CHAPTER 28

Adapting Challenging Textbooks to Improve Content Area Learning

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INTRODUCTION

The ability to read is the most fundamental skill one needs to succeed in society today, and has been identified as a necessary skill for competitive involvement in our technological society (National Research Council [NRC], 1998). As a society and as educators we have recognized the importance of successful reading; however, only recently have we begun to understand the profound and enduring consequence of not learning to read or extract meaning from the printed word (Juel, 1988; Lyon & Chhabra, 1996). The lack of proficient reading skills has been identified as a risk factor associated not only with academic failure and school dropout but with unemployment and adjudication (Cornwall & Bawden, 1992; Werner, 1993). Whitman (1995) found that individuals who test in the least proficient literacy levels are often unemployable, since even low-skilled jobs demand adequate reading abilities. Thus a vicious cycle begins; if you cannot read, you do not practice reading; if you do not practice reading, you do not become automatic and fluent in your ability to recognize words; and, if you do not read, you do not succeed in today’s modern world.

Although experts do not agree on the exact number of poor readers caught in this cycle, a report from the U.S. Department of Education (National Center for Education Statistics, 1993) indicated that 90 million of America’s 191 million adults either are illiterate or can perform only simple literacy tasks. Focusing these data on school-age students, national longitudinal studies indicate that one in six children will encounter a problem in learning to read (National Center to Improve the Tools of Educators, 1996).
Particularly affected are students with disabilities. These children are given a variety of labels by the educational system—students with learning disabilities, students with mental retardation, students with communication disorders, or students at risk. Regardless of the label, most of these students have one characteristic in common—they struggle to read. Among the millions of Americans who have learning disabilities, at least 75% have been identified as having a reading disability (National Institute of Child Health and Human Development [NICHD], 1994). The viciousness of this cycle is exemplified by recent research indicating that this problem emerges during the first 3 years of school (National Center to Improve the Tools of Educators, 1996) and that 74% of the readers who are unsuccessful readers in the third grade are still unsuccessful readers in the ninth grade (Lyon, 1995).

As students with disabilities and students considered at-risk progress through school, reading expectations begin to change. In the primary grades, reading skills and literal reading comprehension are usually the major areas of focus in school. By the upper elementary grades, students are asked to apply their reading skills by drawing conclusions and formulating principles in their content area subjects such as science and social studies. It is during this time that the main format of reading materials used in the classroom begins to shift from narrative text to expository text. Thus, what was once familiar in the early grades (e.g., narrative story lines) is replaced by unfamiliar facts, concepts, and material that is expressed in new and more abstract form (Jordan, 1994). In middle school and high school the emphasis changes again for students. Content area teachers believe that students already have, or should have, the reading, writing, and thinking skills necessary to process the required readings (Hollander, 1991). Thus, students are expected to (a) read independently, (b) process information, (c) analyze what they have read, and (d) synthesize multiple points of view. Literacy is now considered a tool used to extract information from expository texts in content area subjects such as history, science, social studies, and literature.

In secondary school, the instruction of students with disabilities becomes particularly difficult because of the discrepancy between the students’ performance levels and these curriculum demands in their content classes (Schumaker & Deshler, 1984). These students begin to experience failure in their content area coursework. For example, Donahoe and Zigmond (1988) found that 69% of the grades received by ninth-grade science students with learning disabilities were D or below.

Thus, Stanovich’s (1986) application of the “Matthew Effect” concept—the rich get richer and the poor get poorer—is very true for students who struggle to read as they progress through school. If a student reads well, he or she will in all likelihood be successful in school; if not, he or she will be unsuccessful and/or decide to leave school. Because these students perform poorly in school owing to their inability to meet the increasingly high demands for literacy present in today’s high schools (Donahoe & Zigmond, 1990), they often drop out of school (deBettencourt, Zigmond, & Thornton, 1989; Rumberger, 1987; Zigmond & Thornton, 1985). In the end, the ramifications of struggling to read have profound effects on the lives of these students. Not only are the paths to content area material blocked, but ultimately their lives are affected socially and personally. We live in a society that places great value on litera-
INCLUSION OF STUDENTS WITH DISABILITIES

Over the past 15 years, the movement in special education has been to provide educational services for students with disabilities in the general education classroom to the greatest extent possible. This trend to serve students with disabilities in more inclusive programs comes from a number of sources, the primary source being the least restrictive environment clause (LRE) of the Individuals with Disabilities Act of 1997 (IDEA '97) (U.S. Department of Education, 1998). In fact, the passage of IDEA '97 mandates that the placement of students with disabilities in settings other than general education classes must be justified specifically. The law also states that placement in a setting other than the general education classroom may occur only after intensive supports have been provided to keep the child in the general education classroom.

The impact of IDEA '97 is reflected in the 20th Annual Report to Congress (U.S. Department of Education, 1998), which indicates that in the 1995–96 school year more than 95% of students with disabilities ages 6–21 attended schools with their peers without disabilities. These data indicate a gradual increase in the percentage of students with disabilities who are educated in general education for 80% or more of the school day. Approximately 46% of all students with disabilities are removed from their general education classes for less than 21% of the school day. These data also reflect a decrease in the number of students who are removed from general education for 21–60% of the school day. Overall, there has been a decrease in special education resource room use for students with disabilities and an increase in the use of the general education classroom as the primary educational placement. As a result, general education teachers are responsible for the academic instruction of students with mild disabilities for the majority of the academic day (Parmar & Cawley, 1993; Passe & Beattie, 1994).

The movement to provide special education services in the inclusive community of the general education classroom has its roots in the philosophical ideology of the normalization of children with disabilities and the elimination of labels for these children (Lerner, 1997). The belief is that all students have the basic human right to attend school with their typical peers in their neighborhood school (Edgar, 1987; Ferguson, 1996; Sawyer, McLaughlin & Winglee, 1994). This philosophy holds that moving students with disabilities away from their typical peers highlights their disabilities, disrupts or fragments their education, and teaches them to be dependent (Friend & Bursuck, 1999). The goal is to provide education in a setting that more approximates the real world in which the students will live and function when they leave school.

The emphasis on including students with disabilities in the general education classroom also reflects the growing knowledge that many students with disabilities do not complete high school with the knowledge and skills necessary for adult independence (U.S. Department of Education, 1997; Wagner, D’Amico, Marder, Newman, & Blackorby, 1992). For all students with disabilities the major factor predicting success-
ful high school graduation is the ability to read at a fourth-grade level (U.S. Department of Education, 1998). Yet data collected by the National Longitudinal Transition Study (NLTS) (Wagner et al., 1992) indicate that 3–5 years after leaving high school fewer than 25% of youth with disabilities were enrolled in postsecondary education, those who were employed were engaged in low-wage jobs with few opportunities for promotion, and more than half continued to live with their parents—all factors that have been correlated with the lack of reading proficiency (Cornwall & Bawden, 1992; Werner, 1993; Whitman, 1995).

