

Using Universal Design to Unlock the Potential for Academic Achievement of At-Risk Learners

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- How can we reach students with diverse needs?
- How do we help students who have disabilities or are English Language Learners?

The answer came to us indirectly, but our results have been very encouraging.

Notes From a Teacher

I teach sixth grade in the most beautiful place on earth, on the fringes of the Navajo Nation in the State of New Mexico. At our school, we value the diversity of the learning community, which includes Native American students (70%); Hispanic students (18%); and White, Asian, or African American students (12%). My students are (usually) well-behaved and respectful young people, but at times they have difficulty reaching their potential.

Educators consider a significant number of our students to be “at risk” because of their home environments; single parents, grandparents, or members of students’ extended families are raising them. Some students live in homes that do not have electricity and that lack running water; however, these students are growing up in a centuries-old culture that few students around the country experience.

People in our community speak many languages. Grandmothers and

grandchildren laugh together at remarks that I cannot comprehend, yet I feel their joy. Our community values each member, regardless of disabilities or exceptionalities. Like many teachers of at-risk students, I know that my students have a great capacity to learn and that often the challenge to teachers is finding a way to bring the curriculum to the students so that they can learn and show what they know in the classroom, as well as in large-scale assessments.

How Our Journey of Improvement Began

In spring 2003, our school participated in a project undertaken by a researcher at the National Center for Educational Outcomes (NCEO) at the University of Minnesota. The study examined differences in student achievement that occurred when large-scale assessment items included elements of universal design (see box, “What Is Universal Design?”). We were able to see firsthand that our students performed better on standardized test items if we used elements of universal design to construct each test item (Johnstone, 2003).

Because the researcher communicated the outcomes back to us in a timely way, we were able to consider the implications of this research for our school. Although our school did not experience low test scores that subjected it to corrective action, all of us agreed that our students—especially students with

exceptionalities—could do better. We were seeking a new way to improve the performance of our students on standardized tests and increase the curricular competence of our students, as measured by the tests. We also saw firsthand that the concepts of Universal Design of Assessments (UDA) that the NCEO shared with us could work for our classroom materials.

How We Got There

Recent changes to federal legislation require states and districts to be more accountable for students with disabilities on large-scale assessments. Such requirements demand that students with disabilities have greater access to the content and materials on which educators will assess them, just like their peers without disabilities. In an effort to make these assessments more accessible (and more valid) for students

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with disabilities, research has focused on improving the design of assessments through a series of considerations called *elements of universal design* (Thompson, Johnstone, & Thurlow, 2002).

Universal Design seeks to encourage...products that are more usable by everyone. It is a design built for the environment and consumer products for a very broad definition of user.

Ron Mace (1998)

The term *universal design* also appears often in education literature. For example, Thompson et al. (2002) collected research from various fields (including vision, literacy, English as a second language, ergonomics, learning disabilities, graphic design, and architecture) and proposed seven elements that lead to improved student performance on large-scale test items (Johnstone, 2003). The elements that Thompson et al. (2002) proposed are as follows:

- Inclusive test population.
- Precisely defined constructs.
- Accessible, nonbiased items.
- Amenable to accommodations.
- Simple, clear, and intuitive procedures.
- Maximum readability and comprehensibility.
- Maximum legibility.

Although Thompson et al. (2002) intended these elements as directions and aimed them at large-scale assessment, we found that we could easily transfer them for use at the middle school level. We decided to focus on the design of study guides (Wood, 2002) and classroom assessments as a way to make learning more accessible to a wide variety of students. We found that designing study guides and classroom assessments by using the elements of universal design was simple and intuitive, and we discovered that we did not need to make major changes to our existing routines to make our instruction more accessible.

Table 1 presents an easy-to-use guide for teachers who wish to “universally

What Is Universal Design?

The term *universal design* originally came from the field of architecture. Ron Mace, an architect and wheelchair user, coined the term to describe a philosophy of design that was as inclusive as possible.

Mace’s advocacy for universal design came out of frustration with his field. Architects, said Mace, were too concerned with meeting minimum codes of the Americans with Disabilities Act (ADA) and wasted valuable resources by having to return to projects at later dates to retrofit them to meet code. Mace suggested that if structures were designed from the beginning with accessibility in mind, they would meet the needs of a maximum number of users.

