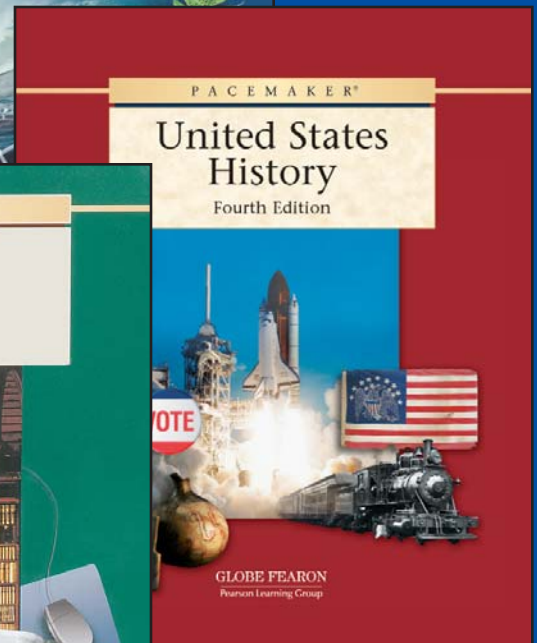
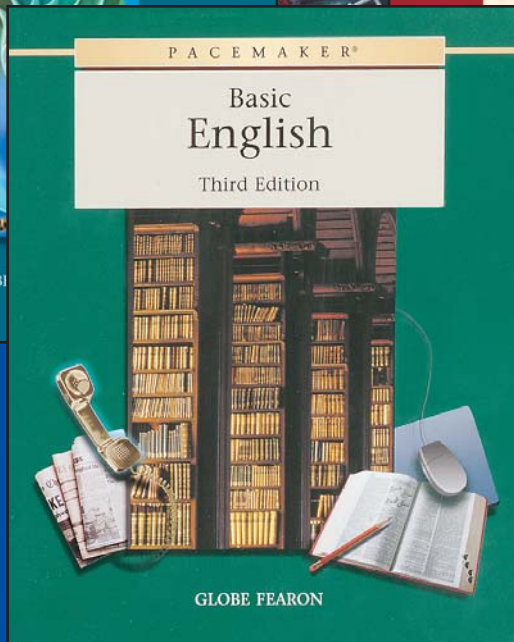
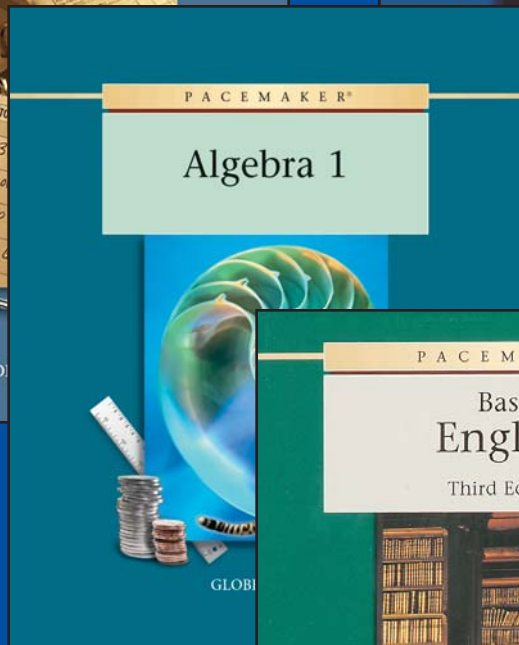
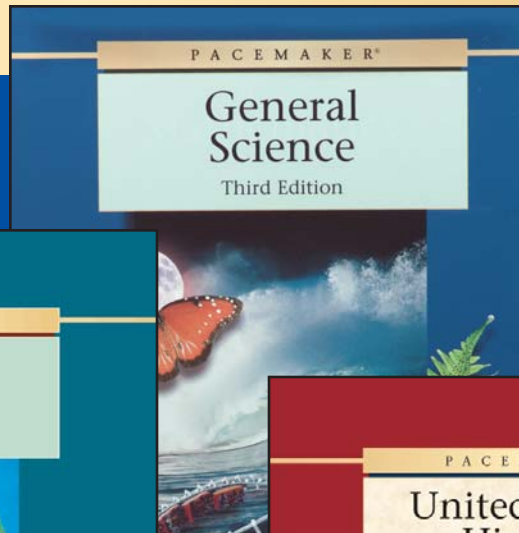
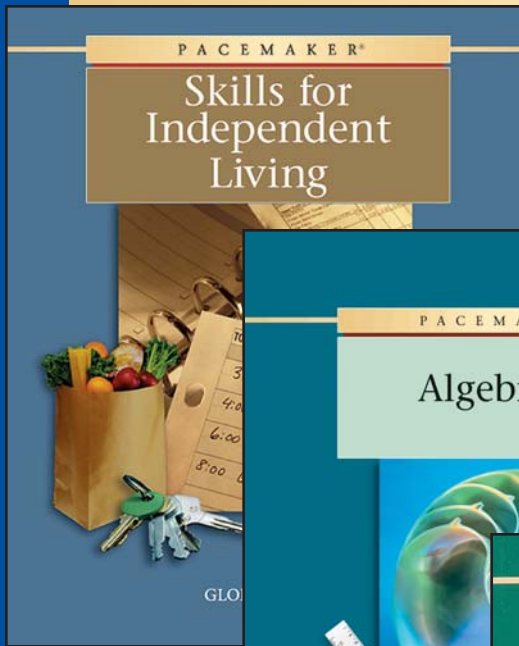