CONTENT AREA INSTRUCTION

Typical general education secondary content area instruction is constructed around a teacher-directed lecture concerning information contained in a textbook, followed by students reading independently in their textbooks (Kinder & Bursuck, 1991; Ravitch & Finn, 1987). Often, this type of reading involves answering questions at the end of a chapter, defining vocabulary words, or studying for a weekly test—all activities based around extracting information from the textbook. It appears that in content area classrooms, the most predominant instructional tool is the textbook (Goodlad, 1976). The literature indicates that in elementary and secondary schools, science, social studies, and history are primarily taught through the use of a textbook by general and special educators (Armento, 1986; Patton, Polloway, & Cronin, 1990; Raizen, 1988; Woodward, Elliot, & Nagel, 1986) with 91% of teachers reporting that they use a single content area text as the primary resource for planning instruction (Bean, Zigmond, & Hartman, 1994). With 75–90% of teachers organizing their content area instruction around a textbook (Mullis & Jenkins, 1988; Tyson & Woodward, 1989), the estimate is that between second grade and 12th grade, a student will read at least 33,000 pages from content area materials (May, 1994). Estimates of the amount of time students actually spend on reading and doing exercises from these textbooks range from 55% to 95% of their classroom instructional time (Zahorik, 1991).

Although textbooks are the primary instructional tool in content area classrooms at the secondary level (Woodward et al., 1986), there is a great deal of criticism targeting these books in terms of their suitability for both students with disabilities and students in general education. This criticism ranges from their content (Beck, McKeown, & Gromoll, 1989), instructional design (Armbruster, & Gudbrandsen, 1986; McKeown, Beck, Sinatra, & Loxterman, 1992), and level of difficulty (Chall & Conrad, 1991; Lovitt, Horton, & Bergerud, 1987) to the irrelevancy of the text (Estes, 1982), overall considerateness of the text (Armbruster, 1984; Anderson & Armbruster, 1984), and the ability of the text to cooperate with the reader during the reading process (Boone, Higgins, Falba, & Langley, 1993). It is important for educators to consider these criticisms when working with or selecting a content area text. General criticisms leveled by researchers concerning content area textbooks are contained in Table 1. Specific concerns relating to social studies and history textbooks are found in Table 2, on page 760, while science textbook criticisms are shown in Table 3, on page 761.
STUDENTS WITH DISABILITIES IN THE CONTENT AREA CLASSROOM

Overall, the research appears to indicate that textbooks are not designed for the typical reader much less for a student who struggles with reading. Kantor, Anderson, and Armbruster (1983) indicated that textbooks are suitable for only the top half of the students in a general education classroom on measure of organizational structure and audience appropriateness. With more and more students with disabilities being included in the general education classroom, particularly for science and social studies instruction (U.S. Department of Education, 1998) and the high reliance of content area teachers on textbooks (Bean et al., 1994), educators must begin to focus on the characteristics

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**TABLE 1**

Overall Criticisms of Content Area Textbooks

1. Content area textbooks are often organized around misleading titles and subtitles (Estes, 1982).

2. Many content area textbooks assume unrealistic levels of students' background knowledge (McKeown & Beck, 1990).

3. Fifty-seven percent of the best-selling content area textbooks are above the grade level for which they were written (e.g., on the fourth-grade level, the average social studies textbook is written for Grade 5 or 6, and the average science textbook for Grade 7 or 8) (Conrad, 1990).

4. Often, supplemental materials (e.g., workbooks) that accompany content area textbooks contain poorly sequenced tasks that provide poor directions for completing the activities (Osborn, 1984).

5. Content area textbooks often only represent mainstream society (Pace, 1992) and sometimes do not include certain cultures (King, 1992).

6. Textbooks often include highly interesting, but trivial or unimportant details designed to heighten the interest of the reader. Often this intriguing information actually distracts the reader from the content that is important (Garner, Gillingham, & White, 1989) and is assigned main idea status, which disrupts the comprehension of the reader (Garner, Alexander, Gillingham, Kulikowich, & Brown, 1991; Graves et al., 1991).

7. Textbook writing tends to be loosely organized and does not focus the reader's attention on important content (Chambliss & Calfee, 1989) and does not provide explicit signals to the reader that certain information is important (Hare, Rabinowitz, & Schieble, 1989).
of these students as content area learners and consider textbook modifications to facilitate their learning.

**Characteristics of Students**

The increase in diverse learners in the general education classroom has been problematic for teachers who continue to use traditional curricula, conventional instructional methods and materials, and standard textbooks and workbooks. Content area textbooks and expository reading places heavy demands on the student with a disability or the student who struggles with reading (see Table 4, on page 762). With readability assessments of upper elementary content area texts indicating that over half of all students assessed were at their frustration reading level (Wait, 1987) and 92% of the students at the high school level were at the frustration reading level in their assigned textbooks (Sellers, 1987), it is no wonder that general education teachers are quickly discovering that traditional methods do not meet the needs of increasingly heterogeneous classrooms (Ciborowski, 1992).

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**TABLE 2**

**Criticisms of Social Studies and History Textbooks**

1. Social studies textbooks have four problem areas: unclear content goals, assumed background knowledge of the reader, inadequate explanations of material presented, and poor presentation of content (Beck, McKeown, & Gromoll, 1989).

2. Social studies textbooks tend to focus on learning names, definitions, and facts—rather than meaningful “big ideas” (Armbruster & Ostertag, 1987).

3. There is a discrepancy among the difficulty levels of social studies textbooks when compared to basal reading texts for the same grade, and the lower the grade level the more difficult the text in relation to the reading ability of the students (Chall & Conrad, 1991).

4. Main ideas are not explicitly stated in most social studies texts, which results in a text that does little to help build understanding for students with little background knowledge of the material being covered (Baumann & Serra, 1984; Tyson & Woodward, 1989).

5. The writing style found in social studies/history textbooks lacks coherence (Beck, McKeown, & Gromoll, 1989; May, 1994).

6. Historical facts often are not presented as a coherent whole in American history textbooks and students are often overwhelmed by the quantity of material presented to them (Kinder & Bursuck, 1991).
Educators who seek solutions in the teacher’s guides provided by textbook publishers often encounter prescriptions that are not applicable to the specific population of students they find in their classroom. Parmar and Cawley (1993), in a study that examined the efforts of textbook publishers to provide educators with teaching manuals outlining strategies specifically designed for students with disabilities, found impractical recommendations, inconsistencies across grade levels, and a poor correspondence between actual student needs and publisher recommendations.

Determining Textbook User-Friendliness for Students With Disabilities

Because of the criticisms leveled against content area textbooks and the knowledge we have concerning the interactions of students with disabilities and other students who experience reading difficulties with these texts, it is prudent that teachers assess the quality of the instructional design, or user-friendliness, of a textbook for supporting a wide variety of learning needs. Through this evaluation the teacher will have a clearer idea of the obstacles that may prevent certain students from being successful with a particular textbook. This evaluation of the textbook also will provide a road map for teachers to follow as they design modifications or adaptations of the textbook to match the specific learning needs of the students. Since there is a wide range of abilities within each class, teachers should not attempt to implement a “one size fits all” modification or adaptation of the textbook.

