Chapter 25
Improving Access to Higher Education With UDL and Switch Access Technology: A Case Study

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ABSTRACT

This chapter presents an in-depth case study of the creative use of a mobile technology system by a diverse learner who is also one of the authors of the chapter. This learner is blind, has significant fine and gross motor impairment, and speaks in a whisper that is not understood by today's speech recognition technology. The learner's inclusion as an author is, in itself, a testimony to the empowerment the mobile communication system has brought to his life, which in turn has allowed him to be an active participant in the design of a learning environment based on Universal Design for Learning (UDL) principles. More specifically, the chapter details the ongoing development of a system for making math content more accessible not only to the individual learner who is the focus of the case study, but to other learners who struggle with higher level math content in higher education.

BACKGROUND STUDENTS WITH DISABILITIES AND HIGHER EDUCATION

According to the National Center for Educational Statistics (NCES), the proportion of college undergraduates with disabilities increased dramatically in the space of just a decade, going from approximately 6 percent in 1999 to 11 percent of all college students in 2012 (U.S. Department of Education, 2013). This

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trend is likely to continue due to two factors: the impact of the Individuals with Disabilities Education Act (IDEA) and returning veterans continuing their education (National Council on Disability, 2015).

About 60 percent of special education students (those receiving services under IDEA) attend some kind of postsecondary educational program after high school, a rate only slightly lower than that of their non-disabled peers (at 67 percent) (Newman et al, 2011). However, despite attending postsecondary education at rates just slightly lower than non-disabled students, students with disabilities continue to face barriers that make it less likely they will complete their undergraduate education when compared to their peers who do not have disabilities. Only 34 percent of students with disabilities are able to complete a four-year degree within eight years, compared to 51.2 percent of the general population (Newman et al, 2011). These lower rates of college graduation then translate into lower participation in the workforce. On average, only one-third of working-age people with disabilities (32 percent) are employed compared to over two-thirds of people without disabilities (72.7 percent) (U.S. Department of Labor, 2014).

The pattern of exclusion is just as pronounced when careers in STEM (Science, Technology, Engineering and Mathematics) are considered. This is important because STEM-related fields have received considerable attention and funding in recent years due to concerns about economic competitiveness. Only 10% of undergraduate STEM majors report having a disability, and participation in STEM fields for students with disabilities decreases significantly at the graduate level, where only 5% of all graduate students in STEM (and only 1% of those receiving doctorates) have a disability (Moon, Todd, Morton and Ivey, 2012). This all translates to low rates of employment for individuals with disabilities in STEM-related jobs, where they make up only 2% of the workforce (Moon, Todd, Morton and Ivey, 2012). Opening up careers in STEM to learners who have disabilities would not only benefit the learners themselves (by providing access to good jobs), but it would also increase the talent pool needed for continued innovation in these fields.

While all learners with disabilities face challenges in pursuing STEM fields, those who are blind are at an even greater disadvantage due to the visual nature of much of the work done in these fields. Graphically conveyed information, such as charts, graphs, diagrams, schematics, and 3-D simulations all present significant challenges if an alternative representation is not provided for those who are not able to see. A number of tools and techniques are available to make this kind of content accessible, ranging from raised line drawings to physical models, but faculty may not always be aware of their existence, know where to procure them, or have the skill needed to implement them effectively during instruction. For example, Nemeth Code is an excellent tool for math accessibility for those who are blind, but its use is often limited to students who have been enrolled in a school for the blind and who have received training in its use. Even then, math content may remain completely inaccessible to a student who is both blind and mobility impaired.

The problem is compounded by the fact that solutions are often implemented in an "ad hoc" basis when faculty encounter individual learners with visual disabilities in their classes. A more proactive approach based on providing multiple representations of key information, would benefit not only those learners who have sensory limitations, but also those who just need these multiple representations as an aid to understanding. This proactive approach to planning more inclusive instruction, known as Universal Design for Learning, is explained in more detail in the next section.

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