P A C E M A K E R[®]

Research Paper



Written by
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Center for Performance Technology
Florida State University



Pacemaker[®]

Research Paper

**Written by Dr. Marty Beech
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Introduction

Pacemaker® curriculum embodies an instructional design and pedagogy that enhances core content instruction for students with special needs including English language learners and struggling readers. The philosophy of this program is to provide students with a text that they can read and navigate successfully. Required content is made accessible through a controlled reading level, strong vocabulary instruction, extensive practice and review, and frequent opportunities for assessment. The depth of coverage, instructional design, and pedagogy have been specifically designed and improved

over time to enable special needs students to meet academic content standards.

In its current form today, *Pacemaker*® curriculum has features designed to provide relevancy for special needs students. Concepts are tied to everyday skills and to attainable occupations in order to motivate students who need to succeed on a basic level in their courses. The program offers teachers flexible support that allows the content to become more challenging and meet the needs of individual students.

The Pacemaker® Curriculum	
<p>Language Arts</p> <p><i>Pacemaker</i>® Practical English <i>Pacemaker</i>® Basic English <i>Pacemaker</i>® English Composition <i>Pacemaker</i>® American Literature <i>Pacemaker</i>® World Literature</p> <p>Mathematics</p> <p><i>Pacemaker</i>® Practical Mathematics <i>for Consumers</i> <i>Pacemaker</i>® Basic Mathematics <i>Pacemaker</i>® Pre-Algebra <i>Pacemaker</i>® Algebra 1 <i>Pacemaker</i>® Geometry</p> <p>Science</p> <p><i>Pacemaker</i>® General Science <i>Pacemaker</i>® Biology</p>	<p>Practical Arts/Daily Living</p> <p><i>Pacemaker</i>® Careers <i>Pacemaker</i>® Computer Literacy <i>Pacemaker</i>® Skills for Independent Living</p> <p>Health</p> <p><i>Pacemaker</i>® Health</p> <p>Social Studies</p> <p><i>Pacemaker</i>® American Government <i>Pacemaker</i>® Economics <i>Pacemaker</i>® United States Geography <i>Pacemaker</i>® United States History <i>Pacemaker</i>® World Geography and Cultures <i>Pacemaker</i>® World History</p>

Research Support for the Pacemaker® Curriculum

Pacemaker® curriculum materials are designed for students with special needs in middle and high schools. The content aligns with the core academic requirements of secondary school programs. The pacing and concept density lets students focus on major concepts and skills, and explicit strategy instruction provides a way for students to learn how to apply new information and skills.

The success of the *Pacemaker*® curriculum is based on the interaction of two key factors: the textbooks and materials used by students and the instructional strategies and assessment procedures provided for teachers. The research that supports the design of the *Pacemaker*® curriculum is based on research on the characteristics of text and instructional design.

These factors are aligned with the valid and reliable list of desirable attributes of instructional materials established by McAlpine and Weston (1994). The list is organized into four categories: 1) instructional design—pedagogical attributes including the objectives, sequencing, and alignment of evaluation with objectives; 2) language—the semantic and syntactic structures, including complexity of sentence structure and vocabulary; 3) presentation—physical attributes of materials, including text, layout, and graphics; 4) subject matter—knowledge structure of the domain, content accuracy, comprehensiveness, and recency.

“Texts can be difficult or easy, depending on factors inherent in the text, on the relationship between the text and the knowledge and abilities of the reader, and on the activities in which the reader is engaged.”

— Snow, 2002, p. 14

The Need for High-Quality Educational Materials

Students in special education programs, English language learners, and others groups of at-risk students may lack the necessary proficiency in basic reading and study skills to successfully complete the requirements of academic courses in secondary school programs. Students with learning disabilities have been found to process information inactively and have difficulty ignoring irrelevant associations. In addition, their lack of background and general word knowledge is confounded by their insufficient awareness of important features of text structure that aid comprehension. Students with special learning needs also frequently display insufficient motivation to persist in learning activities (Gersten, Williams, Fuchs, and Baker, 1998).

The need for high-quality instructional materials for students with special learning needs is well documented (Anderson and Armbruster, 1984, 1986; Armbruster and Anderson 1988; Chambliss, 1994; Tyree, Fiore, and Cook, 1994). Many textbooks are poorly organized, have a high readability level, and contain inadequate features to support learning or interest in the content.

