Cognitive rescaling strategies

Interventions that alter the cognitive accessibility of text

By Dave L. Edyburn

Perhaps you have encountered this problem:

A student with a disability is included in the general education classroom but has an independent reading level many grades below his or her peers. As a result, the majority of the reading assignments are far too difficult for the student.

Unfortunately, this scenario is all too common as it plays out in hundreds of thousands of classrooms each day. Whereas inclusion has provided students with disabilities physical access to the general education classroom, what can be done to make the curriculum cognitively accessible?

Students with disabilities and other struggling readers face extensive challenges throughout their educational careers given the predominant instructional model, which places a premium on learning from text. Because of the difficulty, time, expense, and lack of tools for modifying text-based information, to-date, the one-size-fits-all curriculum has been impenetrable.

Efforts to help delayed readers maximize their abilities to learn from text often focus on a few commercial materials and a handful of modification strategies. Resources like *Weekly Reader* <www.weeklyreader.com> offer various grade/reading levels of current events information. *News-2-You* (www.news-2-you.com), is a weekly subscription service that provides current events informa-
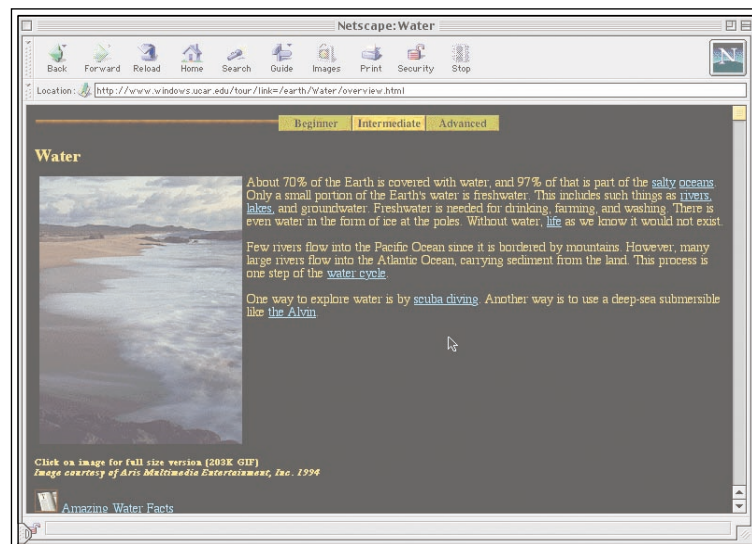

Figure 1

tion using Boardmaker icons. *Cliffs Notes* <www.cliffsnotes.com>, which provide succinct summaries of literature, are now available as e-books for use on personal digital assistants <www.palm.com/ebooks>.

The lack of ready-to-use accessible learning materials requires teachers to create their own modifications. Among the common strategies, each involveing a great deal of time and preparation. Are audio taping the chapters in a textbook so that a student can gain the necessary information by listening instead of reading; highlighting the key ideas in a chapter so that a student can study and focus attention on essential facts, concepts, and vocabulary words; or sitting with a student, reading and discussing the text together.

One exciting development in Web-based instructional design is the work by researchers at the University of Michigan and their Web site: Windows on the Universe

(www.windows.ucar.edu). As illustrated in Figure 1, each page of the curriculum is written at three difficulty levels (beginner, intermediate, and advanced). Students simply click the bar at the top of the screen to select the level that reflects their interests. While the Web site does not offer text-to-speech, it is one of the most impressive examples of cognitively adjustable instructional materials I have seen.

Reflecting on the significance of the instructional challenges associated with learning from text, I have wondered about interventions that could modify text-based information. I have called this process "cognitive rescaling." I define cognitive rescaling as a process of altering the cognitive difficulty of information. As a teacher of students with disabilities, I've dreamed of tools that would enable me to take an assigned reading, manipulate the text in ways that alter (increase or decrease) the cognitive challenge involved in understanding

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About 70% of the Earth is covered with water, and 97% of that is part of the salty oceans. Only a small portion of the Earth's water is freshwater. This includes such things as rivers, lakes, and groundwater. Freshwater is needed for drinking, farming, and washing. There is even water in the form of ice at the poles. Without water, life as we know it would not exist.

Figure 2

the information, and produce cognitively rescaled versions of the original assigned reading that I could distribute to individual students. For many years, these ideas were simply dreams.