Therefore, the first step in making the textbook more user-friendly is to assess the interaction of individual students with the text in question. This involves assessing (a)

### TABLE 3

**Criticisms of Science Textbooks**

<table>
<thead>
<tr>
<th>No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Science textbooks are usually written at reading levels higher than the grade for which they are recommended (Wood &amp; Wood, 1988).</td>
</tr>
<tr>
<td>2</td>
<td>Most science textbooks are designed around the focus of acquiring scientific facts, with the predominant activity being the memorization of vocabulary terms (Horizon Research, 1989; Stinner, 1992).</td>
</tr>
<tr>
<td>3</td>
<td>In science textbooks students are deluged with new terms and concepts at the rate of approximately 300 new words per text in the sixth grade (Armbruster &amp; Valencia, 1989), to over 3,000 new terms and symbols per text in the 10th grade (Hurd, 1986).</td>
</tr>
<tr>
<td>4</td>
<td>Science textbooks fail to incorporate sound instructional design principles (e.g., activating prior knowledge, previewing concepts and vocabulary, presenting metacognitive strategies) (Mastropieri &amp; Scruggs, 1994).</td>
</tr>
</tbody>
</table>
TABLE 4

Students With Disabilities and Content Area Learning

1. The expository text found in content area textbooks is more complex and varied than the narrative text read in elementary school. Students with disabilities often are unaware of the organizational structure of text and consequently overlook main ideas and important details (Englert & Thomas, 1987).

2. Ninety-one percent of content area teachers express concerns about the “readability” of the textbooks they use for instruction (Bean, Zigmond, & Hartman, 1994) and indicate that the vocabulary is too difficult for students with reading problems (Friend & Bursuck, 1999).

3. Students with disabilities often lack much of the prior knowledge of concepts necessary to extract meaning from the expository text contained in content area texts (Bos & Anders, 1987; Lenz & Alley, 1983).

4. When reading content area textbooks, students with disabilities do not use efficient skills and strategies for learning and remembering information, unless specifically cued to do so (Dole, Valencia, Greer, & Wardrop, 1991).

5. Students with disabilities have a difficult time understanding which ideas are important in expository text (Kinder & Bursuck, 1991) and how the ideas relate to one another in social studies (Lawton, 1995) and in science (Scruggs & Mastropieri, 1994).

6. Often the reading rate of secondary students with disabilities is substantially lower than that of their peers in science, social studies, and health classes (Lovitt & Horton, 1988). This often results in the students scoring lower on written tests (Lovitt, Horton, & Bergerud, 1987).

7. Students with disabilities often expect to perform poorly in content area classes (e.g., science, history, social studies) and thus simply go through the motions of learning, dispensing only minimal effort (Readence, Bean, & Baldwin, 1998).

8. The science reading comprehension scores for students with disabilities are minimal, with performance scores on tests hovering around the 33% correct level (Cawley, Miller, & Carr, 1989; Lovitt & Horton, 1994). Low scores are also found in social studies classrooms, with 66% of students with disabilities scoring below average on work completed (Passe & Beattie, 1994).

9. Prior to their inclusion in the content area classroom, students with disabilities receive limited instruction in the use of higher-level cognitive skills (Morsink, Soar, Soar, & Thomas, 1986). This limited exposure could severely impede their ability to function in a situation that requires them to read and generalize information (Passe & Beattie, 1994).
10. Many secondary students with disabilities continue to struggle with simple word identification skills, which severely impacts their ability to read fluently and comprehend text (Moats, 1998) and identify words that are multisyllabic (Lenz & Hughes, 1990). Because they often lack automatic word recognition skills and decoding skills, these students are unable to focus on reading for meaning in their secondary-level content area text (Snider, 1989).

11. When reading content area textbooks, students with disabilities spend an inordinate amount of time focusing on specific words and as a result experience difficulty with comprehension (Horton, Lovitt, & Bergerud, 1990). Because of their concentration on individual components of the reading material to the exclusion of the whole or big idea, they are often easily distracted by trivial, yet captivating, bits of unimportant information (Winograd, 1984).

The assessment of the textbook first involves ascertaining the readability level of the text. Even though the problems with readability formulas are well documented (Lovitt & Horton, 1991), they do provide a one-dimensional view of the text that, with other information, can contribute to the decision-making process. Ascertaining the readability level of the text provides educators with information concerning specific areas in which modifications must be made (e.g., vocabulary, comprehension strategies).

The second step in the assessment of the textbook involves the actual determination of the degree of user-friendliness of the textbook. Singer (1992) suggests that teachers review the text for (a) text organization (e.g., uniform style of writing, consistent method of material presentation, and cohesiveness of the way the information ties together); (b) explication of ideas (e.g., information is stated directly, new terms are defined as they are introduced, text relates new information to information students may already possess or information already presented in the text); (c) conceptual density (e.g., the presentation of new information is spaced out in the text); (d) metadiscourse (e.g., the author talks directly to the reader about the information contained in the text by explicitly stating the purpose or goal of the text, advising students on how to learn from the text, or telling the students how to apply text information in other situations); and (e) instructional devices (e.g., text includes organizational aids such as headings,
subheadings, an index, chapter overviews, diagrams, tables, annotations in margins, summaries, and conclusions. Several checklists have been created to assist teachers in this evaluation (Readence, Bean, & Baldwin, 1998; Singer, 1992; Steinley, 1987).

The last step in evaluating the user-friendliness of the textbook involves assessing the student/text interaction. This process involves previewing the textbook with the students to determine their knowledge of the particular text in terms of organization, instructional devices, conceptual density, metadiscourse, and explication of ideas. Irwin and Baker (1989) suggest constructing a textbook “scavenger hunt” to ascertain the students’ awareness of these components (e.g., ask the student to indicate headings, annotations, summaries, or overviews). Schumm and Stickler (1991) suggest a cloze reading test and a content reading inventory be used to assess the student’s ability to interact and construct meaning from the textbook. Readence et al. (1998) provide a comprehensive description of how to construct and administer a cloze test and create a content reading inventory.

Other characteristics of user-friendly textbooks for teachers to consider are presented in Table 5. These characteristics should be viewed in reference to the audience with whom the textbook will be used. Probably the most important characteristic of a textbook is whether or not it is appropriate for a specific audience. That is, does the text truly consider the prior knowledge and background of the readers who are targeted? If a text does not consider its audience, it is possible that no amount of modification or adaptation will make it user-friendly.

Determining a textbook’s user-friendliness is only the first step in adapting challenging textbooks to improve content area learning. The second step to facilitate learning is for the teacher to enhance the textbook to increase the interactions of the reader with the text.

Traditional Content Area Textbook Modifications

There are four reasons to consider modifying or adapting content area reading for students with disabilities and students who struggle with reading in order to make the text more user-friendly.

1. The majority of these students are unable to read their textbooks with the proficiency required to gain enough information from them to assimilate and integrate the information with previously learned material (Lovitt & Horton, 1991, 1998).