The Center for Universal Design at North Carolina State University built on the philosophy of Mace and published a series of principles that both define and promote best practice in universal design.

Principles of Universal Design

The Center for Universal Design (1997) lists the following principles of universal design:

Principle One: Equitable Use: The design is useful and marketable to people with diverse abilities.

Principle Two: Flexibility in Use: The design accommodates a wide range of individual preferences and abilities.

Principle Three: Simple and Intuitive Use: Use of the design is easy to understand, regardless of the user’s experience, knowledge, language skills, or current concentration level.

Principle Four: Perceptible Information: The design communicates necessary information effectively to the user, regardless of ambient conditions or the user’s sensory abilities.

Principle Five: Tolerance for Error: The design minimizes hazards and the adverse consequences of accidental or unintended actions.

Principle Six: Low Physical Effort: The design can be used efficiently and comfortably and with a minimum of fatigue.

Principle Seven: Size and Space for Approach and Use: Appropriate size and space is provided for approach, reach, manipulation, and use regardless of user’s body size, posture, or mobility.

Note. From *The Principles of Universal Design, Version 2.0* by The Center for Universal Design, 1997, Raleigh, NC: North Carolina State University. Copyright 1997 by NC State University, The Center for Universal Design. Reprinted with permission.

Universal design is found everywhere, and the general public often takes it for granted. Examples include curb cuts that create accessibility for wheelchair users, in addition to facilitating ease of movement for people with shopping carts, bicycles, or baby strollers. Around the house, utensils and tools with large grips prevent blisters and make jobs easier. Although people with fine-motor difficulties were the intended users of such utensils, they have become very popular among nondisabled users.

design” their assessments and handouts. The table slightly modifies the policy considerations that Thompson et al. (2002) described so that they better fit the realities of a middle school setting. Figure 1 is an example of an actual study guide.

We also found that many of the elements of Thompson et al. (2002) reflect contemporary thinking in graphic design. Therefore, we expanded our efforts by collaborating with a professor of graphic design. We found that considering broad-based educational research and specific graphic arts infor-

Table 1. Elements of Universal Design

National Center for Educational Outcomes Element	Classroom Element	Application
Inclusive test population	Inclusive classroom population	Design all classroom materials with the end user (diverse student populations) in mind.
Precisely defined constructs	Same	Remember the construct that you are trying to teach or test. Avoid construct-irrelevant materials that may be teaching or testing nontargeted behaviors or information.
Accessible, nonbiased items	Accessible, nonbiased materials	Accessible, nonbiased materials are those that consider the diversity of all students and do not present material that may be offensive or may give one group an advantage over another.
Amenable to accommodations	Same	Even the best-designed tests and materials may need to be adjusted through accommodations. Avoid language or diagrams that cannot be converted to Braille, translated, or read aloud.
Simple, clear, and intuitive procedures	Same	Tests and materials should be clear and understandable. Tests are invalid if students cannot understand what the teacher expects. Students more clearly understand what is expected if they receive frequent feedback.
Maximum readability and comprehensibility ^a	Same	Language should be clear, simple, and direct.
Maximum legibility	Same	Font size should be large and familiar enough for students with visual difficulties to read. Overly enlarged text, however, may cause difficulty for some readers. For these readers, staggered right margins, white space around text, sans serif fonts, and space between lines increase legibility.

^a These elements of universal design overlap with graphic design principles.

mation helped us produce accessible and legible study guides for all students.

How Can It Happen in Your School? A Case Study

Universal design is a philosophy that is applicable at the national, state, school, or classroom level. At Gallup Middle School in Gallup, New Mexico, we examined the feasibility of using the elements of universal design for study guides and for classroom tests. Gallup Middle School’s leadership embraced philosophies of UDA in an effort to

increase access to curriculum for traditionally underserved students.

Gallup Middle School, as previously indicated, has a high at-risk population. Many students are of low socioeconomic status, more than half of them are English Language Learners, and many have disabilities. Nonetheless, we have committed ourselves to increasing access to the general curriculum for all students and creating an environment that fosters inclusion.

For this project, we decided to focus solely on classroom tests and study

guides. We found that we could easily adapt the concrete elements of UDA to both classroom tests and study guides. To be successful, we decided to start small and in a specific area, providing our teachers with tangible information that they could use in their classrooms. The UDA elements that our research partner described were logical and concise. A graphic design professor at a local college further elaborated on these elements.