In 1985 the U.S. Department of Education, the Education Development Center, and the RMC Research Corporation began a project (as cited in Ciborowski, 1992) to improve textbooks for students experiencing learning problems. Teachers analyzed 12 widely used social studies and science textbook programs, looking for effective instruction for students with special learning needs and text features that enhance comprehension. In general, they found that textbooks failed to reflect effective methods of instruction. Secondary books seldom included organization, study, or test-taking strategies. They also found that textbooks did not integrate

structural features known to facilitate comprehension, organization, and recall.

Tyree, Fiore, and Cook of the Research Triangle Institute in North Carolina stress that today's textbooks are designed for the above-average reader, and many pose difficulties for the average student as well as for students with special needs. Problems noted by these researchers include poor directions and poor sequencing of activities, lack of instructional support for difficult-to-teach topics, information with errors, presentations that lead to misconceptions, dense concentration of new information, underdeveloped ideas, and high vocabulary loads (1994).

In a synthesis of research on text organization, the National Center to Improve Tools of Educators (NCITE) indicated that although research suggests that textbook organization affects reading comprehension, evaluations of textbooks have found that many are poorly written. For example, Kinder and Bursuck reviewed critiques by six different groups of evaluators of social studies textbooks and concluded that many social studies books were poorly written and incoherent and often failed to use precise language or clarify the relationships between concepts and ideas. Scruggs and Mastropieri reported similar problems with science texts and concluded that the science texts offered extensive coverage of content but little opportunity for in-depth practice of important concepts. Poorly written textbooks add to the comprehension difficulties of poor readers, particularly in remembering content, organizing information, identifying main ideas, and discriminating between relevant and irrelevant information (Dickson, Simmons, and Kame'enui, 1998).

Mathematics textbook programs are also problematic. The number of instructional

examples and the organization of practice activities are frequently insufficient for low-performing students to achieve mastery. Insufficient numbers of examples can also lead to a second deficiency: inadequate sampling. When examples do not address the full range of critical variables, student learning may result in incomplete or erroneous conceptualizations. The lack of explicit instruction in mathematical concepts and skills and insufficient attention to the hierarchical sequencing of content can potentially make the learning of mathematics more difficult for students with special needs (Jones, Wilson, and Bhojwani, 1997).

Studies by authors such as DeFord, Eckoff, Gourley, and Rhodes report that textbooks that have been adapted to control the readability level are generally criticized for using stilted language and a reduced quality of writing (as cited in Tyree et al., 1994). A strict reliance on readability formulas can also adversely affect comprehension. The exclusive use of short sentences can result in the omission of connective words that explicitly describe the relationship between ideas expressed in complex sentences. The short sentences are actually harder to understand because the reader must determine the relationship implied by both sentences (Armbruster and Anderson, 1988; Chambliss, 1994).

“Texts at an appropriate instructional [reading] level may be rejected as too babyish by older learners; paradoxically, texts that seem too difficult may be read successfully if the topic is sufficiently interesting and relevant to the learner.”

— Snow, 2002, p. 26

Textbook programs are developed to provide information to students and to enable them to acquire and apply new knowledge

and skills. Armbruster and colleagues first introduced the concept “considerate text” to call attention to the need to provide text that is specifically designed to enable the reader to gather needed information with minimal cognitive effort. “Inconsiderate text” requires more effort, more skill, and access to prior knowledge to comprehend.

Factors that contribute to considerate text include structure (organization), coherence, unity, and audience appropriateness (Anderson and Armbruster 1984, 1986; Armbruster and Anderson, 1988). In a recent review of research examining the relationship between text organization and comprehension of students with diverse learning needs, Dickson, Simmons, and Kame’enui concluded that, “Well-presented physical text enables readers to identify the relevant information in text, including main ideas and relationships between ideas” (1998, p. 245). They found evidence to show that students who were aware of the structure of text used that structure to both organize and increase recall. Goldman and Rakestraw (2000) explain that acquiring information from print requires that individuals process the meaning of words and phrases within the text itself and within their own preexisting knowledge base. Readers use both knowledge-driven and text-driven processes to comprehend print material.

“Meaning resides in the intentional, problem-solving, thinking processes of the reader that occur during an interchange with a text. The content of meaning is influenced by the text and by the reader’s prior knowledge and experience that are brought to bear on it.”

— National Reading Panel,
2000, p. 4–5

Text Characteristics

A print-based instructional program like the *Pacemaker*® curriculum is designed and developed with deliberate attention to the text characteristics. Text characteristics can be described in terms of three components: subject matter, or content; language; and presentation and physical appearance. Subject matter must be appropriately organized with an explicit structure. The content must reflect coherence and unity of ideas and must be accurate and current. The language must include sentences with understandable syntax; vocabulary that is familiar or explained within the text; and text that is written with necessary redundancy, consistency, clarity, and conciseness. The presentation of the text must incorporate an understandable layout, titles and headings, illustrations, and graphics that serve to facilitate the visual reading process and alert the reader to particular aspects of meaning.

