

Introduction

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Since the late 1990s, federal laws have sparked dramatic changes in academic expectations for students with disabilities. The 1997 reauthorization of the Individuals with Disabilities Education Act (IDEA) broke new ground by articulating the right of special education students to participate and progress in the general education curriculum and requiring states to evaluate such students within the same accountability systems as their peers. Four years later, the No Child Left Behind Act of 2001 (NCLB) realigned separate general and special education standards, curricula, and accountability, supporting the idea that students with disabilities, given the means, are able to interact with the general education curriculum, benefit from it, and achieve measurably improved performance. The 2004 IDEA reauthorization emphasized the same concept and called for greater efforts to provide universally designed curriculum to support the learning of students with disabilities.

As a result of these laws and a general trend toward more inclusive education policies, students with disabilities are included in standards-based reform systems in ways that few anticipated a decade earlier. For example, by 2003 the average participation by such students in achievement testing had risen to 85 percent, up from just 10 percent in the early 1990s (Quenemoen & Marion, 2003). In addition, the movement in most states toward standards-based educational reform has resulted in an increased emphasis on learning outcomes for students with disabilities (Jorgensen, 1997). While there have been numerous successful efforts to reduce the barriers to access, participation, and progress within

the general education curriculum, students with disabilities still experience significant difficulty obtaining accessible and usable educational resources in a timely manner. As a result, students with disabilities are chronically at high risk for school failure and underperformance (Blackorby & Wagner, 2004; Frieden, 2004).

Of course, facilitating genuine access, participation, and progress in the general education curriculum requires much more than physical inclusion in classrooms. Many students remain at risk because classroom learning is still dominated by inaccessible printed textbooks: Students who are blind or visually impaired cannot see the words or images on a page, those with physical disabilities cannot hold a book or turn its pages, those with learning or cognitive disabilities cannot decode the text. For all of these students, the printed book presents a common barrier. As a result, they lack basic access to the content and activities that would support them in reaching high standards. Educators routinely scan and digitize books for students in order to level the playing field. When the cost in time and lost opportunity is totaled, many millions of dollars and valuable instructional time are wasted by the duplication of such efforts across the country.

These concerns became particularly pressing with the passage of IDEA '97. In response, the National Center on Accessing the General Curriculum (NCAC) was created through a collaborative agreement between the Center for Applied Special Technology (CAST) and the U.S. Department of Education Office of Special Education Programs (OSEP). NCAC set out to provide a practical vision of how to shape curricula, teaching practices, and policies to improve access to the general curriculum by students with disabilities. NCAC would accomplish this by synthesizing existing knowledge and research about curriculum access and by conducting national leadership and dissemination activities to raise awareness.

CAST brought to its leadership of NCAC 15 years of experience in improving education for children with disabilities not only through innovative uses of computer technologies but by rethinking fundamental assumptions of special education. As the developer of nationally known learning and accessibility tools such as WiggleWorks (Scholastic), CAST eReader, Bobby (Watchfire), and Thinking Reader (Tom Snyder Productions/Scholastic), CAST had established itself as a key contribu-

tor to ongoing efforts to improve life and learning for students with disabilities.

While CAST is often thought of as a technology group, it is in fact an educational research and development organization with a staff composed primarily of lifelong educators, curriculum specialists, and special education experts. Its experiments with technology in education reflect a desire to find the most powerful and practical means of solving pressing issues in K–12 classrooms. Each year, CAST conducts extensive classroom research and provides training for classroom teachers and school administrators, keeping a close tab on the pulse of today’s classrooms and the special challenges teachers face.

CAST’s unique framework for reshaping education—called Universal Design for Learning, or UDL—offered NCAC a powerful means by which to assess barriers and promising designs in current curricula; best teaching practices and successful educational reform efforts; and existing and promising policies at state and national levels. UDL provides a blueprint for creating flexible goals, methods, materials, and assessments that meet the needs of diverse learners. It draws on the principles of the universal design movement in architecture and product development, which call for designs that from the outset accommodate the greatest variety of individuals, making the need for costly and unattractive after-the-fact retrofitting unnecessary. Speaker phones, curb cuts, and close-captioned television are all examples of universally designed products that are made to accommodate a variety of users, including but not limited to those with disabilities. TV captions, for example, enable those in a busy, noisy restaurant or airport lobby to understand and learn from what is being shown on the screen. The same innovations that provide disabled individuals with everyday access to information or places also enhance the experiences of those who do not have disabilities per se but may have unrecognized situational needs, challenges, or preferences that enable them to benefit from universally designed solutions.