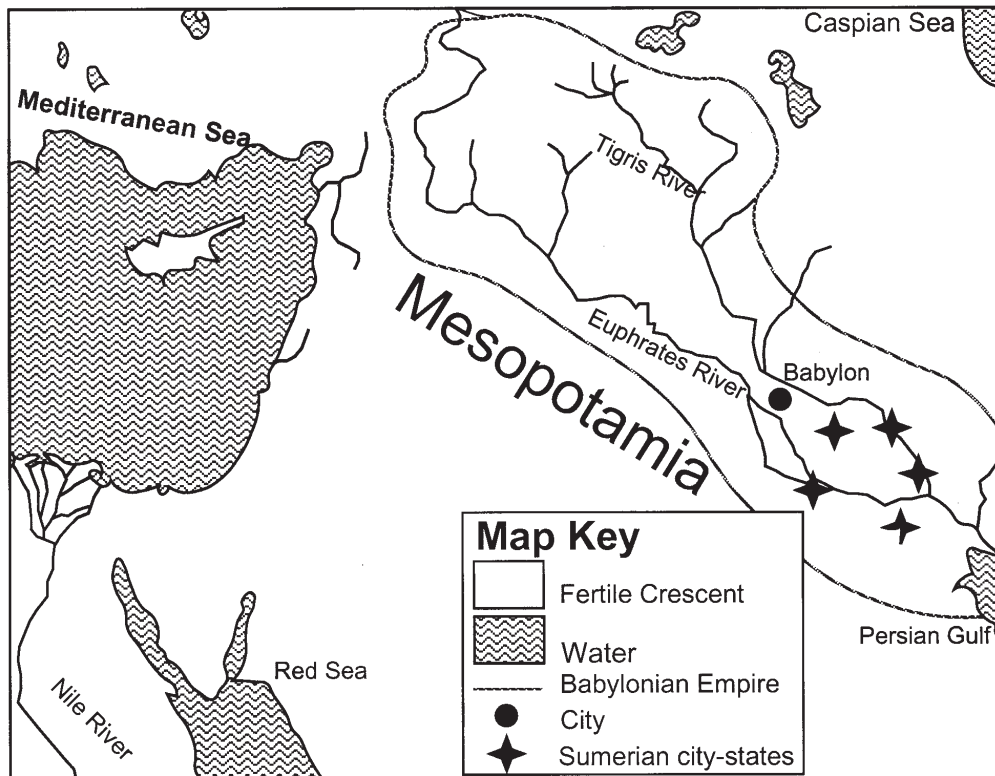
To implement universal design, we devised a three-step process to incorpo-

Figure 1. Sample Page of Study Guide

STUDY GUIDE

Fertile Crescent Civilizations

Geography: a **science** that deals with the **natural features** of the **earth**, its **climate**, **products**, and **inhabitants**.



Feature: a distinguishing part or detail

- Where is the **Fertile Crescent**?
- Where were the first cities? Why did the cities develop there?
- What are the **city-states**?
- Why were the city-states independent of each other?
- Why were the city-states frequently at war?
- What were the **Sumerian** cities like?
- What were the temples in the center of Sumerian cities called?

rate the elements into the culture of the school. Teachers first familiarized themselves with the philosophy of universal design. Although we used external consultation at Gallup Middle School, educators can also read about universal design and share the information that they learn. One teacher at a school may

take responsibility for leading training, or several teachers may “jigsaw” what they have learned from reading various sources (for a list of helpful resources, see box, “Additional Resources to Explore”).

Teachers next developed study guides and based them on the elements

of universal design that Thompson et al. (2002) described. We created study guides to increase the accessibility of course content for all students. We wanted our study guides to be readable and to be culturally relevant. The careful design of such study guides acts as a bridge to instruction for students and

reinforces concepts that they learn. Such reinforcement increases the opportunity for students to recall and use their new knowledge during the school year and beyond it (Wood, 2002).

To ensure that our study guides were both comprehensible and legible, we spent a full day reviewing best practices in graphic design. (See Figure 2 for insights that our graphic designer shared with us). Much of the information used in graphic arts practices reflects universal design approaches, but our graphic arts consultant helped us with such important details as font, type size, and graphics for study guides.