Structure and Organization

The structure of ideas in text is related to the discourse genre and the author’s purpose. Structure is simply described as the way the ideas and events are organized within the text. The discourse genre used in most content area textbooks is expository. Structures found in expository text include description, definition and example, temporal or procedural sequence, cause and effect, problem and solution, and comparison and contrast. Structure that is easy to use includes explicit references to the nature of the relationship connecting the ideas (Anderson and Armbruster, 1984; Armbruster and Anderson, 1988; Ciborowski, 1992, Dickson, Simmons, and Kame’enui, 1998; Snow, 2002).

The structure of the text should reflect the underlying conceptual structure of the content. When they are not aligned, the text is more difficult to comprehend. When readers

are less familiar with the content and have limited background knowledge, they become more dependent on explicit cueing of the structure (Anderson and Armbruster, 1984; Goldman and Rakestraw, 2000).

A consistent finding in reading comprehension research is that text with a clear structure and well-organized content is more easily comprehended by readers, particularly low-performing readers. For example, Meyer, Brandt, and Bluth found that ninth graders who identified the structure of the text and used the structure as the basis of their recall could remember more from a passage than those who hadn't. Even normally achieving readers have difficulty with text that has unclear structure (as cited in Dickson, Simmons, and Kame'enui, 1998). Horton found that students reading on grade level had difficulty identifying implicit main ideas and the relationship between concepts and information in the passage (as cited in Dickson, Simmons, and Kame'enui, 1998). Students with learning disabilities are frequently distracted by irrelevant text elements and focus their attention on ideas based on personal interest or on a sentence-by-sentence basis (Seidenberg, 1989).

Readers are given explicit information about the organization of the text through the use of consistent and predictable formats. Thorndyke noted that readers learn about the structure through early presentations and come to expect it (as cited in Armbruster and Anderson, 1988). Authors use a variety of mechanisms to explicitly convey structure to the readers. Readers often use headings to predict content or to form self-questions to guide their comprehension. A variety of signaling devices can emphasize certain aspects of semantic content or aspects of the discourse structure (Anderson and Armbruster, 1988; Goldman and Rakestraw, 2000):

- Explicit statements of the structure or organization
- Preview or introductory statements
- Titles, headings, and subheadings
- Summary statements
- Pointer words and phrases
- Formatting cues such as underlining
Italic and boldfaced type

Although well-organized text structure seems important to reading comprehension, it may not be sufficient to facilitate comprehension. Students vary in their awareness of different expository text structures. Text that follows a temporal or procedural sequence is easier to understand than listing or descriptive structures. Younger readers experience more difficulty with comparison and contrast structures (Dickson, Simmons, and Kame'enui, 1998).

Studies by Zabrocky and Ratner (as cited in Seidenberg, 1989) and Englert and Thomas (1987) have shown that effective readers use strategies linked to their awareness of text structure to identify and recall main ideas and supporting details and to summarize important information from a text, while poor readers do not spontaneously apply these strategies. Poor readers do not appear to regulate their understanding of difficult texts by using look-backs (rereading when they don't understand) or noting inconsistencies in ideas presented when they are reading.

Coherence and Unity

The coherence and unity of ideas is another important text characteristic. "More cohesive text is read faster and remembered better because it helps readers construct a coherent model or interpretation of the text. When an incohesive text makes this difficult, readers

spend extra time and cognitive energy to remediate the problem” (Anderson and Armbruster, 1986, p. 160). McNamara, Kintsch, Songer, and Kintsch (1996) looked at the differential effects of coherent text on low-knowledge and high-knowledge readers. They found that learners with appropriate background knowledge more actively processed text that required inferences. Low-knowledge readers could not fill in the gaps when text was too difficult.

Coherence operates on both a global and a local level. On a global level, it facilitates the integration of the major concepts and ideas across the entire passage or document. Titles, visual displays, diagrams, and consistent use of signaling and formatting elements contribute to global coherence (Anderson and Armbruster, 1984; Armbruster and Anderson, 1988; Ciborowski, 1992).

Features of text that increase local coherence and facilitate comprehension function as organizational aids. They include verbal or linear formats designed to focus the reader’s attention, preview statements of goals and objectives, explicit statements of steps and procedures, embedded questions, and written conclusions and summaries. Luiten, Ames, and Ackerman found that these features are most helpful for children without background knowledge; Peleg and Moore reported similar findings for students with disabilities (as cited in Tyree et al., 1994). Each idea in the text should contribute directly to the fulfillment of the author’s purpose. Text should address one purpose at a time and not stray from the purpose by including irrelevant and distracting information. Explicit captions or descriptions should support the use of graphics (Tyree et al., 1994).