In the same way, UDL leverages technology’s power to make education more inclusive and effective. UDL helps educators customize for individual differences by offering 1) multiple means of representation, to give learners various ways of acquiring information and knowledge; 2) multiple means of expression, to offer learners alternatives for demonstrating what they know; and 3) multiple means of engagement, to

tap into learners' interests, challenge them appropriately, and motivate them to learn (Rose & Meyer, 2002).

In addition to providing technological know-how and an educational framework, CAST brought to its leadership of NCAC extensive experience in developing and sustaining productive partnerships with leading publishers, research organizations, and universities. This was important because NCAC's mission required collaboration among experts in universal curriculum design, advanced teaching practices, educational policy, and consensus building.

To establish a base of interdisciplinary expertise, CAST enlisted four organizations—all established as national leaders in their fields—as NCAC partners:

- Boston College School of Education, Department of Teacher Education/Special Education, Curriculum, & Instruction, to provide leadership in integrating best practices in regular and special education;
- Harvard University Children's Initiative/Harvard Law School, to provide leadership in policy analysis and development, as well as program evaluation;
- The Council for Exceptional Children, to advise on appropriate governmental policies and professional standards and to contribute to consensus-building with professionals, educational organizations, parents, and individuals with disabilities;
- Parent Advocacy Coalition for Educational Rights, to support dissemination efforts and provide expertise from parent perspectives.

THE DEVELOPMENT OF NIMAS

During NCAC's five-year term (1999–2004), its partners accomplished much in identifying both the need and potential solutions for increasing access to the general education curriculum for all students. NCAC's most significant outcome—and the work that continues today through two new federal centers led by CAST—was the development of the first National Instructional Materials Accessibility Standard, or NIMAS, to guide the creation and distribution of digital accessible instructional materials.

Driving the development of the standard was the realization that the mandates of IDEA and NCLB cannot be implemented successfully by

merely adapting existing curriculum and methods. Although curriculum adaptation may be effective in individual instances and can serve as a necessary stopgap, this approach is costly and inefficient and does not contribute to the kind of global, or universal, solution that is needed to help the greatest number of learners. Digital text is not available for the vast majority of students with disabilities, partly because its benefits are not widely known, and partly because acquiring these materials can be a challenge, even among those who realize its potential. In schools throughout the country, highly motivated teachers are making Herculean efforts to adapt individual books by scanning them into an electronic format to accommodate their students. Some schools and districts are even digitizing their entire curriculum. While beneficial for individual students, these local efforts are often costly, redundant, and lacking a research basis (Espin, 2001).

Fortunately, technologies for designing flexible and customizable instructional materials hold great promise for improving access and learning for students with disabilities—a subject discussed in more detail throughout this collection. With a digital version of a textbook, a student who is blind can have text read aloud through text-to-speech technologies or transformed into braille. Students with physical disabilities can turn the pages of the book with a click of a single switch. Those with learning disabilities can hear an unfamiliar word read aloud or link to a definition or related background knowledge. Students who are deaf can view an embedded sign-language video of the text.

Some states and nonprofit organizations are building systemic strategies for providing flexible, alternate-format materials. For example, nonprofits such as Recordings for the Blind & Dyslexic, the American Printing House for the Blind, and the American Foundation for the Blind have been supporting schools over the years by producing alternate-format materials, including audio books and braille. While very important, these solutions are each designed for students with specific disabilities and therefore are not usually sufficiently flexible to reach all students.

There is no systematic research-based approach for creating and disseminating digital curriculum materials in the United States—or anywhere else, for that matter. The barriers to developing such an approach are numerous and include technical, economic, commercial, and legislative factors. The leading cause—the inconsistency of file formats used by

publishers and others creating digital material—impedes the creation of flexible digital formats that can be adapted to each individual learner. Educational publishers face challenges in both production and distribution: A conflict between copyright law and federal disability statutes creates problems around permissions and intellectual property protections. And the novelty of the market for digital materials makes it difficult to create a robust business solution to these challenges.