3. Secondary students are very sensitive to changes in their textbooks that result in their having a different textbook than the other students in the class (Vaughn, Schumm, Niarhos, & Daugherty, 1993).
### TABLE 5

Components of User-Friendly Textbooks

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Components</th>
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<tbody>
<tr>
<td><strong>Text Organization</strong></td>
<td>• The text contains a uniform style of writing (e.g., text frames are used to provide consistent structure to the writing).</td>
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<tr>
<td></td>
<td>• Information is presented in a consistent and predictable manner.</td>
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<td></td>
<td>• The writing style is cohesive, the relationship among concepts is clear, and information is tied together for the reader.</td>
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<td></td>
<td>• There is logical connection and flow of meaning from one idea or concept to the next.</td>
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<tr>
<td></td>
<td>• The text provides the reader with information concerning the organization of the text (e.g., through the use of a variety of instructional devices embedded in the text).</td>
</tr>
<tr>
<td></td>
<td>• Overall, the text is well written (e.g., clear references, explicit quantifiers, definite pronoun phrases, easy to follow chronological sequences, and appropriate transitions from one topic to another).</td>
</tr>
<tr>
<td><strong>Metadiscourse</strong></td>
<td>• The author talks directly to the reader about the information contained in the text by explicitly stating the purpose or goal of the text.</td>
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<td></td>
<td>• The text advises students on how to best learn from the text.</td>
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<tr>
<td></td>
<td>• The text explicitly tells students how to apply text information in other situations and provides examples of how to do so.</td>
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<tr>
<td><strong>Explication of Ideas</strong></td>
<td>• Information is stated directly.</td>
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<td></td>
<td>• New terms are defined as they are introduced.</td>
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<td></td>
<td>• The text, directly and explicitly, relates new information to information that students may already possess or to information previously presented in the text.</td>
</tr>
<tr>
<td></td>
<td>• Complete explanations of concepts are provided.</td>
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<tr>
<td></td>
<td>• The text provides enough examples and nonexamples of concepts to provide readers with adequate information to relate to their background knowledge.</td>
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<tr>
<td></td>
<td>• The text considers the limited background knowledge of some readers and provides clear descriptions of information that may be necessary to interpret facts or data presented.</td>
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<tr>
<td></td>
<td>• Relationships among key pieces of information are provided.</td>
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<tr>
<td><strong>Conceptual Density</strong></td>
<td>• The presentation of new information is spaced out in the text so that concept overload does not occur in one chapter or recommended reading assignment.</td>
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<td></td>
<td>• The text considers the amount of vocabulary and concepts introduced in a lesson.</td>
</tr>
<tr>
<td></td>
<td>• The text considers the number of new concepts or vocabulary introduced in a single sentence.</td>
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<tr>
<td></td>
<td>• The text does not include irrelevant or distracting information.</td>
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<tr>
<td></td>
<td>• Information that is only peripherally related to the purpose of a chapter (e.g., excerpts from a diary or a letter) is set aside in a boxed-in area.</td>
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<td></td>
<td>• The text balances breadth with depth by addressing a limited number of powerful ideas or big ideas.</td>
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<tr>
<td><strong>Instructional Devices Incorporated</strong></td>
<td>• The headings and subheadings are appropriate and are accurate indications of the information that follows.</td>
</tr>
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Table 5 continued on page 766
4. The textbooks are not “cooperative” in that they do not have scaffolds built into them by the publisher and/or author to provide support and assistance for a wide variety of readers (Boone & Higgins, 1993; Boone et al., 1993; Higgins & Boone, 1994; Higgins et al., 1996).

Regardless of the criticism leveled against them, textbooks continue to be a pervasive feature of education in secondary schools (Tyson & Woodward, 1989) and as such are considered to be a legitimate source of content knowledge by teachers and students. Because teachers often find themselves with only one textbook to use with all students in the classroom—from the student who is able to work totally independently to the student who needs one-on-one instruction—modifications and adaptations to the text appear to be the best option to address the diversity of the classroom.

Educators in the field of reading (Armbruster & Gudbrandsen, 1986; Dishner, Bean, Readence, & Moore, 1992; Readence et al., 1998) and in special education (Boone & Higgins, 1992, Higgins & Boone, 1992; Higgins et al., 1996; Lovitt & Horton, 1991, 1998; MacArthur & Haynes, 1995; Schumm & Stickler, 1991) have suggested a variety of methods by which teachers can modify textbooks. These modifications provide the basis by which the texts become more effective learning tools so that all students are better able to meet the demands in content area classrooms. These suggestions range along a continuum from more traditional techniques designed to help students use the text more efficiently, to ideas for supplementing the use of the text, to the more radical ideas of recreating the text as a digital study guide or digital textbook.

We should remember that experts continue to stress the importance of the teacher’s willingness to make adaptations to accommodate individual differences among learners.
and that the success of including students with disabilities in general education classrooms will rest upon the teacher’s ability and willingness to make these changes (Stainback, Stainback, Courtnage, & Jaben, 1985). Because the population of a typical general education classroom is a heterogeneous group of students, modifications made will benefit many of the general education students in the classroom as well. Recent research has indicated that teachers view textbooks and their accompanying material as important instructional resources that they do not want to do without (Bean et al., 1994). This research also reveals that teachers do not often suggest any methods by which they modify the text to make it more “user-friendly” or considerate for students. Thus, it is prudent for all educators to review suggested methods for modifying and supplementing content area textbooks so that students with disabilities and other students who struggle with reading are better able to participate more successfully in the secondary content area classroom. Table 6, on page 768, delineates a number of paper/pencil methods for modifying and/or supplementing content area textbooks. The modifications presented here are by no means the only modifications that may be used to increase the user-friendliness of a text. However, they are the modifications found most often in the research literature to be effective for students with disabilities and other students at risk for reading failure.

**DIGITAL TEXTBOOKS AS COOPERATIVE INSTRUCTIONAL TOOLS**

Technology use in education has grown exponentially over the last 15 years. A recent survey of special educators indicated that 85% use technology in literacy instruction, 97% believe that technology can help students acquire literacy skills, and 91% expect to increase their use of technology in the future (Burton-Radzely, 1998). Although not a panacea for all of the problems students encounter when they read content area material, adapting a textbook to the digital format can provide a tool with which to assist students who struggle to read and learn from the text. The most important consideration is that the digital text provides the learning strategies in an individualized, learner-centered situation (Boone et al., 1993) that does not conflict radically with the traditional organization of the content area classroom or the instructional strategies typically used by the content area teacher (Loucks & Zacchei, 1983).

Adjusting a textbook to a digital format does not mean “dumbing down” or “watering down” instruction. Cooperative digital textbooks offer great potential for students with disabilities by providing alternate access to the standard textbook. The textbook can be customized to meet the unique needs of each individual student (e.g., style and pace). When students read from a traditional content area textbook, they are limited to the information contained in that particular volume, with any additional facts, details, or clarification being obtained from supplementary reference sources (e.g., a dictionary, thesaurus, encyclopedia, or another person). A cooperative digital textbook, on the other hand, provides immediate access to supplemental data through its computer format without the interruptions of having to seek additional help outside of the immediate reading environment. A digital cooperative textbook can include extra information in the form of additional text, computer-generated speech or sound, graphics, animated sequences, digital video clips, access to the Internet, or combinations of these various media.
INTERVENTIONS
for Academic and Behavior Problems II: Preventive and Remedial Approaches