Text Structure and Coherence in <i>Pacemaker</i>® Curriculum		
Research-Based Principle	<i>Pacemaker</i>® Component	<i>Pacemaker</i>® Practice for Research-Based Principle
<p>External Alignment Structure is aligned with discipline. The sequence of ideas within the text is predictable according to conventional or standard wisdom.</p>	<ul style="list-style-type: none"> • Correlation to Standards, Classroom Resource Binder (CRB) • Table of Contents, Student Edition (SE) 	<ul style="list-style-type: none"> • The content is developed to reflect state and national standards and on-level texts. • For example, history titles follow a chronological sequence; <i>General Science</i> includes the nature of science, life science, physical science, and Earth science.
<p>Organization and Structure of Content Topics are ordered systematically and follow the structure of the discipline or content logically. Supporting details are arranged in recognizable patterns. Students with limited background knowledge benefit from an explicit structure.</p>	<ul style="list-style-type: none"> • Writer’s Guidelines • Table of Contents, SE • Margin Notes, SE • Getting Started, Teacher’s Answer Edition (TAE) 	<ul style="list-style-type: none"> • Skills and concepts are deliberately sequenced to ensure students have the knowledge and skills they need. • Background knowledge is not assumed. • Both Student and Teacher’s Editions provide explicit statements or hints to aid recall.

Text Structure and Coherence in <i>Pacemaker</i>® Curriculum (Continued)		
Research-Based Principle	<i>Pacemaker</i>® Component	<i>Pacemaker</i>® Practice for Research-Based Principle
<p>Concept Density The text addresses one purpose at a time.</p>	<ul style="list-style-type: none"> • Writer’s Guidelines • Chapters & Lessons, SE 	<ul style="list-style-type: none"> • The depth of coverage is one concept per lesson.
<p>Explicit Signaling of Structure Opening paragraphs or other introductory material describes the organization of the content.</p>	<ul style="list-style-type: none"> • Writer’s Guidelines • Learning Objectives, SE 	<ul style="list-style-type: none"> • The titles, headings, and subheadings act as interesting lead-ins to a change of topic or as predictors of new content. • Learning objectives outline the sequence of chapter content.
<p>Global Coherence The author’s topic, purpose or question, and structure are readily apparent to reader in the titles, headings, and/or topic sentences.</p>	<ul style="list-style-type: none"> • Writer’s Guidelines • Unit Opener, SE • Chapter Opener and Objectives, SE 	<ul style="list-style-type: none"> • Unit title includes a list of chapters: numbers and titles. • Chapter opener includes a photograph, the learning objectives, a vocabulary, and a project.
<p>Local Coherence Main ideas are explicit and clear and located at the beginning of the section and paragraphs. Topic sentences alert the reader to the organization of the paragraph. Irrelevant and distracting information is not included in the text.</p>	<ul style="list-style-type: none"> • Writer’s Guidelines • Special Features: Content Connections, Content On-the-Job; Content in Your Life, SE 	<ul style="list-style-type: none"> • Paragraphs must have clear topic sentences and supporting details. • Special attention is given to connecting topics. Relevant information is provided in boxed features, so that it does not distract from the main focus of the lesson.

Language

The language of the text involves attributes such as vocabulary, syntax, clarity, and appropriateness for the audience. Readability research has identified two related factors—vocabulary difficulty and syntactic complexity—as related to the difficulty of text (Snow, 2002). In spite of the warnings about the use of readability formulas, textbooks designed for poor readers must use vocabulary and sentence structures that can be easily understood by students (Beech, 1983).

Vocabulary

Instructional materials should include vocabulary that is appropriate for the reading level of the intended population. Core vocabulary lists, such as those developed by Fearon (1980) for the original *Pacemaker*® books, can be used to ensure that students can read and understand terms in the text. However, for content-area textbooks, new terms must be introduced, defined, and elaborated in context. Learning new vocabulary is an important aspect of understanding new information.

Individual differences in vocabulary knowledge have been attributed to generalized linguistic deficiencies, memory deficits, and poor word-learning strategies. Vocabulary development in adolescence continues throughout high school years, with increased ability to define words, use of idioms, and use and comprehension of connectives. Poor readers may lack the confidence in decoding or vocabulary knowledge to figure out the meaning of unknown words on their own. Research on ways to reduce the gaps that exist in vocabulary knowledge and skills among adolescents is limited (Baker, Simmons, and Kame'enui, 1998; Curtis, 2002).

The National Reading Panel (NRP) (2000) states that a word must be in the learner's oral vocabulary in order for it to be understood in print. The NRP analysis of research shows that vocabulary instruction does lead to gains in comprehension. Vocabulary can be learned through incidental encounters with language through listening and reading, although repeated exposure to vocabulary terms is essential. NRP also found that pre-instruction of vocabulary before reading the words in context can facilitate vocabulary acquisition and comprehension. Beck and McKeown report that Jenkins, Stein, and Wysocki found that six to ten encounters were required for fifth-grade students to learn the meaning of words unless they were exposed to definitions prior to reading a passage. Then two encounters were sufficient (as cited in Baker et al., 1998).