Aware of these issues, NCAC received special funding from OSEP in 2002 to convene the National File Format Technical Panel to develop a single standard for accessible curricular materials. The panel brought together key stakeholders, including disability advocacy groups, publishers, technology experts, and production and distribution experts. The result: version 1.0 of NIMAS (pronounced “NYE-mas”).

NIMAS represents a consensus of disability advocates, curriculum publishers, educators, and technology and policy experts that established a unified foundation for the development of accessible materials, improvements in their quality and consistency, and timely distribution to qualified students with special needs. It is a file format that is sufficiently flexible to create multiple output transformations (contracted braille, digital talking book, etc.) from the same source file, eliminating the need for repetitious and ineffective transformations.

In July 2004, the U.S. Department of Education endorsed NIMAS 1.0. Later that year, the U.S. Congress did so too, through its reauthorization of IDEA, which passed with overwhelming bipartisan support. IDEA 2004, which established Universal Design for Learning as a national educational priority, mandated the adoption of NIMAS (or a NIMAS equivalent) by states, local education agencies, and curriculum publishers. However, until NIMAS is actually implemented, educators will continue to struggle to acquire alternate-format materials, and students with print disabilities will continue to receive a lesser educational experience than students without such disabilities.

NIMAS details the baseline technological specifications for the creation of valid digital source files of preK–12 textbooks and related instructional materials. NIMAS is sufficiently flexible to guide the creation of multiple student-ready versions that meet the needs of a variety of users from the same publisher-provided source-file package, eliminating the need for repetitious and inefficient transformations. NIMAS codifies the minimum requirements for a subset of students with disabilities,

particularly those with blindness/low vision and other print disabilities. NIMAS will help to ensure that the ubiquitous textbook will be within reach of many students with disabilities at the critical point of instruction in an accessible and usable form.

In order to fully participate in standards-based reform and accountability systems, students with disabilities must have opportunities to learn (Elmore & Fuhrman, 1995; Guiton & Oakes, 1995).

NIMAS will help states and districts provide those opportunities, serving as an essential first step that provides the foundation for the subsequent creation of a variety of alternate-format versions designed to meet the needs of students with varied disabilities.

The environment is ripe for the large-scale implementation of NIMAS. At the present time, 31 states have alternate-format requirements specifically relating to the provision of files for the creation of braille versions of print textbooks (American Foundation for the Blind, n.d.). In addition, a smaller but expanding number of states (Arizona, California, Georgia, New Mexico, and New York) either require publishers to provide accessible versions of textbooks, require publishers to provide digital versions, or give preference to publishers who provide accessible versions.

While there are many barriers to accessibility, the problems caused by multiple formats are particularly frustrating and easily remedied. The adoption of a common, or standard, format is a simplifying step that has been crucial to progress in many other fields—from railroads (adopting a common track gauge) to video technology (adopting a common format for DVD and HDTV). Similarly, progress in accessibility will be greatly aided by defining a common national file format. With that single change, a number of barriers at many points in the educational system can be addressed.

The next challenge is to extend the standard to address the needs of a wider range of students with disabilities and to develop a free-market model for providing evidenced-based, accessible curriculum materials while simultaneously compensating the publishers who create them. In answer to this challenge, CAST and OSEP have entered into two more cooperative agreements to provide national leadership in maintaining and extending NIMAS. With its establishment and leadership of the NIMAS Development and Technical Assistance Centers, CAST will engage a wide variety of stakeholders in a consensus-building process to develop and extend the standard and address production and dissemination

issues. As with NCAC, the work of the new centers will be informed by curriculum publishers, disability advocates and researchers, textbook adoption organizations, alternate-format repositories, assistive technology developers, states, educators, and parents. The centers will recommend updates to NIMAS to take advantage of advances in technology, gather knowledge of accessible educational practices that are shown to support student learning, and explore ways to facilitate efficient production and distribution of digital materials.

Without basic access to the textbooks that are a part of the general education curriculum, students with disabilities are put at an immediate disadvantage in relation to the rest of the student population. The provision of accessible materials increases the likelihood that teacher expectations and the quality of instruction and learning activities for these students will be raised. Families will also benefit when students are able to participate more independently in homework activities based on core educational materials.

