Universal Design for Learning: Implications for Large-Scale Assessment

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It is a dreadful irony that students with disabilities have better access to school buildings than they do to the curricula within them. Although our culture has made great strides in redesigning school buildings so that they provide alternative means of physical navigation - stairs, ramps, elevators - for students with and without physical disabilities, it has not made comparable gains in redesigning learning materials and methods so that they provide accessible alternatives for students with disabilities. Most schools depend on a single medium - text - for the majority of learning and evaluation. As important to our culture as this medium is, it is not equally accessible to all students. For students with reading-related learning disabilities, this dominant medium of instruction is more of a barrier than a ramp.

This article will describe a way to make strides toward an education system that works for all students, including those with learning disabilities, by applying the concept of universal design to learning and assessment. We will illustrate how the learning needs of different students, including students with dyslexia, can be accommodated through accessible design of educational material, resulting in better learning and more accurate assessments.

Meeting Diverse Learner Needs Through Universal Design for Learning

The concept of universal design originated in architecture as a means to create structures that accommodate the widest spectrum of users, including those with disabilities. Instead of retrofitting structures such as ramps and elevators to existing buildings for accessibility, universal design considers the needs of all possible building users from the start, thus allowing architects to integrate universal accessibility into the building's design. An unanticipated benefit of universal design is that addressing the divergent needs of special populations increases usability for everyone. The classic example is the curb cut. Curb cuts, originally designed to enable those in wheelchairs to negotiate curbs, also ease travel for people pushing strollers or riding skateboards, pedestrians with canes, and even the average walker. Thus, by focusing on the needs of users with disabilities at the outset, universal design produces better solutions for all users by providing multiple choices.

Universal Design for Learning (UDL) was developed to extend the concept of universal design to embrace the diverse ways in which individuals learn. It does so by incorporating knowledge about the brain and how individuals vary in their learning methods. There is perhaps no greater

example of diversity than in the way individuals process information and how they learn. Much of what we know about learning emerged from brain imaging technologies that allow us to measure brain activity. This research has demonstrated that different parts of the brain oversee different, relatively simple activities, such as distinguishing color or moving a finger. More complex activities and behaviors rely on interactions between these individual brain regions, which join together to form functional "networks" akin to a computer network. There are large person-to-person differences in both individual brain areas and how they "network" to perform complex actions.

Thus, one of the most important revelations stemming from brain research is that there are no "regular" students. The notion of rigid categories of learners - smart/not smart, disabled/not disabled, regular/irregular - is an unrealistic oversimplification. By categorizing students in this way, we focus on single characteristics while missing many subtle and important qualities. The truth told by brain research is that each student brings a unique assortment of strengths, challenges, and preferences into the learning environment.

The brain regions that take part in learning can be grouped roughly into three sets of interconnected networks, each one with a fundamental role in the classroom: (a) *recognition* networks are specialized to receive and analyze information (the "what" of learning), (b) *strategic* networks are specialized to plan and execute actions (the "how" of learning), and (c) *affective* networks are specialized to evaluate and set priorities (the "why" of learning). The functions of these networks parallel the three prerequisites for learning described by the Russian psychologist Lev Vygotsky, namely: (a) *recognition* of the information to be learned, (b) application of *strategies* to process that information, and (c) *engagement* with the learning task. Putting this all into practice, we now have guidelines for what a universally designed learning environment must provide to be accessible to diverse learners:

- Multiple means of recognition
- Multiple means of expression
- Multiple means of engagement

To provide multiple means of recognition, expression, and engagement, Universal Design for Learning relies on the ability of new digital media to provide flexible presentation. Unlike printed matter, new digital media, such as audio text, images, audio, video, and networked environments, allow for transformation from one medium to another, such as text-to-speech (e.g. talking word processors), speech-to-text (e.g. captions), text-to-touch (e.g. Braille), and image-to-touch (e.g. tactile graphics) (explore http://www.cast.org/udl/ for examples). These transformations not only permit a user to choose the format that is most accessible, they allow for multiple representations for clarity and enhanced meaning. Thus, new media have the potential to go beyond merely providing access to information and actually enrich the communication and absorption of that information, and thus potentially improve learning and mastery of the material.