TABLE 6

Traditional Modifications to Content Area Textbooks

<table>
<thead>
<tr>
<th>Modification</th>
<th>Explanation</th>
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<tr>
<td>Advance Organizers</td>
<td>Advance organizers are presented to students before the actual lesson or reading assignment to activate prior knowledge and to provide a cognitive road map for students as they progress through the lesson or reading material. They may be written on the board, passed out to students on a worksheet, or given verbally. Typically the components in an advance organizer are as follows: (a) the tasks involved in the lesson, (b) topics and concepts to be covered in the lesson, (c) pertinent background information to understand the lesson, (d) the rationale for the lesson (e.g., why the lesson or information is important), (e) key vocabulary contained in the lesson, and (f) expected student outcomes. The goal is to get students to think about what they already know about a topic, direct their attention to the reason(s) they will be reading, and to activate their interest and curiosity.</td>
</tr>
<tr>
<td>Vocabulary Development</td>
<td>Vocabulary development is the foundation on which students will place the information collected in their reading (e.g., facts, ideas, concepts). Vocabulary selected for instruction should be words that the student is likely to encounter again, or only those words that pertain to the main concepts/ideas of the lesson. Students who have a working knowledge of the vocabulary to be encountered in an assignment stand a better chance of comprehending the material read. Vocabulary development typically occurs prior to reading the assigned material and may take several forms: (a) a series of timed drills in which students write terms that match definitions; (b) lessons designed to develop an understanding not only of the word definition, but also of how the term may be used in different contexts; (c) assessment of student knowledge of content vocabulary to ascertain the level of understanding a student has for a particular word (e.g., “I’ve never seen that word before,” “I’ve heard that word, but I don’t know what it means,” “I can read that word and I think it has something to do with ...” (Nagy, 1998); and (d) opportunities to learn the relationships of words.</td>
</tr>
<tr>
<td>Study Guides</td>
<td>Study guides usually are incorporated into a worksheet and take the form of questions or statements designed to help students learn content information. They may be used before, during, or after reading the assigned material and serve as a supplement to teacher-led instruction. Study guides attempt to abstract or isolate important pieces of information, thereby guiding student comprehension. Study guides should be constructed around the three levels of comprehension: applied (e.g., helps students understand how this information can be used), interpretive (e.g., helps students understand what the author means), and factual (e.g., helps students understand what the author said). Study guide formats that have been effective with students with disabilities and remedial students in content area classrooms include short-answer questions, framed outlines, and matching. It is suggested that study guides cover an approximately 1,500-word passage (Lovitt &amp; Horton, 1994) and include no more than 10 questions (Readence et al., 1998). The goal is to design a study guide that helps students organize information and reflect upon the information they collect.</td>
</tr>
</tbody>
</table>
### Modification Explanation

#### Graphic Organizers
Graphic organizers are visual representations of key vocabulary or content information in which subordinate categories branch off from superordinate categories in the form of tree diagrams. Information contained in the graphic organizer is connected graphically into a meaningful whole to provide organization to a series of related terms, facts, or concepts. Other terms used to refer to graphic organizers are tree diagrams, structured overviews, semantic maps, concept maps, and flowcharts. Graphic organizers are beneficial learning tools used prior to reading, during reading, and as a follow-up to reading assignments. It appears that graphic organizers help students learn the interrelatedness of meaningful concepts and principles (Novak, 1990). Well-developed graphic organizers can communicate complex relationships (e.g., comparison, contrast, cause, effect, superordination, and subordination) and have been found to facilitate not only the initial learning of concepts, but the subsequent retention and retrieval of information learned (Carnine, Silbert, & Kame’enui, 1990).

#### Visual Displays
Visual displays are illustrations or line drawings combined with words to convey facts, concepts, or to illustrate relationships among pieces of information. The types of enhancements found in visual displays may include hierarchical, comparative, directional, and representative information. A visual display may be a diagram, a concrete model that students label, or an illustration that portrays relationships to be learned. The visual display may be used in any part of the lesson in combination with effective teaching practices.

#### Interspersed Questions
A common instructional tool used by content area teachers is to stop periodically during reading or direct instruction and ask questions. Interspersing questions is a technique that positively influences test performance (Tobias, 1987; Wong, 1980) in that the teacher has the opportunity to immediately provide corrective feedback to students. It is important that the questions be planned in advance and require the students to identify critical pieces of information and associations in the text (Kame’enui & Simmons, 1990). In this manner, the interspersed questions focus the students’ attention on critical concepts and principles contained in the content area textbook.

#### Mnemonic Devices
Mnemonic strategies are verbal or pictorial memory-facilitating strategies designed to help low-achieving students learn factual information. Mnemonic strategies facilitate the acquisition of content material by training students in specific memory strategies to apply to unfamiliar information. Typically, students must be trained in the use and application of mnemonic strategies with the teacher monitoring their use over time.

Five types of mnemonic devices have been explored in the literature:

(a) first-letter mnemonics (e.g., students are taught to use the first letter of a word, phrase, or sentence as a cue to recall information);

(b) keyword mnemonics (e.g., students are presented with an illustration that is phonetically similar to the unfamiliar term to be learned—a picture of a box to remember the mineral bauxite [Mastropieri, Scruggs, & Levin, 1986]);

(c) pegword mnemonics (e.g., students are taught to connect a series of numbers to familiar objects that rhyme with the numbers—1 equals bun, 2 equals shoe; the association between the number and pegword helps the student to remember sequential information [Mastropieri et al., 1986]);

(d) mimetic mnemonics (e.g., exercises that involve the actual pictorial representation of the information to be learned—if the students need to learn the chambers of the heart, they are presented with an illustration of the heart with the chambers identified); and

(e) symbolic mnemonics (e.g., common symbols are used to represent information to be learned—a donkey to represent the Democratic Party, a coin to represent money).
For example, in a digital science textbook, a student may begin reading about reptiles. Some words are underlined, indicating to the student that extra, related information is available either as text, pictures, or sound. The student selects the underlined text, “cold-blooded,” and a text window appears partially overlaying the original text (see Figure 1). The student reads the information or selects to have the information read to her and when finished closes the window. The student then selects the word “lizard” and a picture of a common lizard is displayed in a graphic window (see Figure 2). Digitized voice, music, or sound effects can accompany both the graphic and text windows for further help or clarification.

Although these adaptations to the text seem relatively simple, they mimic the types of strategies that teachers traditionally employ with students when reading in a group situation. For example, monitoring for new and unusual words with which the student may have difficulty, providing definitions, suggesting that students define key words, and drawing relationships between pictures and text elements are all successful strate-
CHAPTER 28
Challenging Textbooks

FIGURE 2
Another Example of Additional Information About a Topic That Can Be Selected by a Student Using a Digital Text

SCIENCE TEXT -- CHAPTER 2  PAGE 3

Lizards are reptiles that come in many shapes and colors. They are different from snakes. Two characteristics that are different from snakes are no limbs and external ear openings.

Reptiles and cold-blooded vertebrates with dry, scaly body coverings with lungs for breathing air. Modern reptiles include turtles, lizards, snakes, crocodilians, and tuatara.

Note
A graphic window is linked to the word “lizard” and depicts a gecko, a common lizard.

gies for improving comprehension. For students who struggle with reading, the benefit to the digital textbook is that it provides these strategies in the private learning environment of the computer screen, thus individualizing the instruction for each student. Students who are hesitant to ask questions can review the material over and over without the stress of speaking up in class.