The benefit of NIMAS will extend to a significant number of students with disabilities. For students with visual impairments, we anticipate timely delivery following a rapid conversion from NIMAS source files to embossed and refreshable braille, along with digital talking books. Students with physical disabilities will benefit from having access to electronic books that can be easily navigated with a switch, and students with learning disabilities will have access to text-to-speech supports and the capacity to organize the content in ways that support individual executive functions. Students who are deaf or hard of hearing will, for the first time, have digital content that can be transformed to exact signed English using a digital avatar. Furthermore, the adoption of NIMAS source files will provide the necessary foundation for the subsequent creation of learning resources that contain both ASL and text versions of the same instructional content. For students with mental retardation, text to speech can support reading, and the material can be marked and chunked to support improved comprehension.

It is our hope that the work NCAC has accomplished—especially the development of NIMAS—will make the widespread adoption of universally designed curriculum achievable. Universal Design for Learning sets high standards for all students, but it also provides flexibility in the means of representing information, expressing ideas, and engaging students. Such a flexible curriculum will not only serve the needs of

students with physical, sensory, or learning disabilities, but will also be more effective and efficient for all students, whose learning needs and styles are wonderfully diverse (Rose & Meyer, 2002). If we truly want to “leave no child behind,” we need better, fairer, and more effective ways of delivering curriculum and assessing student performance.

THE CONTENTS OF THIS BOOK

The articles in this collection—written during the past four years at NCAC and updated for this volume—are divided into two parts. The first part covers broad conceptual topics and findings, including Universal Design for Learning, an evolving understanding of curriculum and curriculum access, and legislative/policy changes affecting special and general education. In “The Future Is in the Margins: The Role of Technology and Disability in Educational Reform” (chapter 1), Meyer and Rose discuss UDL in greater depth, laying out its pedagogical and neurobiological underpinnings. Brain-imaging technologies have helped to demonstrate that learning styles and needs can be as unique as fingerprints or DNA. The authors describe ways the coming digital curriculum promises to improve our capacity to align content standards and curriculum more precisely to students’ individual strengths and needs along a wide spectrum of abilities.

How can we customize instruction so that students of diverse abilities, skills, and interests can learn the same standards-based classroom material and be assessed fairly on what they know? As research at CAST demonstrates, digital technologies make it possible to individualize instruction and engage many kinds of learners. The result of new technologies will be a recentering of the core agenda of schools on learning instead of on content. Students with disabilities, for whom such transformations and multiple representations (e.g., talking books, descriptive video, ASL captioning) will vastly increase access and learning opportunities, will be the first among many beneficiaries of the new media. Incidental beneficiaries will include the teachers of subject matters like math, music, geography, physics, and other subjects that have never easily yielded their magic through linear text. But the ultimate beneficiaries will be learners of all kinds, because everyone experiences, in one way or another, barriers to motivation and comprehension from the prevailing overreliance on text and other fixed media.

In “Equal Access, Participation, and Progress in the General Education Curriculum” (chapter 2), Hitchcock et al. survey the new challenges and accountability requirements posed by recent federal laws (IDEA, NCLB). They demonstrate ways that current practice falls short of the IDEA imperative. The reasons are multiple and complex, but the primary problem is the nature of the curriculum. Therefore, the primary solution will be found in the curriculum as well. To explain why, the authors explore how our changing understanding and implementation of the general education curriculum has affected diverse students’ ability to truly access, participate, and progress within it.

Lawyer and educator Joanne Karger explains “What IDEA and NCLB Suggest about Curriculum Access for Students with Disabilities” (chapter 3). In examining the concept of “access to the general curriculum” as presented in recent federal law, Karger clarifies what IDEA and NCLB require of states and school districts, providing a better understanding of the challenges educators and policymakers face in adopting high-quality content standards, performance standards, and curriculum for students with disabilities. The inclusion of students with disabilities in standards-based reform efforts raises issues not only about curriculum but also about statewide or districtwide assessments: What accommodations are appropriate for students with various disabilities? What impact do such accommodations have on how we measure student learning? Finally, what implication does the relatively new emphasis on “highly qualified” teachers have for the involvement of students with disabilities in the general education curriculum?