Sentence Structure

The effect of syntax on sentence processing has been well documented in research in psycholinguistics. The simplest gauge of sentence difficulty is the number of words in the sentence (Beech, 1983). Wiig and Semel (1980) suggest that passages written for students above a third-grade reading level should contain sentences with eight to ten

words. Sentences with complex syntax may present comprehension problems for readers. Explicit semantic and syntactic cues emphasize and identify the relationships between important ideas. They carry meaning across phrases, clauses, and sentence boundaries. Noncontent signal words, such as *first*, *second*, and *finally* are used to indicate sequence where as terms such as *in contrast*, *but*, and *similarly* indicate comparison and contrast. Halliday and Hasan report that words or phrases that make temporal, causal, spatial, or conditional relationships explicit assist readers at a local or surface level (as cited in Goldman and Rakestraw, 2000). Readers also make assumptions or predictions of meaning based on the order of words and phrases in sentences (Goldman and Rakestraw, 2000). Sentences written with a left-embedded syntax using introductory clauses, prepositional phrases, and/or qualifiers preceding the main verb are difficult to process. Struggling readers may misinterpret the meaning of these types of sentences because they interpret the meaning as it is reflected in the order of the words (Snow, 2002).

In a summary of research on adolescent reading, Curtis (2002) notes that the incidence of language difficulties or language differences appears to increase among adolescents with reading problems. However, in an analysis of cross-sectional and longitudinal studies of poor readers, Vellutino and Scanlon (1998) concluded that the semantic and syntactic deficits found in older students who are poor readers are highly likely to be the consequence of a reading problem, not the cause. Second language learners who are poor readers may function as if their languages are separate and unrelated (Jiménez, 1997). Successful bilingual readers seem to understand the relationship between literacy systems and apply their literacy knowledge and abilities

Language in Pacemaker® Curriculum		
Research-Based Principle	Pacemaker® Component	Pacemaker® Practice for Research-Based Principle
<p>Choice of Vocabulary Meaning of new terms is introduced prior to reading the text. Vocabulary can be learned from incidental encounters through listening and reading. Students need multiple exposures to new words in context to learn new vocabulary.</p>	<ul style="list-style-type: none"> • Writer's Guidelines • Words to Know, SE • Notations for English Language Learners, TAE • Vocabulary Activities in ESL/ELL Teacher's Guide 	<ul style="list-style-type: none"> • Words to Know are listed in the order in which they appear in the chapter. • On first appearance in the lesson, vocabulary words are shown in boldfaced type in the same case, tense, and form as in the Words to Know list. They are defined within context in the lesson. When used in running text, each word is more fully explained. Vocabulary is repeated in the glossary. • Use of unfamiliar words that are not targeted vocabulary is limited. • Words from common usage that are above <i>Pacemaker®</i> level are replaced by simpler synonyms. Idioms are avoided. • Vocabulary building activities that focus on high-frequency academic words, idioms, and expressions are included for English language learners.
<p>Complexity of Sentence Structure Sentences with complex syntax present comprehension problems for readers. Sentences written with a left-embedded syntax using introductory clauses, prepositional phrases, and/or qualifiers preceding the main verb are difficult to process. Explicit semantic and syntactic cues emphasize and identify the relationships between important ideas. Consistency in usage facilitates understanding.</p>	<ul style="list-style-type: none"> • Writer's Guidelines 	<ul style="list-style-type: none"> • Text is written in simple, direct language, using the active voice. Complex sentences are used sparingly, although writers are cautioned to avoid sequences of short, choppy sentences. Modifiers are included only when they are essential for the meaning of the sentence. • Direction lines are consistently worded throughout the series. • The wording of the steps stays constant from example to example in a lesson and from lesson to lesson in a chapter.
<p>Appropriateness for Audience Readability is influenced by readers' knowledge of vocabulary, sentence length and complexity, text structure and coherence, and interest.</p>	<ul style="list-style-type: none"> • Writers' Guidelines 	<ul style="list-style-type: none"> • All material should be written at a 3.5–4.0 reading level, using a controlled vocabulary but allowing that a word, once defined, does not raise the reading level in subsequent appearances.

from one language to the other (Jiménez, García, and Pearson, 1996).

Presentation

The appearance of textbook and related instructional materials is a critical aspect of textbook design. The *Pacemaker*® curriculum is intended for secondary students with diverse learning needs. Textbooks must look and feel like those used by typical peers. Low-performing students do not favor adaptations to materials because the adaptations may call attention to their learning deficiencies (Schumm, Vaughn and Saumell, 1992).

The presentation, or physical features, of the text includes the page layouts, font, marginal notations, graphic representations (diagrams, illustrations, symbols), use of highlighting, color, and technical quality. This discussion focuses on the roles of layout, formatting, and graphic representations in assisting comprehension by signaling structure and cuing meaning, activating background knowledge, and motivating the learner.

Formatting and page layout should provide explicit clues to the organization of the text (Armbruster and Anderson, 1988). The con-

sistent use of a particular structure aids readers, in that readers come to expect that ideas will be organized in a particular manner (Anderson and Armbruster, 1986).

Hare et al. and van Kijk and Kintsch note that visual signals including highlighting, use of boldfaced or Italic type, and use of color guide readers through subject matter by stressing important information. On the other hand, Garofalo found that typographic cues can be confusing and distracting and recommended that no more than two be used on the same page (as cited in Tyree et al., 1994).

