Running Head: Universally-Designed Content in Education

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Issue Overview

Individuals with disabilities have always faced impediments to learning. A key challenge faced by educator is the difficulty of providing learning materials to students having disabilities that are in formats that are usable and appropriate for individualized needs. In recent years, there has been legislation drafted with the intent of mitigating such learning barriers. For example, The US Rehabilitation Act strives to ensure that students having disabilities will receive a free and appropriate public education in an environment of minimal restriction (US Department of Education, 2007).

A recent provision of the Individuals with Disabilities in Education Act (aka, IDEA) is the creation of the National Instructional Materials Accessibility Standard (NIMAS). This law compels providers of commercially-available learning materials to make their content available to schools in a format that can easily be adapted for learners with visual impairments (US Department of Education, 2007). Traditionally, accessible content formats has been subjected to delays, with delivery several months, or even years after the release of materials for the general student population (textbooks, CD-ROMs, etc.).

Perhaps no single piece of legislation has raised the stakes of special education as much as No Child Left Behind, which mandates that the standardized test scores of special education students must be considered along those of the general education population in order to fulfill NCLB's adequate yearly progress requirements. Thus, it is critical that students of all levels of ability have access to content that is appropriate for their individual needs.

While the intent of the Rehab Act was to provide for education in the least restrictive environment, and NIMAS helps to ensure that commercially developed content is accessible, neither addresses the 'last-mile' issue of accessible learning content. That is, the difficulty faced by teachers who develop their own content and are burdened with converting that content into formats that are usable and appropriate for special needs learners.

It is the intent of this paper to demonstrate that the adoption of a universally-designed content framework, coupled with appropriate learning technologies, can allow schools to better

achieve their educational goals for all learners. This is predicated on the following: that the universal design for learning (defined in next section) provides a sound model for the development of curricula, that digital technologies have made it easier to transform content into accessible formats, and finally, that adoption of UDL principals is likely to become integrated into educational policy (State of Michigan, 2006) as well as federal law (Samuels 2007).

Background Information

The principles of Universal Design were developed independent of pedagogy. Ron Mace, an architect who was wheelchair user, observed that the retrofitting of pre-existing buildings and infrastructure such that they were more accessible was expensive and time-consuming (Johnstone, 2003). He conceived the philosophy of "universal design" of products that would be usable—to the greatest extent possible—by everyone (Johnstone). A notable outcome of universal design is the "curb" cuts in a sidewalk which benefit wheelchair user, but also parents pushing a stroller, and children riding bicycles.

In recent years the principles of universal design have been extended to the development of learning content. Proponents of universally designed content contend that traditional learning tools (print-based textbooks, classroom lectures, etc) are inflexible and place an unfair burden on the learners and teachers to adapt to the content.

At the forefront of the effort to apply universal-design principles to learning content has been the Center for Applied Special Technology (CAST), which has developed a model it has termed the Universal Design for Learning (UDL). UDL is a learning framework designed with the goal of creating content accessible to the greatest number of learners possible. UDL is not a one-size-fits-all approach, but emphasizes content that is flexible and can be transformed to accessible formats (Hitchcock and Stahl, 2002). CAST's research has indicated that learning outcomes are optimized for all learners when content is prepared to allow for the following:

- Multiple means of representation, to give learners various ways of acquiring information and knowledge, for example content can be made available to learners in voice or Braille formats.
- Multiple means of expression, to provide learners alternatives for demonstrating what

they know. In this case student may be able to fulfill an assignment's requirement with their choice of a written essay, interactive computer program, or an oral presentation

- Multiple means of engagement, to offer appropriate challenges, and increase motivation. This may be addressed by offering students multiple levels of scaffolding, rewards, or contextual flexibility—such as choice of individual or group assignment. (Hitchcock and Stahl).

CAST cites breakthroughs in technology that permit content to be prepared in such a way that it is more easily delivered in appropriate formats (Hitchcock 2006). One technology that facilitates these transformations is the extensible markup language: XML (Hitchcock).

XML is an esoteric concept to those not familiar with it; an in-depth exploration of the topic is beyond the scope of this paper. Let it suffice to say that XML enables the structuring of content so that it can be more easily converted to multiple communication formats (print, Web, refreshable Braille, synthetic voice…). Many schools and districts are already working with document-management or learning-content systems that support XML.

XML is a critical component of NIMAS guidelines. Under NIMAS laws, if a school has visually-impaired learners, an educational publisher is required to provide the school with XML-conformant versions of purchased content. Adherence to XML guidelines allow the publishers to create the content only once such that it can be delivered in traditional print, or Web channels and can also be converted to Braille or text-to-speech formats (Hitchcock).