When teachers get to know their students' strengths and challenges in recognition, strategy, and engagement, they can better choose when and how to use what medium and how to best set goals and select materials and methods for a range of learners. Printed text is often not the best option.

If a learning goal can be achieved via other means and media, or if certain parts of text comprehension are suitable for scaffolds and supports without jeopardizing the learning opportunity, the use of other media is warranted - indeed beneficial. Consider a student with dyslexia in a 4th grade math class: the availability of a digital textbook that supports reading by voicing selected words aloud may make the difference between her success and failure. Unable to manage the reading component of the task, even the most ardent mathematics lover might lose his or her enthusiasm. The digital textbook makes it easier for a struggling reader to keep up with the reading component of the task, preserving his or her interest and enthusiasm for math and focusing the learning challenge where it is meant to be - on mathematics not reading. These kinds of supports allow teachers to provide instruction that is more highly focused on the educational goals.

The Need to Support Assessment

Certainly one of the most important and consequential elements of instruction is assessment. Whether assessment is embedded into teaching (e.g. curriculum-based measurement) or administered separately (e.g. large-scale assessment), it must provide students with adequate and equitable means to express their knowledge and understanding if it is to provide accurate feedback on the performance of students. UDL can provide great insights into how to accomplish this.

Unless a student with disabilities is provided access during testing to the supports they rely on in the classroom, they may not be able to show their knowledge and understanding. As a result, the validity of an assessment may be compromised. As an example, consider testing a student's ability to identify birds in the field without allowing him access to the binoculars he had been using in his biology class throughout the year. In this case, we would be preventing him from demonstrating his knowledge of birds, which is the learning goal being tested, by creating a barrier out of his visual acuity. This is analogous to the problems seen in the classroom discussed in the previous section: by failing to provide students with appropriate means of recognition, expression, and engagement, we're creating a barrier out of their disabilities and preventing learning. Withholding supports during testing further compounds these problems by requiring students to adopt a new set of strategies at a particularly inopportune moment: during a test. Unless students are tested in an environment that provides access and supports comparable to those they had during learning, the results of assessment are likely to be invalid.

The standard way to ensure that students have appropriate access during assessment is to provide testing accommodations. Examples of accommodations include administering tests in large print for a student with visual impairment or providing a student who is unable to write with a scribe to record her responses. Accommodations attempt to "level the playing field" so that tests fairly and accurately assess students' knowledge and abilities and not their disabilities. Quite simply, without accommodations many students with disabilities are effectively excluded from large-scale assessments.

Federal law is clear regarding the responsibility of state and local education agencies to provide students with disabilities access to appropriate testing accommodations. The Individuals with Disabilities Education Act (IDEA) Amendments of 1997 (Public Law No. 105-17) require that

large-scale assessment programs must include children with disabilities, if necessary through the use of appropriate accommodations and modifications in administration. A clarifying memorandum from the U.S. Department of Education this year states: "Assessment accommodations should be chosen on the basis of the individual student's needs and should generally be consistent with the accommodations provided during instruction."

However, existing testing accommodations are often limited in their effectiveness in two crucial ways by virtue of problems with how the accommodations are administered and by virtue of limitations in what accommodations can accomplish. In the following sections, we will discuss both types of limitations, starting with the former.

Using Technology to Improve Testing Accommodations

As technology-based approaches become solutions of choice in the classroom, so they must also become solutions of choice for providing accessible assessments. By borrowing from the solutions provided by UDL in the classroom, we begin developing assessments that not only are accessible but employ the same technologies that students use in the classroom and in daily life.