Digital textbooks can be constructed in a variety of formats, from a textbook designed for nonlinear browsing to a more specific, directed teaching tool. Research has shown that digital texts and study guides, designed as directed teaching tools, can be powerful instructional interventions (Anderson-Inman, Horney, Chen, & Lewin, 1994; Anderson-Inman, Knox-Quinn, Horney, 1996; Boone & Higgins, 1993; Higgins & Boone, 1990a, 1990b; Higgins et al., 1996; Horton, Boone, & Lovitt, 1990; MacArthur & Haynes, 1995).
Successful Adaptations to a Digital Text

A plethora of research indicates that when teachers make traditional modifications and adaptations to content area material for students with disabilities and for students who struggle with reading, the students achieve at a higher level (Horton & Lovitt, 1989; Lenz & Hughes, 1990; Lovitt & Horton, 1991, 1994, 1998; Mastropieri, Scruggs, & Levin, 1986; Wong, 1980). This higher achievement level also is the outcome when technological modifications and adaptations are implemented (Anderson-Inman et al., 1994; Anderson-Inman et al., 1996; Boone & Higgins, 1993; Higgins & Boone, 1990a, 1990b; Higgins et al., 1996; Horton, Boone, & Lovitt, 1990; MacArthur & Haynes, 1995).

The capacity for the individualization of the digital textbook allows for each student’s disability and learning style to be taken into consideration when the digital text is designed by the teacher(s). Further individualization occurs when the student works with the digital textbook and “elects” to interact (or not) with the various modifications made by the teacher(s).

Textbook adaptations that have shown positive results in the research include (a) reading text aloud to students; (b) using related pictures, recordings, or video; (c) constructing abridged versions of the text; (d) providing students with outlines or summaries; (e) using a multilevel approach in difficulty of text; (f) introducing key vocabulary in a prereading situation; (g) summarizing textbook information; (h) reducing the length of assignments; (i) slowing the pace of the instruction; and (j) teaching students to take notes and record key concepts and terms (Schumm & Stickler, 1991).

Most of these strategies can be implemented successfully in a cooperative digital textbook. Examples include the following:

1. Provide Talking Text. Text can be “read aloud” from the digital textbook as a digitally recorded voice.

2. Use related pictures, recordings, or video. These three types of media are easily incorporated into a digital textbook. The capability also exists to connect students to the Internet from within a digital textbook.

3–5. Construct abridged material. Many students need an abridged version of the content contained in the text. This can be done by providing chapter outlines, summaries, graphic organizers, or study guides. The construction of the abridged material takes a multilevel approach in that the extra information is available through information windows (e.g., text, graphic, and video) as well as text rewritten at a lower reading level. It is important to remember not to sacrifice the content to be learned when making these modifications. When in doubt, consider formatively evaluating the modification with students and use their suggestions to make the modification. It is best to build in supports that provide clarification of material to be learned, thus “watering up” the curriculum rather than taking out important material.
6. Introduce key vocabulary. Boldface words can be used to introduce the important new vocabulary before reading takes place. Students can highlight key words and the digital text can either display a “talking” printed definition of the word, provide a picture of the word, or provide a video clip of the vocabulary word. For example, if the vocabulary word was “photosynthesis,” the student could hear the word pronounced, hear or read the definition, view a diagram of the process of photosynthesis and hear it explained, or watch a video of the process of photosynthesis.

7–8. Summarize content. Reworking the text into the page-by-page chunks for the digital textbook, the teacher(s) can select the amount of text necessary to fill each page by changing the font and size of the text, reducing the length of the text, or rewriting the content to more approximate the reading level and/or background knowledge of the audience.

9. Modify the pace. Working with the digital textbook allows each student to work at his or her own pace. The student has the opportunity to read and reread the material, access the supporting material in any order to aid comprehension, move about in the text, and determine how fast or slow the information is presented. The textbook can also be designed so that students must proceed through certain instruction routines that teachers want all students to access. Teachers can also put the digital textbook up on the Internet for students to access from home, thus increasing the opportunity to interact with the text in a variety of settings.

10. Encourage study skills. Built-in, easy-to-use, note-taking functions can be built into the digital textbook that provide students with the option of writing their own notes or selecting text from the text to be included in their notes. Teachers also can include study guides to direct the students in extracting information from the textbook, embed questions into the text read as a comprehension strategy, include quizzes that pertain to material read, and incorporate other traditional content area modifications into the digital textbook.

Incorporating Empirical Research Into the Design of the Digital Textbook

The ultimate goal in the creation of a cooperative digital textbook is to make use of the “best practices” research concerning content area instruction for students with disabilities and the components of user-friendly textbooks and to incorporate those findings into the design of the software. Teachers who develop digital textbooks should make every effort to reflect current research on the learning characteristics of the students with whom they work. The digital textbook should be designed around explicit instructional methods for learning so that clear expectations are communicated to the students.
INTERVENTIONS
for Academic and Behavior Problems II: Preventive and Remedial Approaches

Tables 1–6 provide a research base from which to begin to design and create cooperative digital textbooks. The research contained in these tables is provided to assist educators in the development of the basic digital textbook so that the text offers systematic instruction to the students. The information is by no means exhaustive of the research in the field. It is offered merely to stimulate development. The goal is to take the empirical research and use it in the design of a cooperative textbook that is tailored to the learning strengths and needs of students in content area classrooms. The ability to customize a digital content area textbook for a particular group of students, to reinforce certain learning behaviors, or to provide controlled practice on a skill is limited only by the educator’s imagination.

Systematic Design of the Digital Textbook

Instructional components to incorporate into the design of a digital textbook include (a) the empirical research in the field of content area learning as well as the field of special education in regard to the content area learning of students with disabilities, (b) the educator’s knowledge concerning the learning characteristics of the students, (c) the educator’s knowledge concerning the components of user-friendly textbooks, and (d) the educator’s knowledge concerning the use of the particular authoring software being used. Current authoring systems have reduced drastically the amount of time needed to create digital reading material, but educators should be warned that the estimates for creating interactive computer-based instructional materials can vary widely depending on the complexity of the design (Sampath & Quaine, 1990). MacArthur and Haynes (1995) found that by using an authoring system, 3 to 4 hours were required to convert a typical textbook chapter that included speech synthesis, access to a glossary, highlighted main ideas, questions embedded within the text, and summaries of important points. Currently it is possible to create digital, hypermedia texts directly from just about any modern word processing or desktop publishing program simply by saving an existing document file as hypertext markup language (HTML), thus drawing on skills that many people have already. And with many documents that might be utilized in a digital textbook already extant in a word processing or desktop publishing file, many of the more time-consuming obstacles are eliminated.

Although the creation of a digital cooperative text is a labor-intensive task, it can be managed if members of a department, a school district that has adopted the same text for a particular grade level, or a curriculum committee of a school or school district divide the task into manageable units. If educators are willing to pool their resources and talents to collaborate in creating a digital modification of the content area textbook, the benefits will provide support for a variety of students in the content area classroom.

Much of the time involved in the creation of a digital textbook is in the preplanning stage, when content is targeted, skills are targeted, goals are written, proper reinforcement is selected, research is consulted, and student characteristics are considered (see Figure 3). In the preplanning stage, it is important to ask the following questions:
FIGURE 3

Identifying Critical Information for Use in a Digital Text in the Planning Process

Chapter 3

Page 234

The vaqueros were America’s first cowboys. They came to Mexico from Spain with the first cattle herds that were brought to the New World. With them came new skills, games, and songs that will always be a part of our country. The vaqueros came north from Mexico to the land that is now the state of New Mexico. They drove the thousands of cattle that came with the wealthy Dons. The vaqueros lived with their families at the haciendas. There they tended the cattle herds that belonged to the wealthy Dons.