Finally, we evaluated teaching and study guides to determine whether they met school-determined criteria of access and essential information. NCEO research staff evaluated our first attempts at creating study guides. Subsequently, however, the teachers evaluated themselves. Gallup Middle School used a universal design team

that consisted of teachers who supported and evaluated their colleagues' study guides. Other schools using the Gallup Middle School model can ask interested teachers or teachers with expertise in the area of universal design to develop a universal design support and evaluation team to assist teachers in creating accessible study guides.

What Happened?

The outcomes of our experiment with universal design were very positive. First, all 51 of the school's teachers participated and incorporated at least some type of changes in their study guides. The statewide tests that measure student performance showed increases in teacher-created scores for students across all subject areas; however, our program had started only 3 months before the students took standardized tests, so the data may not be entirely related to our universal design approach. We also anticipated that scores from 2005 statewide assessments would rise, but they were unavailable when this article went to press. The universal design team at Gallup Middle School also surveyed teachers about the impact that universal design approaches had on their teaching. The teachers' responses were overwhelmingly positive.

Teachers reported better on-task behavior and better comprehension of materials, and they even reported that the students were more cooperative. The following comment reflects one teacher's reactions:

As an added benefit and unanticipated outcome, the general level of cooperativeness rose among my students. A possible future inquiry might involve a comparison of student cooperativeness in classrooms where the teacher has made observable efforts to increase the access of all students to the means for academic success. Do students perceive the classroom as more "fair"? This year I have also experienced a higher level of academic achievement as demonstrated by course grades among general education and special education students alike.

The example of Gallup Middle School demonstrates the flexibility and potential of universal design. As Mace (see Mace, 1998) (1998) noted more than 20 years ago, universal design is a design philosophy. Although guiding principles exist, educators can best apply those principles within the context of the local environment. Teachers and school leaders may find success either by following the development plans of Gallup Middle School or by developing their own plan for implementing universal design in their classrooms and schools. After the initial successes of this year, Gallup Middle School intends to expand its use of universal design, both in instruction and materials, to ensure increased access and success for all students.

Our example demonstrates how researchers and practitioners can work together for results. Although the NCEO targeted its research toward policymakers, the willingness of all parties involved to find multiple uses for research made a difference. We adjusted research ideas so that they would be practical and concise for teacher use, and teacher participation demonstrated

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that whole-school change can occur when educators implement best practices. We hope that our model will demonstrate not only that incorporating the principles of universal design in materials used by learners can make a difference in student achievement, but also that people working together toward common goals can increase the achievement of at-risk students. At our school, we have always believed that the diversity of our students is our

Additional Resources to Explore

Council for Exceptional Children. (1999). *Universal design: Research connections*. Retrieved September 3, 2004, from <http://ericec.org/osep/recon5/rc5sec1.html>

Gaster, L., & Clark, C. (1995). *A guide to providing alternate formats*. West Columbia, SC: Center for Rehabilitation Technology Services.

Hanson, M. R., Hayes, J. R., Schriver, K., LeMahieu, P. G., & Brown, P. J. (1998, April). *A plain language approach to the revision of test items*. Paper presented at the annual meeting of the American Educational Research Association, San Diego, CA.

Hitchcock, C., Meyer, A., Rose, D., & Jackson, D. (2002). Providing new access to the general curriculum: Universal design for learning. *TEACHING Exceptional Children*, 35(2), 8-17.

Hoerner, A., Salend, S., & Kay, S. I. (1997). Creating readable handouts, worksheets, overheads, tests, review materials, study guides, and homework assessment through effective typographic design. *TEACHING Exceptional Children*, 29(3), 32-35.

Whitaker, C. R., Salend, S., & Duhaney, D. (2001). Creating instructional rubrics for inclusive classrooms. *TEACHING Exceptional Children*, 34(2), 8-13.

Figure 2. How to Use Graphic Design Principles to Make Study Guides More Comprehensible and Legible

Applying **universal design principles** to reformatting current curriculum materials

Understand the instructional context

Establish familiarity with current instructional context for using the existing materials and the teacher's goals and objectives.