The most common testing accommodation outside of altering test format (e.g. schedule or setting changes) is reading aloud test questions to the learner. The intent of this accommodation (when testing skills other than word reading) is to remove the barrier that text presents to many students (e.g. students with dyslexia or visual impairments). The problem with this accommodation is that it is typically administered in group settings of one reader with many students. In this environment, students are unlikely to request rereads due to peer pressure or embarrassment. Thus these students may still be at a disadvantage compared to students who are able to read independently. On the other hand, if students were provided with a technology supported reading environment, similar to the ones mentioned in the previous section, they would have independent access to the text and could read and reread passages at will.

Other accommodations, such as test magnification, use of a keyboard for response, and access to a bilingual dictionary, also can be provided by using technology in ways that are more user-friendly than can be done without their use. For example, in a study funded by the U.S. Department of Education, Martha Burk has shown that using computers to provide large print, extra spacing, and the use of sound was a better means to grant accommodations to students with some learning disabilities than the standard non-technological approaches.

Moving Beyond Retrofitting Accommodations

Technology-based accommodations have tremendous potential to improve the accessibility of tests for students with disabilities. However, this solution only borrows from the concept of UDL; it does not embrace it. If tests are to truly become universally designed, they must be created with consideration for a broad student population that includes students with disabilities. Otherwise, the ability of accommodations to level the playing field will be limited to what can typically be achieved with retrofit solutions.

As an example, consider Sylvia, a 10th grade student taking a science test. Sylvia must read a passage extracted from an earth science textbook and answer a set of questions to demonstrate that she understands the factors causing short- and long-term changes to the earth. Sylvia has dyslexia and is particularly challenged when reading text with complex syntax. Because of Sylvia's dyslexia, she was prescribed a read-aloud accommodation by her IEP team on science and math tests. With the test in digital format and with text-to-speech-capable reading software, Sylvia's deficit in word decoding is supported. However, Sylvia is still confused by the complex syntax of the test item, something that cannot be corrected through accommodations. As a result, Sylvia is at a disadvantage in interpreting the test question and thus at a disadvantage in demonstrating her mastery of the scientific concepts being tested.

The point illustrated here is that retrofitted accommodations often do not suffice. When this test item was created, an unintentional barrier was laid that prevented the test from accurately, assessing progress of many students vis-à-vis the learning goal. In Sylvia's case, we have confounded her knowledge and abilities in science with her skills as a reader. While reading ability should be a factor in a test of reading skills, it should not be a factor when assessing other subject areas. Unfortunately, reading ability remains a strong predictor of test performance, *regardless of the subject area being tested*. For assessments to be truly accurate, they must evaluate the knowledge and skills that are relevant to specific learning standards and only those knowledge and skills. While on the face of it, using the same assessment tools and procedures for each learner seems fair and equal, this approach yields inaccurate results for many students. Any test that relies on a single medium inevitably (albeit unintentionally) evaluates knowledge and skills that may not be germane to instructional goals. Thus, students' ability or inability to work with particular media and methods may confound their knowledge and skill. According to the joint standards on testing developed by the American Educational Research Association, the American Psychological Association and the National Council on Measurement in Education, when testing individuals with disabilities, we must ensure that scores "accurately reflect the intended construct rather than any disabilities and their associated characteristics extraneous to the intent of the measurement." While accommodations can be an effective means for providing students with disabilities access to a test, they can only go so far in correcting assessments that test extraneous knowledge and abilities, such as reading abilities in a science test.

We will now revisit the *multiple representations* concept to see how more accurate assessments can be created when the principles of UDL are applied to incorporate widespread student needs into the original design.

Multiple Means of Recognition

In the example above, Sylvia's dilemma shows the limitation of a single representation of the information for any particular task or problem. To provide basic access for some students (e.g. deficient in one modality or another, such as in dyslexia), and multiple routes to meaning for all students (e.g. representing a math concept both in text and graphically), multiple representations of meaning should be provided. During assessment, unless we are testing students' ability to use a particular modality (e.g. specifically testing their ability to read text), multiple representations will help ensure that they are provided the best opportunity to demonstrate their skills and knowledge. For example, if we are assessing students' understanding of principles of mathematic

probability, representing the questions both as word problems and graphically may better align the test with the learning goals and make it more broadly equitable to students.