The tough little roping horses of the vaqueros were well trained and skillful. They knew when to run and when to make sharp turns or sudden stops. The lasso rope that the vaqueros used was eighty feet long and made of tightly woven sea grass, horse hair, or leather. The vaqueros used these long ropes as a tool for herding cattle, a plaything for performing rope tricks, and sometimes even as a weapon. Some vaqueros boasted that they had used their lassos to catch mountain lions and bears.

Note
This page from a history textbook is marked up during the preplanning stage in transforming a text on paper to digital format.

1. Is there a piece of commercial software available to meet the learning needs of the students (e.g., does the read-aloud part of a “talking storybook” CD-ROM provide adequate help for students who need to hear the words spoken)?

2. Would traditional instructional methods be just as effective as the digital textbook?

3. What are the prerequisite computer skills students will need to work with the digital text?

4. What is the background knowledge the student will need prior to working with the digital text?

5. Are there any learning or behavioral idiosyncrasies that might preclude a student using the digital text appropriately?

Once preplanning has occurred, those involved in the creation of the digital textbook need to consider the actual design of the text (see Figure 4, on page 776). The
more work done here, the fewer the problems encountered in the actual creation of the digital textbook. In fact, if the work done in this stage is thorough and complete, an educational assistant or parent can be taught to use the authoring software and simply follow the educator’s design instructions to create the actual digital textbook. A storyboard or flowchart is very helpful for visualizing the work to be done in this stage (Fitzgerald, Bauder, & Werner, 1992). The ability to “see” what will be incorporated into the design of the digital textbook helps clarify where problems may arise or where errors of logic have occurred. The starting point should be a review of the chapters to be transferred into a digital format, the order in which teachers cover these chapters, the time during the school year the chapters are taught, and the depth of coverage that the teachers provide when teaching a particular chapter. Suggested considerations at this stage are:

1. Make sure that all skills and subskills included in the content area text are also included in the digital textbook—ask both a content area expert and a special educator to review the logic of the instruction.

2. Decide on the level of interactivity to be incorporated into the digital textbook (e.g., simple to complex).
3. Decide whether the student will be “branched” to easier or more difficult tasks depending on his or her responses.

4. Decide whether the digital textbook will keep track of student responses or selections.

5. Decide whether the digital textbook will provide the teacher with data to analyze concerning the student’s interaction with the text.

6. Review the language demands of the textbook and decide how to modify or support the language in the digital textbook.

7. Identify the prompts and cues to be used in the digital textbook.

8. Decide whether the digital textbook will contain time constraints or whether students will be allowed to interact freely with the text with no time constraints.

9. Design the digital textbook to be as flexible as possible so that it can be changed as the student needs change.

It is important to remember as one begins to create cooperative digital textbooks that the possibilities for the textbook design depend on the authoring software selected and what the software will and will not allow the educator to do. It is not unusual for educators to begin with the easiest-to-learn authoring software and progress to more powerful and complicated software as they become more skilled. It is also not unusual for digital textbooks designed and created by educators to become more sophisticated as the educators become more proficient in using the software selected. In fact, one of the main benefits of a digital textbook is that it can be modified as the learning needs of the students change, as the teacher finds interesting supportive items to include in the text, and as the structure of the learning environment changes.

As each chapter of the content area textbook is created, it should be field-tested and piloted with the students and/or other content area educators. The goal here is to ascertain whether the digital chapter “works” as intended with students and meets with the satisfaction of the content area experts (the teachers). Often there are errors in the programming that need to be corrected, and sometimes there are logic errors in the design of the digital textbook so that it is unclear to the students what they are being asked to do. Sometimes the students simply do not respond to the software in the anticipated manner and revisions are needed. It is also at this point that the experts (teachers) often find items they want to add (e.g., a video clip), emphasize (e.g., a learning sequence), or delete.

Once completed, the digital textbook and its use by students should continue to be periodically evaluated, both formatively and summatively, and updated as necessary.
As the students become more familiar with the technology and more sophisticated in their use of the digital textbook, they may even begin to make suggestions for enhancements. Continuous evaluation allows the educator to make revisions to the digital textbook so that continued student interaction is assured.

**Digital Content Delivery**

With the overwhelming popularity of the Internet, few people still think of computers in terms of programs such as spreadsheets, databases, and word processors. The commercialization and popularization of the World Wide Web (WWW), with its nonlinear, multimedia interface, has transformed many computer users’ ideas of what it means to use a computer. It has also brought about a new avenue of multimedia content delivery not only for school settings, but anywhere one can connect a computer to a phone line or cable TV outlet. Online journals, multimedia encyclopedias, and electronic books and novels are a very real part of current technology. With this “pipeline” for digital content delivery, and the ever-increasing speeds for computer processing units and Internet access (e.g., cable modems and digital phone service—digital subscriber line, or DSL—offer Internet access at 100 times the speed of a typical 56K phone modem), little stands in the way of access to digital content. But equating access to information and access to learning is a misreading of the terms (Rose & Meyer, 2000). Using the technology of digital content simply to make information more accessible is not enough. Differentiating learning from access is an important feature in determining instructional design for digital content.

It is very easy to be distracted by the variety of presentation tools (i.e., bells and whistles) available in many of the digital content-delivery software programs now available. The structure of the software tool that is chosen for digital content delivery can likewise influence the look and feel or instructional design of the product. For example, there are several computer programs such as PowerPoint (1998) that allow easy creation of slides for presentation purposes. Most of these programs, because of the way in which they are designed, promote the creation of linear presentations of ideas, not very different from transparencies on an overhead projector. This is just one example of improving access without necessarily improving learning.

**Creating Digital Content**

The World Wide Web is overwhelmingly the most readily available and most affordable delivery system for digital content. Internet browser software, the programs that read the multimedia files that make up the Web, are generally free (especially to educators and schools) and almost without exception come installed on most new computer systems. The hypertext markup language (HTML) that serves as the principal programming language for the Web is not specific to any one type of computer (e.g., both Macintosh and Windows computers can read it) and is relatively easy to employ using new Web authoring tools such as PageMill (1999), DreamWeaver (1997), and FrontPage (1998). And with most word processing programs now having
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FIGURE 5
A Finished Page of Digital Text as It Appears to the Student

Cold-Blooded

Animals whose body temperatures are controlled by the outside environment are called cold-blooded. Human and other mammals are called warm-blooded because their body temperatures are controlled from within their own bodies.

Go Back

Gecko — A common lizard

Note
A single-document digital text was created on a typical word processing program and saved as HTML. The main text at the top contains links to the information in the middle and at the bottom of the page. This file can be viewed by any Web browser such as Internet Explorer, Netscape, or Opera.

HTML as an alternate file format for saving, teachers easily can design a Web document using their familiar word processor and then save it in a file format that is compatible with the Web (see Figure 5 above and Table 7, on page 780, for a detailed description of creating a digital text using a word processor). Even with these improvements in access and development of digital content, the most important issue remains—developing instructional goals and translating those into an instructional design that works.

Practical Issues to Consider in Creating a Digital Textbook

There are some practical issues to consider when educators make the decision to create digital textbooks from content area texts. The first is the level of collaboration that will be necessary between the general educator and the special educator. With the inclusion of students with disabilities into the general education classroom for content
## TABLE 7

### Using a Typical Word Processor to Create a Single-Document, Digital Text for the World Wide Web

The example used here is AppleWorks 6.0 (formerly ClarisWorks), available for both Windows and Macintosh computers.