Recently I discovered several software tools that now make it possible to cognitively rescale text-based information. Simply. In just seconds. Sound too good to be true? Read on as I outline two cognitive rescaling strategies.

Getting started

Before we can cognitive rescale text-based information, we must ascertain the source and format of the original text. Obtaining a digital version of the text is a prerequisite for cognitive rescaling.

Information sources and formats

When students are required to learn from text, any number of sources and formats may be involved: Web pages, textbooks, teacher-created handouts, periodicals, or reference books. Assistive technology and

universal design interventions must recognize the array of information sources and formats commonly used in classrooms.

Digital text

Regardless of the source of the original text, to make the curriculum accessible, it is essential to obtain the information in a digital format. In the case of the teacher-created handout, it should be relatively easy to obtain the word processing file that was used to create the document. Obviously, Web sites, some periodicals, and on-line ready-reference documents are already in digital format. Many literature texts <promo.net/pg/> and historical documents <www.loc.gov> are in the public domain and the full text can be downloaded.

Persuading commercial publishers of the necessity of digital text for struggling readers is an on-going effort. Ideally, textbook publishers will provide digital copies of reading materials as part of the textbook adoption process. A new development seeking to exchange digital texts is an extremely promising initiative <www.bookshare.org>. However, without systematic support to access digital text, print documents must be scanned using optical character recognition (OCR) software in order to obtain a digital version of the information.

Once we have a digital version of a reading assignment, we can utilize one or more cognitive rescaling strategies: executive summaries and rebus-enhanced texts.

Cognitive rescaling strategy# 1 executive summaries

Background

Busy executives and other decision makers have long relied on a technique called the Executive Summary. Simply, an executive summary is a two to three page summary of the key issues extracted from a report hundreds of pages long. The rationale is that if someone is too busy to read an entire report, reading the executive summary will provide them with a descrip-

tion of the most important issues, findings, and recommendations.

Procedure

Microsoft Word includes a feature for creating executive summaries. As a result, this tool can be used to create summary versions of any text document. The following description will highlight step-by-step directions for accessing and using this tool.

1. To begin, you'll need a text document. As an example, I've copied a paragraph from a page on water and life in the section, "Our Planet," from the Windows on the Universe Web site <www.windows.ucar.edu/tour/link=/earth/Water/overview.html>, opened Microsoft Word, and pasted the text into a new document file (see Figure 2).

2. Under the Tool menu, select: AutoSummarize (see Figure 3).

3. Figure 4 illustrates the window that appears after AutoSummarize has been selected. The first section, "Type of Summary," offers four possibilities for viewing your executive summary. The first option provides a slider for users to interact with the percentage of the summary and view highlighted information that will be included (non-highlighted text will be left out of the executive summary). The second option creates a new document with the summary. The third option inserts the summary at the beginning of the document. The fourth option hides the text of the original document and includes the summary. The second section, "Length of Summary" allows users to select three types of lengths for their executive summary: predetermined number of words (100 or less, 500 or less), predetermined number of sentences (10 or 20), or a percentage of the original text (10, 25, 50, 75).
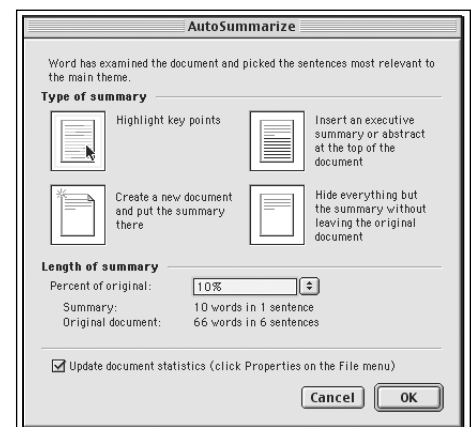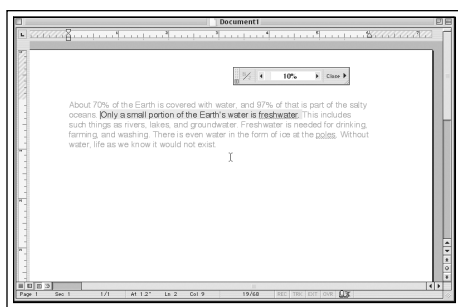
Figure 3

Figure 4

Figure 5

4. In our example, we've selected a summary length of 10 percent and the first type of summary (see Figure 5). Review the content of the paragraph we selected in Figure 2. Notice that a 10 percent summary of the key information in that paragraph has been reduced to: "Only a small portion of the Earth's water is freshwater. " Experimenting with the slider will visually reveal how increasing or decreasing the percentage of the summary will add or delete text.