Critical Points

There is a fairly large volume of research in the area of UDL; however, much of it is from its progenitor, CAST. Because of CAST's large presence in the body of professional literature, I felt that there was an inherent bias in the available research. There was surprisingly little empirical data that demonstrated that a quantifiable improvement in learning—such as increased test scores—that could be directly attributed to UDL. Furthermore, much of CAST research is based on neuroscience. For these reasons, the benefits of UDL may not be immediately evident to some educational decision-makers.

On the other hand, studies that have identified flaws with the principals of UDL are conspicuously absent. Research that suggested electronic media might have a negative impact on test scores for learners with specific disabilities, such as dyslexia (Alty 2005). However, the researchers in that study intimated that the diminished scores might be attributable to deficient instructional design of the electronic learning materials (Alty).

The lack of studies critical of UDL is not necessarily an aggrandizement of UDL. The special-education community recognizes benefits of technology (Edyburn, 2001); however it also recognizes it's own inability to evaluate the technology in quantifiable terms—such as increased assessment scores (Edyburn). A primary reason that Edyburn cites is that the pace at which assistive technology products are released—and 'obsoleted'— far outpaces researcher's ability to measure technology's impact.

Resistance to the to the adoption of UDL might be characterized with more-general organizational issues. Any modification to a school district's curriculum framework is a major one. Factors such as increased expense, change-management and professional-development needs can be a hard sell to educational decision makers (and taxpayers). Quite simply, any major shift in a curriculum framework that is so reliant on technology is going to require extensive software acquisitions, support and several years of professional development (Edyburn).

The research findings that provided quantifiable support some of UDL's were of a narrow scope, focusing on specific alternative forms of delivering assessment content (Thompson, Johnstone, Thurlow 2002) or to allowing choice of way in which to expressions answers to tests (Thompson et al.). These findings do lend credence to the "multiple means" tenets (representation, engagement and expression) of UDL. Johstone et al. (2003) concluded that ensuring of universally designed, paper-and-pencil-based methods of assessments did show a measurable increase in test scores for large-scale assessment. The same study showed an upturn of test scores when students were presented a "read-aloud" version of a text-based assessment (Johnstone et al.).

Similarly, research has shown that when students, were offered the choice of text-to-speech (an electronic read-aloud format), options or traditional text-only formats, most chose the

text-to-speech for a reading comprehension exam (Dolan, Banjee, Chun, 2005). Students were later surveyed as to their opinions of the text-to-speech formats, with 70% finding it useful (Dolan et al.). Nearly all recommended the text-to-speech option to other learners (Dolan et al.). The study showed increased test score for those who chose text-to-speech, particular with passages in excess of 100 words (Dolan et al.).

Summary

Despite the noble intentions of The Rehab Act, IDEA/NIMAS and NCLB, the laws fall short in the sense that the bulk of learning content in a school—that which is created by teacher---falls through the cracks. There are no guidelines to help ensure that such content can be adapted without expensive assistive devices, or laborious efforts by teachers and paraprofessionals.

Universal Design for Learning holds promise in the delivery of content to students with special needs as well as the general student population. The research by CAST has shown the great diversity in students' learning styles and has demonstrated the need for flexible curricula. Technology breakthroughs—like XML—ensure that content can be more easily transformed to better meet individualized needs. Furthermore, there are draft versions of legislation at state and federal levels that include provisions for UDL; its adoption may soon be mandatory.

Implications

Decision makers need to be aware that the adoption and successful integration of the UDL framework will not eliminate the need for assistive technology devices for its learners. It should be noted that some content, particularly 'pre-NIMAS" textbooks are going to be in a print-only format. Thus, it is unrealistic to say that the UDL would make a Kurzweil reader unnecessary.

This paper does not contend that transition to a UDL framework by a school system would be without cost. While a school, district, or ISD may already have may be creating content in format that is XML-compliant, this does not guarantee it's capable of converting that content into accessible formats. Extensive customizations and staff training are likely to be necessary.

There is one item previously mentioned that might possibly ensure UDL's adoption---UDL mandates in state policy or reauthorization measures in NCLB. If either becomes true, UDL should soon become widespread. If this 'stick' is not in place, it is not clear the carrots—such as neurological research and easier-to-transform content—will be convincing enough to persuade educational decision makers embrace UDL. Right, or wrong, NCLB guarantees more than anything else; the promise of increased test scores will be a key driver in whether UDL becomes ubiquitous in schools.

Still, I see that components of UDL such as multiple means of representation, engagement and expression can make an immediate impact on learning without a complete re-engineering of a district's curriculum. Districts making such a move will be in a better position of compliance should UDL become part of educational legislation. If such laws never surface, the district will have done itself a favor, by being in a better position to create content that is going to be of greatest use to all of its students.

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