, and even elevators, technology has allowed individuals who are different from the mainstream population to perform activities and tasks independently that would not have been possible without the assistance of others (Turnbull, Huerta, & Stowe, 2006). Technology has also greatly facilitated individuals with LDs. For example, students with fine and gross motor control issues can use computers to type. Dyslexic students can use voice recognition and text reading software to hear and type responses. Pictographic apps on the iPad are allowing non-verbal autistic students to communicate with others. There are increasing numbers of new programs and technology tools to assist individuals with special needs (Raskind, 2000). Language-based LDs such as dyslexia can affect learning the unfamiliar language and vocabulary of science, because they affect reading, processing, and retaining new information (Carlisle, Fleming, & Gudbrandsen, 2000).