The second half of the collection turns to addressing specific applications of Universal Design for Learning and digital media to support students in accessing and succeeding in the general education curriculum. These chapters are certainly informative for practitioners, but they will also provide policymakers with a vision of how flexible digital media can help educators customize educational content and its delivery in the most practical ways to more precisely match individual strengths and needs. Without a digital curriculum, the transformations and adaptations classroom materials and activities must undergo to permit participation in the general curriculum are onerous. But digital media and related technologies open up the curriculum to all learners with efficiency and effectiveness.

In “Teacher Planning for Accessibility: The Universal Design of Learning Environments” (chapter 4), researchers from CAST and Boston College’s School of Education first consider what it means to plan curriculum and instruction in the UDL framework. What does UDL look like in action? Richard Jackson and Kelly Harper provide a concrete demonstration of how to apply UDL to classroom activities. Using a fifth-grade model unit, they describe ways that educators can develop instructional units, identify resources, and design activities to reach all learners in the classroom. In “Teaching for Accessibility: Effective Practices, Classroom Barriers” (chapter 5), Jackson et al. review the literature on barriers to access and on promising teaching practices that create new opportunities to learn. Topics include the use of digital curricular materials, flexible grouping, peer support, teacher collaboration, and more.

In the final chapter, “UDL Implementation: Examples Using Best Practices and Curriculum Enhancements,” Tracey Hall and colleagues offer detailed discussions of curriculum enhancements and classroom practices that can contribute to universally designed learning environments. These include text transformations (such as text-to-speech technology), curriculum modifications, differentiated instruction, graphic organizers, computer simulations/virtual reality, and background knowledge instruction. Alone these enhancements and practices do not constitute Universal Design for Learning—that is, UDL does not simply mean using differentiated instruction, graphic organizers, or enhanced background knowledge. But these strategies and tools can be powerful contributors to a UDL learning environment that seeks to provide multiple means of representation, expression, and engagement in order to serve all kinds of learners.

As powerful digital technologies reshape the work of schools, special education is also undergoing a significant shift in emphasis—away from meeting disability-specific needs and toward providing access to the general education curriculum. At a time when federal law guarantees every student the right to a high-quality education, it is essential to translate scientifically validated instructional interventions and teaching approaches into useful classroom practices. Using new technologies within the inclusive framework of Universal Design for Learning provides a way to do so—and thereby to increase educational opportunities for students of all abilities.

REFERENCES

- American Foundation for the Blind. (n.d). *State-by-state chart of braille laws*. Retrieved July 18, 2005, from <http://www.afb.org/section.asp?SectionID=44&TopicID=192&DocumentID=360>
- Blackorby, J., & Wagner, M. (2004). *Overview of findings from wave 1 of the Special Education Elementary Longitudinal Study (SEELS)*. Menlo Park, CA: SRI. Retrieved May 1, 2005, from http://www.seels.net/designdocs/seels_wave1_9-23-04.pdf
- Elmore, R. F., & Fuhrman, S. H. (1995). Opportunity-to-learn standards and the state role in education. *Teachers College Record*, 96, 433–458.
- Espin, C. A. (2001). Curriculum-based measurement in the content areas: Validity of vocabulary-matching as an indicator of performance in social studies. *Learning Disabilities Research and Practices*, 16(3), 142–151.
- Frieden, L. (2004). *Improving educational outcomes for students with disabilities*. Washington, DC: National Council on Disability. Retrieved May 1, 2005, from <http://www.ncd.gov/newsroom/publications/2004/educationoutcomes.htm#execsummary>
- Guiton, G., & Oakes, J. (1995). Opportunity to learn and conceptions of educational equality. *Educational Evaluation and Policy Analysis*, 17, 323–336.
- Jorgensen, C. M. (1997). Curriculum and its impact on inclusion and achievement of students with disabilities. *Consortium on Inclusive Schooling Practices Issue Brief*, 2(2), 19.
- Quenemoen, R., & Marion, S. (2003). *Rethinking basic assumptions of test development: Assessment frameworks for inclusive accountability tests* (Policy Directions No. 17). Minneapolis: University of Minnesota, National Center on Educational Outcomes. Retrieved May 1, 2005, from <http://education.umn.edu/NCEO/OnlinePubs/Policy17.htm>
- Rose, D. H., & Meyer, A. (2002). *Teaching every student in the digital age: Universal Design for Learning*. Alexandria, VA: ASCD.