- **Grade level:** Sixth grade in a middle school that has a culturally diverse population. Integrated classroom with a wide range of skills and reading levels.
- **Subject:** Geography—a history of the world's early civilizations. The class textbook is grade-appropriate and includes a supplemental workbook for teachers. The text is effectively formatted with interesting page design intended to engage young readers and is especially appropriate for children whose ethnicity is Native American. It includes direct links with cultural images.
- **Teacher expectations as a result of reformatting the subject content**
To apply the principles of Universal Design for Learning to the physical and informational aspect of existing materials (study guides) for strengthening student preparation for testing course content (meeting the instructor's educational goals as well as those of external standardized testing)

Design Strategy

To apply **universal design** to the way that information is presented in a learning context and specifically in study guides and tests.

Easy and affordable access to computers, scanners, laser printers, and digital cameras has brought all the essentials of page-formatting material to teachers (and to students). Teachers who have basic computer skills can apply many options that are in current word processing programs to add visual interest to text materials and to organize and structure the information that they want to convey to their students. After determining how to apply some page layout standards to the layout of a master page, teachers can create a template and change information as it applies to class materials. This technology helps the teacher develop a style with which students can become familiar. By organizing information in a structured and consistent way, teachers think about their individual approach to subject matter from the perspective of a designer. By selectively examining the separate elements of class materials, a teacher not only explores more effective ways to organize information but also better understands the components that are the architecture of any page layout scheme.

When creating study guides and tests for student use, the teacher should think of the printed word as the human voice recorded on a permanent (the printed page) or semipermanent surface (a blackboard). Writing systems are the construct that

Figure 2. (Continued)

humans have devised over time to transmit not only the human voice but also human thought. If a teacher thinks of all written material as an extension of individual communication between teacher and student, then the organization of that communication becomes more personal. If the teacher thinks of words printed in **BOLD CAPITAL LETTERS** as spoken loudly or emphasized and *words printed in italics* as having a softer emphasis, then communication begins to take on a different aspect.

Writing in complete sentences rather than in phrases may help students understand how to consistently apply the rules of grammar.

The following are components of page design that graphic designers use to develop effective page layout. Separating these components makes it easier to understand each function and see how they can contribute to the overall effect of the final product.

The elements (ingredients) of page layouts include the following:

- ❑ **Format:** A simple format can identify the function of the materials. This format can become standard for all future study guides while allowing for teaching incrementally complex information as students assume a greater participatory role in learning during the school year.
- ❑ **Paper color:** The teacher can use a paper color to identify a study guide (or a test or pretest). Many types of colored papers are available. Vivid, fluorescent colors are eye-catching and effective for notices and posters, but the contrast between text and background color makes small text printed on fluorescent paper hard to read. A better choice—especially for students who are struggling with reading skills—is a pale or pastel color. If the teacher uses paper that is a consistent color throughout the school year, the paper color can also help students identify the study guides.
- ❑ **Text blocks isolated with a border (10–20% light gray):** Such text blocks isolate text and thereby reinforce important information. In the study guide in Figure 1, a text block defines the study of geography as it applies to this class. The repetition of information (i.e., the short definition of geography) on each subsequent study guide helps reinforce the course objectives.
- ❑ **Lines:** The teacher can use lines to separate sections of the study guide. Graphic designers use points to measure line thickness in the same way that they measure type size. The teacher can consider using varying line thickness to separate instructions from study elements or other information in which the student's response to the information should shift: A half-point line could separate the sections of a test that have differing instructions.
- ❑ **Bullets:** Bullets replace numerals to point to important information that does not have an implied numerical order; however, numbers should remain when hierarchical display is appropriate.
- ❑ **Alignment:** The alignment of important information usually implies that the left margin is the starting point for information presented in a writing system

Figure 2. (Continued)

that reads from left to right. Departing from the primacy of left-aligned information implies information that is either more important or less important. People respond positively to organized information, and alignment can create order and organization in complex information.

- **Word clustering:** Paying attention to word clusters is very important in any context. Avoid a line break in word groups that students need to remember. Control line breaks with sentence structure (and if necessary, reduce the type size of word groups by 1 point).
- **Margins:** A wide left margin provides space for punched holes to keep the page in a notebook.
- **Page numbers:** The teacher should use page numbers to help organize and sequence multiple pages within a group. (I also include a date for the year that I created a document as a reminder to myself.)
- **Type:** The choice of type is perhaps the most essential consideration when creating a document.