5. After you have interacted with the text and selected the optimal size for the executive summary, return to AutoSummarize, repeat step 2, and select the second option: create a new document and put the summary there (see Figure 4). Your executive summary will now appear in a new file. Save the file containing your executive summary. Print and distribute to individual students as needed. Check your watch: this entire process has only taken a few minutes!

Application

Microsoft Word's AutoSummary is an easy-to-use, and timesaving tool. It works on text documents of any length (i.e., paragraph, chapter summary, or entire book). This intervention appears to have important implications for teachers, students, and curriculum developers. Operation of the interactive slider is so easy that it may be appropriate to teach some students to modify their own reading assignments. When this intervention is used by students, it may offer significant metacognitive benefits as the individual thinks about their needs, evaluates their current knowledge, and creates cognitively rescaled instructional materials.

Cognitive rescaling strategy #2
Rebus-enhanced texts

Background

Rebus is an instructional strategy used with emerging readers that involves substituting pictures for words. This helps beginning readers develop reading fluency in situations where they may encounter words beyond their emerging decoding skills. Over time, students develop a picture vocabulary knowledge that bridges their understanding of text. To view examples of rebus reading materials, visit: Rebus Rhymes <www.enchantedlearning.com/rhymes.html>.

Several software products are designed to create picture-enhanced reading materials: Kids Media Magic 2.0 <www.sunburst.com>, Picture It <www.slatersoftware.com>, and Writing with Symbols 2000 <www.mayer-johnson.com>. Readers are encouraged to explore each of these tools to consider their potential for facilitating the process of converting text-based information into rebus reading materials for students with very low reading abilities.

Procedure

The following description will highlight step-by-step directions for accessing and using Picture It to make rebus-enhanced reading materials.

1. To begin, we'll need a text document. I'll use the same paragraph from the previous example (see Figure 2). I've copied the text from Microsoft Word and pasted it into the Story Text box in Picture It (see Figure 6).

2. Under the Edit menu, select Parse the text (see Figure 7). This activates a database review of each word in the Story Text box.

3. After a few seconds, the text is displayed in the main window along with the images of any words that were found in the database. As a result, we now have a picture-enhanced version of our text information (see Figure 8) that can be used to support the efforts of some struggling readers.

4. After reviewing the results, additional pictures can be assigned to individual words using a manual process that is accessed under the Edit Menu; click on Target Words (see Figure 9). In this example, I have assigned the picture for water to the term "freshwater" since they are very similar
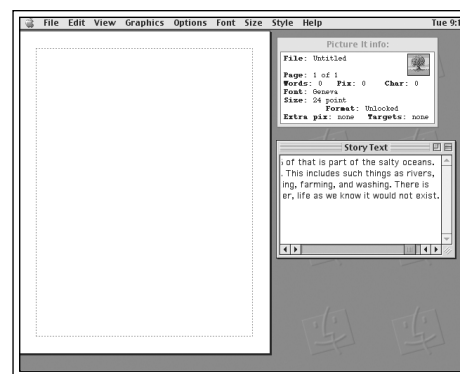

Figure 6

concepts. Any image (i.e., clip art, photos, logos, etc.) can be brought into the program and assigned to specific words, such as a digital picture of a student paired with his/her name.

5. Save the file. Print and distribute to individual students as needed. Like the first strategy, this entire process has only taken a few minutes!

Application

The use of Picture It! to create rebus-enhanced reading materials is a powerful and easy-to-use strategy for helping struggling students independently read material that otherwise may not be available to them. Whereas only a few students in a class may need this level of support, rebus-enhanced text may prove to be an important transitional strategy. This example highlights the ease and efficiency of the process of creating rebus-enhanced reading material.