Features in text that activate background knowledge can facilitate comprehension. Text and visuals that help the reader make connections to prior experiences or world situations can serve this purpose. Graphics and photographs and their captions should support important concepts within the text. Woodward warns, “There is no necessary connection between bountiful and pretty illustrations and learning. Rather, studies have suggested that many illustrations fail to enhance learning” (quoted in Tyree et al., 1994, p. 134).

Presentation in <i>Pacemaker</i>® Curriculum		
Research-Based Principle	<i>Pacemaker</i>® Component	<i>Pacemaker</i>® Practice for Research-Based Principle
<p>Predictable Format The consistent use of a particular structure aids readers.</p>	<ul style="list-style-type: none"> • Unit Introduction, SE • Chapter Opener, SE • Chapter Lessons, SE • Chapter Review, SE 	<ul style="list-style-type: none"> • The general layout and presentation is similar for all textbooks. • Chapter objectives and vocabulary are consistent features of a chapter’s opening spread. • A chapter review is connected visually to the chapter opener. All chapter reviews have a vocabulary review and a chapter quiz. • A chapter summary and/or activity, or project, are also features of chapter review.
<p>Typeface, Layout, and Color Color is used sparingly and with a purpose that is clearly explained. Color is used to enhance or highlight a display and promote discrimination between elements.</p>	<ul style="list-style-type: none"> • <i>Pacemaker</i>® program design 	<ul style="list-style-type: none"> • The typeface is readable in size and in character shape. Labels and leaders are positioned in an orderly way, and leaders do not cross one another. • A single column of text, 4 inches wide is used, which is easy for the eye to travel across. • Color and lines guide readers across or down charts and tables. Paragraphs are not separated with art. Images are positioned near the applicable text. • Color is used to support instruction to emphasize important points or to help the reader connect ideas.
<p>Visual Signals for Structure and Meaning Titles and headings clarify the text and guide readers.</p>	<ul style="list-style-type: none"> • Writers’ Guidelines • <i>Pacemaker</i>® program design • Margin Notes, SE 	<ul style="list-style-type: none"> • Subsection heads act as interesting leads to a change of topic or as previews of the new content. • A library of graphic elements is adapted to each title. • Whenever possible, visual aids are used to replace long text explanations. • Margin notes in the side column are used as an aid for furthering understanding. They appear next to the text they are “helping.”

Presentation in <i>Pacemaker</i>® Curriculum (Continued)		
Research-Based Principle	<i>Pacemaker</i>® Component	<i>Pacemaker</i>® Practice for Research-Based Principle
<p>Supportive Graphics, Illustrations, and Visuals Graphics, illustrations, and visuals accomplish what running text cannot. Captions that accompany graphics and illustrations serve as links to prior knowledge or serve to activate learners.</p>	<ul style="list-style-type: none"> • <i>Pacemaker</i>® Program Design 	<ul style="list-style-type: none"> • When appropriate, each lesson contains visual representations of material that not only teach but also allow students to extract information. • All art is included to instruct. Contemporary, sharp, readable photos are used. The main focus must be easily identifiable. • Logos and brand names are eliminated. • Captions accompany all photos, and tag lines must be included for art, along with labels. • Study questions follow graphics and visuals (for example map study questions) to reinforce comprehension.
<p>Presentation and Style The overall appearance of media should be appropriate for the intended audience.</p>	<ul style="list-style-type: none"> • <i>Pacemaker</i>® Program Design 	<ul style="list-style-type: none"> • The color palette was chosen for a mature and sophisticated look. • People of high school age or older are shown. Younger people are shown only in a family situation. Photos also show a balance in gender and ethnicity/races and do not show a subject relating to war, gambling, drugs, or violence. • Cartoon illustrations are not used unless the style is very sophisticated, because the books are not designed for a young audience. Political cartoons are the exception.

Instructional Design

Instructional design refers to the pedagogical attributes of an instructional program and includes features such as objectives, instructional strategies, sequencing, assessment procedures, and alignment and integration of elements based on the needs of the intended audience. This section describes the research base that supports the instructional design used in the *Pacemaker*® curriculum.

In print-based instructional material, the characteristics of the text are also key elements of the instructional design. The organization and structure of the content, the explicit signaling of the structure, the selection of vocabulary and syntax, and the use of predictable format and instructive graphics contribute to the effectiveness of the instructional approaches incorporated in the *Pacemaker*® curriculum.

Target Audience

The primary audience of the *Pacemaker*® curriculum includes special-needs students at the middle school and high school level, at which placement occurs in a variety of settings, such as mainstreamed classes, self-contained classes, resource rooms, etc. Secondary markets are middle school and high school regular education students reading below grade level, as well as English as a second language or English language learners (ESL/ELL) and at-risk students. Many adolescents who read below grade level do not use effective comprehension strategies or text structure, lack vocabulary and word knowledge, and have limited decoding strategies and reading fluency (Gersten et al., 1998; Deshler, Ellis, and Lenz, 1996). Students who are reading below grade level need more intensive and explicit instruction that is highly structured and provides sufficient practice in order to access content subject matter successfully (Bryant, Linan-Thompson, Hamff, Ugell, and Hougen, 2001).