Multiple Means of Expression

Writing continues to be the predominant method for expression on tests. However, writing remains a very difficult task for many students. If writing ability is being assessed, then clearly we must be very careful in allowing accommodations for risk of invalidating the test item. However, to the extent that writing ability represents an obstacle to accurately measuring knowledge and abilities, we must consider alternatives. For students who have limited physical abilities, current assistive technologies involving computers such as single switches, alternative keyboards, and alternative pointing devices allow students who would otherwise be unable to express themselves the ability to respond and thus participate in the assessment. For students who struggle with other aspects of writing such as converting sounds to letter combinations or organizing information, technologies such as speech-to-text (still a rather immature technology) and graphic organizers can provide more equitable means for expressing information; CRESST, for example, has done excellent work exploring the use of concept maps in science assessment.

One particular study examining the use of technology in expression during assessment is worth mentioning. In a carefully and elegantly designed study of students taking large-scale assessment, researchers at Boston College have shown that students allowed to use a keyboard to answer writing portions of the test scored significantly higher than those students required to use pencil and paper. The researchers attribute this difference primarily to fact that many students are already accustomed to using computers to compose essays. Furthermore, for many students, keyboarding is simply a more efficient way to produce good writing. Thus, providing multiple means of expression can have unanticipated benefits for students.

Multiple Means of Engagement

Many students are often bored in school. There is no single solution to this problem because of the range of individual differences - there are many different reasons for their lack of engagement. Students with disabilities illustrate the issues. The same design that would likely engage a student with attention deficit hyperactivity disorder (a high degree of novelty and surprise, for example) would be absolutely terrifying (and thus disengaging) to a student with autism. Universally designed curricula must consider the role of motivation in learning and the individual differences that underlie motivation and engagement. These curricula must provide alternative means of engagement - more novelty and surprise in the learning environment for some students, less for others, for example.

Within assessment, the engagement issues present in curriculum are compounded by the testing phenomenon. Testing triggers widely different emotions in different students, thus raising the potential for inaccuracies in test results. One means for improving and equalizing student engagement is to give them choices. For example, if we're testing reading comprehension, allowing a student to choose the topic of the passage to be read, based on his interest, could greatly improve his engagement. In addition, expanding the presentation of a test beyond the

standard text-based format by implementing simulation environments, such as digital manipulatives the interactive labs, can have a stimulating rather than dulling effect on student engagement.

As a result of applying universal design principles to assessment, we can create tests that more accurately assess the knowledge and abilities of all students, including those with dyslexia and other learning, cognitive, or physical disabilities. In the process, we will reduce the need for many of the accommodations that are used today as retrofit solutions to providing a more level playing field.

Conclusion

Currently great emphasis is being placed on assessment to improve education. Large-scale assessment is one means for such improvement, but we must be careful not to confuse the testing of standardized learning goals with testing using standardized administrations. Standardized administrations are a significant problem because the use of single, inflexible media during assessment confounds the measurement of knowledge and abilities relevant to the test with those particular to the test administration conditions. Only by creating fair and accurate tests that allow students to demonstrate their learning progress regardless of how they learn can we ensure that we are holding educational systems accountable for all students, including those with disabilities. Furthermore, and more importantly, fair and accurate testing is essential if we are to use assessment results to help shape subsequent instruction for individual students. Universal design is one means for accomplishing this.

Ironically, current efforts to administer computer-based testing in many states may potentially *decrease* accessibility since they are largely done without considering student needs from the start. While merely offering tests in a digital format opens the doors to use of access tools such as text-to-speech, retrofit solutions are limited in their effectiveness; tests must be designed *from the start* to be inclusive of all students. Fortunately, the application of universal design principles in the classroom provides valuable insights that can help inform the design of fair and accurate assessments for all students.

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- CAST's Website for additional information on UDL: http://www.cast org/UDL/

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