Implications of cognitive rescaling

To-date, most efforts to make the general education curriculum accessible have focused on enabling students to listen to information when they are unable to read
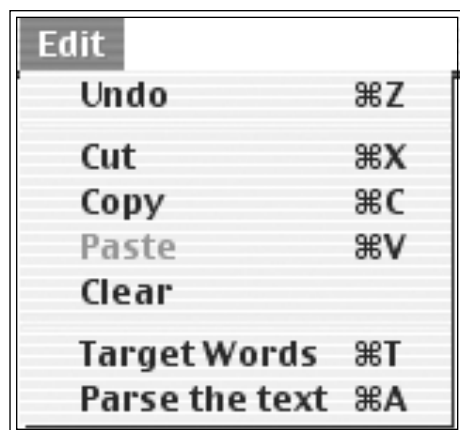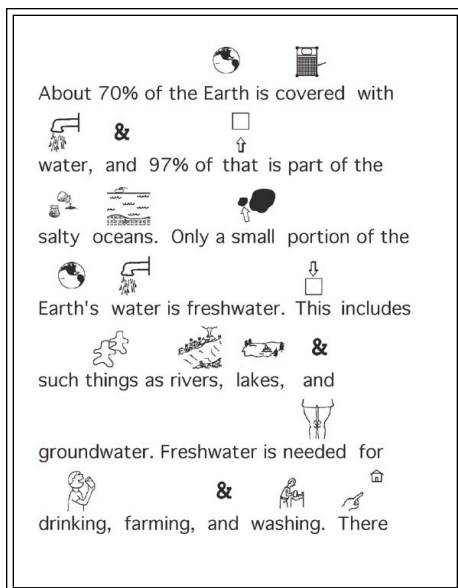

Figure 7

About 70% of the Earth is covered with water, and 97% of that is part of the salty oceans. Only a small portion of the Earth's water is freshwater. This includes such things as rivers, lakes, and groundwater. Freshwater is needed for drinking, farming, and washing. There

Figure 8

Figure 9

it (i.e., text-to-speech). The traditional method of creating cognitively simplified versions of text documents, like textbook chapters, has required teachers to first read an assigned reading and then create summaries in their own words. Obviously, the traditional process has been labor and time intensive, given the lack of powerful tools.

The two examples of cognitive rescaling described in this article suggest ways in which technology can be used to automate and facilitate the process of altering the cognitive difficulty of text so that information can be made accessible for students who lack grade-level reading skills. Indeed, these interventions have significant potential for expanding the palette of tools available for responding to academic diversity.

The benefit of cognitive rescaling for teachers and curriculum developers is that it is efficient to make instructional materials which anticipate the diverse cognitive abilities found in every classroom. The metacognitive value for students, as students are taught to manipulate text using cognitive rescaling strategies, needs to be studied.

The value and full potential of the cognitive rescaling strategies outlined in this article remains to be demonstrated through research and classroom application. However, widespread access to Microsoft Word and the ease of use of Picture It suggest that these interventions can be readily taught to students for use as cognitive prostheses, a form of assistive technology. A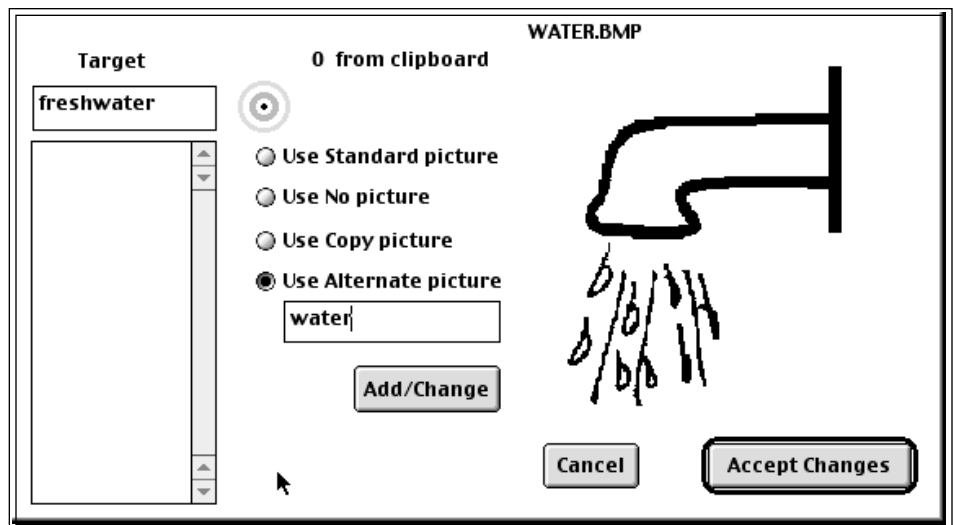dditionally, the value of these strategies to help all students when they encounter difficult texts requires exploration of the universal design applications of these interventions. Tools that enable teachers to create cognitive rescaled materials have the potential to radically alter the 21st century teachers' toolbox.