The default font for most text that adults read is a **serif font**. The small lines (serifs) attached to the strokes aid in placing text along an invisible line and aid in reading pages of text. Most books and newspapers use serif typefaces. **Times Roman** is a standard font. However, if a teacher is preparing material for beginning readers or for students who are struggling with letter and word recognition, other available type choices imitate the basic structure of a hand-printed letterform.

Sans serif fonts were originally part of a comprehensive design approach in Europe that included architecture, interior design, and print materials. These fonts are similar to hand lettering, and readers can easily recognize letters and words, thereby diminishing obstacles in letterform recognition for students who may have low reading comprehension (because of age) or who have cognitive challenges (e.g., dyslexia). Font designers created many sans serif fonts for readability and legibility. **Helvetica** was formerly a universally available typeface. Helvetica's design refines letterforms to their essential symbol identity. The letter *a* is like the letter *a* in hand-lettered text. Helvetica takes up more line space than many other fonts. When teachers desire to reduce the amount of paper needed to present information, as in a class that requires a significant amount of reading, **Arial** is a good choice. Arial is a simple, easy-to-read font that conserves space. (Arial is similar to Helvetica and is available in word processing software for either PC or Mac.) **Arial** is the font used in this study guide.

- **Point size** (points are the standard unit of measurement for all type).
 - 72-point type** is one inch high.
 - 36-point type** is one-half inch high.
 - 14- or 18-point type** is used as the standard for lower grades because it provides easy character recognition for beginning readers.
 - 12-point type**, the customary standard for most print material, identifies different areas of the study guide.

Figure 2. (Continued)

10-point type is acceptable but may be harder to read in large blocks of text for students of this age group.

- **The hierarchy of information uses several point sizes.**
24-point major headers identify the guide and become part of the template for each document.
18-point secondary headers make titles easily recognizable and can keep longer words on the same line without breaking them.
14-point headers denote topic headers.
12-point text is an easy-to-read type size.
- **When using type**

Colored type has value for emphasizing words or concepts. However, color increases production costs, and running out of toner or cartridges in the middle of producing a test or study guide can create a problem.

Some colors (such as yellow or light green) can make type hard to read, so check for readability before printing a class set of materials.

- **CAPITAL LETTERS USED FOR LONG SENTENCES ARE HARDER TO READ BECAUSE THE LETTERS ARE NEARLY THE SAME SIZE AND BECAUSE STUDENTS CANNOT USE THE SHAPE OF LETTERS TO AID IN WORD RECOGNITION. LIMIT THEIR USE TO IMPORTANT TITLES OR PHRASES.**
- Use **bold type** for important words.
- **Underlining makes words harder to read. Use bold type or *italics* instead.**

Other important considerations

- **Visual aids:** Such visual aids as maps and charts, graphs, or examples in a study guide help students recognize the relationship between place and other class content. The teacher can scan images from the textbook (with the publisher's consent), and students can draw on them (or color them), thereby reinforcing learning.

Additional charts and images can aid in learning.

In subject areas in which the concept of time is important, including a simple timeline with a highlighted bar that references the relationship of the topic that the study guide addresses can help students develop a sense of time.

- **Plan for future use:** After developing a functional format, the teacher can save essential parts as a template and use them in additional study guides.

Figure 2. (Continued)

- ❑ **Computers:** Computers have made preparing classroom materials less time-consuming after the teacher has developed the original template.
- ❑ The teacher can easily adapt the basic elements of universal design to the principles of Universal Design for Learning. Templates also aid in organizing and archiving instructional materials.
- ❑ Creating study guides gives the teacher an additional opportunity to organize the essential points that he or she wants to make with regard to the subject matter.

[If this material comes from either a handout given at a presentation or from notes taken at a presentation, the following information should probably appear at the bottom of the page]

Adapted from presentation given by _____
(date)_____.

greatest strength. Constantly finding innovative ways to reach these students has been our charge as teachers, and working hard to bring research to practice has brought us positive results.

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Ad Index

Captioned Media Program, p 65
Crisis Prevention Institute, cover 4
Council for Exceptional Children, pp 21, 38, 39, 59, 61, 66-67, 68, cover 3
Curriculum Associates, cover 2
Marymount University, p 49
Mesa Public Schools, p 1
National University, p 5
NOVA Southeastern, p 51
NPR, p 21
Pearson Assessments, p 20
University of Nebraska, p 51
Woodbine House, p 4

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