<table>
<thead>
<tr>
<th>Basic Task</th>
<th>Specific Instructions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type in or scan main text.</td>
<td>Be sure to include a title word at the top. This word will serve as an “anchor” or reference spot for creating links.</td>
</tr>
<tr>
<td>Format the main text.</td>
<td>This is the initial text that the student will read. It should be at the top of the document.</td>
</tr>
<tr>
<td>Insert a page break.</td>
<td>The page break will show up as a horizontal rule or line when saved as HTML.</td>
</tr>
<tr>
<td>Type in or scan text for definition pop-up window.</td>
<td>Be sure to include a title word at the top. This word will serve as an “anchor” or reference spot for creating links.</td>
</tr>
<tr>
<td>Format the pop-up window text.</td>
<td>Use a different font or text style to indicate to the user that a definition section is being viewed.</td>
</tr>
<tr>
<td>Include the words Go Back to be used as a navigation button.</td>
<td>Put this at the bottom left corner of the page.</td>
</tr>
<tr>
<td>Insert a page break.</td>
<td>The page break will show up as a horizontal rule or line when saved as HTML.</td>
</tr>
<tr>
<td>Type in text title for graphic pop-up window.</td>
<td>This word will serve as an “anchor” or reference spot for creating links.</td>
</tr>
</tbody>
</table>

Paste or insert graphic onto page.

Include the words Go Back to be used as a navigation button. Put this at the bottom left corner of the page.

Spell-check the entire document.

Save the document as a Word Processing File. Use the Save command usually found under the File menu.

Make the word “LIZARDS” in the Title of the Main Text section an Anchor.

Select the word LIZARDS. Then choose Create an Anchor Link from the Format menu.

Make the word “Cold-blooded” in the Definition pop-up window an Anchor.

Select the word Cold-blooded. Then choose Create an Anchor Link from the Format menu.

Make the word “Gecko” in the Graphic pop-up window an Anchor.

Select the word Gecko. Then choose Create an Anchor Link from the Format menu.

Make the word “Lizards” in the Main Text section a Document Link to the Anchor “Gecko.”

Select the word Lizards. Then choose Create a Document Link from the Format menu. Choose Gecko as the appropriate Anchor from the pop-up dialog box that appears.
area instruction, more and more collaboration between general educators and special educators is occurring. Educators now meet more often in grade-level or department-level teams to share, solve problems, and create interdisciplinary teams to work on curricula (Friend & Bursuck, 1999). These interdisciplinary teams work together to support one another, develop appropriate instructional plans for students, modify and adapt instructional materials for students, and work to ensure the success of students with disabilities within the general education content area classroom. Because general education teachers often have not been trained to make adaptations for students with disabilities (Schumm & Vaughn, 1991), it is important that the special educators and general educators work together to assess the students, review the content area textbook, and evaluate the interaction between the student and the textbook. From this initial assessment and subsequent collaboration will evolve the appropriate adaptation and modifications to create the digital textbook. An exciting element in the development of a digital textbook is that it allows for the creation of an adaptation or modification that, depending on the enhancements built into the digital text, can meet the learning needs of a wide variety of students—both those with disabilities and those who are at risk for school failure.

The second issue that educators should consider is the physical makeup of the content area classroom as well as the instructional routine of the classroom. Each classroom is different and each teacher has a different instructional style. Thus, educators need to decide upon the placement of the computers in the classroom or if the students will travel to a computer lab, when the students access the digital text (e.g., before a teacher-led lesson as an advance organizer or following a teacher-led lesson for reinforcement), and the Internet access that students will have to the digital textbook from home. It is important to note that an abundance of computers is not necessary to incorporate a digital textbook into the instructional routine of a classroom. Boone and Higgins (1993) found that with as few as two computers in a classroom, a digital textbook could become a regular feature of reading instruction.

The third consideration educators must keep in mind as they create digital content area textbooks is that the power of the digital textbook lies in its ability to mimic the
paper textbook, yet become a dynamic interactive learning tool. The technology allows for the creation of a digital textbook that looks just like the paper textbook but contains access to study guides, graphic organizers, speech, video, vocabulary, scenarios that create background knowledge, etc.—all available with a click of the mouse. Thus, the textbook becomes a multidimensional learning tool. When the full power of the technology is considered, a truly cooperative digital text is created that works along with the reader in the reading process.

The final practical consideration is that students must be trained concerning the use of the digital textbook. It is not enough to create the digital textbook and simply allow students access to it. Students must be directly trained in accessing all the enhancements (e.g., vocabulary definitions, embedded questions, video clips) of the digital textbook and a thorough explanation provided as to how each enhancement can facilitate their learning. Initial use of the digital textbook should be monitored to ascertain whether or not students are making full use of the enhancements and periodic retraining scheduled to emphasize to the students the power of the digital textbook to act as a tool to connect reading, thinking, and learning of content.

**Copyright Rules**

The question of copyright always comes up when digital media are discussed; unfortunately no one ever seems to have clear-cut answers to the questions asked. Until the regulations of copyright and the digital modification of instructional materials by educators are clarified, it seems reasonable to follow the rules outlined for paper reproduction via copy machines that educators have been using for several years. The following two scenarios illustrate situations that probably fall on either side of copyright infringement.

1. An educator wants to create digital text based on a chapter contained in the American History text she is using in her classroom. The classroom contains at least one copy of the textbook for each student in the class. Creating a digital text based on this chapter for use within this classroom probably does not involve infringement of any copyright.

2. Another educator wants to create a digital text based on a chapter out of a historical novel as part of an instructional unit. The teacher buys one copy of the book to read aloud to the class and then creates a digital text of the one chapter for students to use. He makes copies of the digital text for every student in his class to work with independently. This is very likely an infringement of copyright. Purchasing a copy of the book for every student, however, would probably alleviate the problem.

These are not hard-and-fast rules, of course. Educators should obtain copies of copyright policies at their schools and follow those policies as stringently as possible.
CONCLUSION

The use of technology for content area learning purposes within special education and general education to facilitate the inclusion of students with disabilities is just beginning. Initial research into the use of technology to adapt content area textbooks in both environments indicates that digital textbooks are as effective as teacher-led instruction and/or a traditional content area textbook (Anderson-Inman et al., 1994; Anderson-Inman et al., 1996; Boone & Higgins, 1993; Higgins & Boone, 1990a, 1990b; Higgins et al., 1996; Horton, Boone, & Lovitt, 1990; MacArthur & Haynes, 1995). Whether the content to be learned comes from a basal reader or a content area textbook, the digital adaptation of the text has proven to be an effective instructional modification for students of varying ages and ability levels.

The technology of today has already eclipsed the technology used in these early studies concerning digital textbooks in terms of power, speed, ease of use, adaptability, capacity to include a variety of enhancements, and availability—and as a result today’s educators can create more sophisticated and cooperative text than was created in the past. As educators begin to visualize their content area classrooms, the inclusion of students with disabilities into those classrooms, and the unique learning needs of those students, it would appear that the creation of a digital content area textbook should be considered a viable alternative to the traditional content area textbook with which these students so often struggle.
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Challenging Textbooks