Objectives

The identification of learning objectives is generally the first step in the design of instruction. In this step, the desired outcomes of instruction are specified. The objectives describe what students are expected to know and be able to do, and by inference, determine the necessary prerequisite knowledge and skills. All other components of instructional design, including the materials, instructional strategies, and assessments, must align with learning objectives.

Informing students of the objectives has been found to have a positive impact on student learning. Berliner reports that teachers who communicate goals, structures, and directions for lessons have been found to be more effective in increasing student learning (as cited in Ellis and Worthington, 1994). Pre-

senting objectives at the outset of a lesson makes students aware of the goals of learning and has been shown to increase performance of students. Identifying specific learning objectives serves to elicit the metacognitive function of goal specification, or to enable students to better understand what they are going to learn (Marzano, 1998).

Motivation and Context for Learning

Instructional materials must be designed to get and hold student attention, particularly if the target audience includes students with limited reading skills. High-interest content and interest-enhancing features direct students to what they are expected to learn (Chambliss, 1994; Tyree et al., 1994).

Interest in text is also influenced by the background knowledge of the reader. Features of the text that activate or build upon prior knowledge include preview statements, connections to life experiences, and connections to prior chapters or related information. In addition, text that provides new or unusual information, high action, dramatic verbs, and concrete detail, has also been shown to heighten interest in text. Readers have shown greater interest in text that identifies with characters, uses personal pronouns that speak directly to the reader, and identifies information that will be of personal importance (Tyree et al. 1994). Simply asking students what they know about a topic prior to studying that topic has been shown to increase student learning (Marzano, 1998).

Instructional Sequence

Research on effective teaching reveals that different phases and teaching functions are needed to ensure successful learning by all students. In the Beginning Teacher Evaluation Study, Rosenshine found that effective teachers routinely incorporate an instructional sequence into their content lessons.

They begin the lesson with goal statements, review prior learning, and then present new material in small steps, with practice after each step. Effective teachers give clear and detailed instructions and explanations, provide active and ample practice, and ask questions to check for understanding by all students. Effective teachers also provide guided practice, explicit instruction, and independent practice in order to enable students to attain fluency. Rosenshine emphasized that these steps are particularly important when material is new or when students are young or experience learning difficulties (as cited in Ellis and Worthington, 1994).

A three-phase instructional model that incorporates effective teaching behaviors has been found to be effective for student learning (Ciborowski, 1992; Ellis and Worthington, 1994). In the first phase, a teacher focuses instruction by announcing the purpose and goals of learning, activating prior knowledge, making connections between what is known and what is to be learned, correcting common misconceptions, and teaching students how to preview the text and identify the text structure, i.e., how the “big ideas” fit together. Students learn what they will be doing and why it is important.

In the second phase, direct instruction, guided practice, and activities that promote application and generalization are provided. A teacher models and demonstrates the use of a strategy or process to identify concepts, to carry out the steps of a procedure, or to use a rule or new knowledge to accomplish a goal. Students’ attention is focused on relevant features of the new information. Cues and prompts are provided to promote active engagement and response by students. Guided practice provides students with the scaffolding needed to successfully respond or carry out a procedure. Gersten et al.,

(1998) also indicate that successful instruction for poor readers is characterized by explicit modeling by the teacher, additional opportunities for practice with feedback, skillful adjustment to learners’ levels, and readers’ engagement with the purposes for reading.

The final phase provides additional opportunities for review and practice, this time on a more independent level. Teachers systematically evaluate student learning and provide corrective feedback. Assessment procedures also include extensions to enable students to consolidate and expand knowledge through critical-thinking activities, cooperative learning, and other types of applications.

In a review of high-quality scientifically-based research on mathematics, Dixon, Carnine, Lee, Wallin, and Chard (1998) found support for a multiphase instructional sequence in which the teachers explained and demonstrated math concepts and skills, asked questions, and engaged students in responding and discussions. The second phase gradually reduced learners’ reliance on teacher support (guided practice) and moved learners into more independent and self-regulated practice and application.

Instructional Strategies

The instructional strategies selected for use in the *Pacemaker*® curriculum have been found to be effective with diverse groups of students. These strategies are effective with low-performing students, but they also enhance the learning of all students (Kame’enui and Carnine, 1998). Because of the needs of the targeted student audience, the instruction must support the development of vocabulary and comprehension skills and strategies (content literacy), as well as the learning of new concepts, procedures, and algorithms inherent in the subject matter (McKenna and Robinson, 1990).

Vocabulary Instruction

Instructional approaches to develop vocabulary must match the goals for depth of understanding of word meaning. Isolated work on definitions is not likely to result in an in-depth knowledge of a term, or even in long-term recall. Both independent and teacher-directed word-learning strategies must be used. These strategies may include the explicit instruction of the meaning of the word, coupled with multiple exposures to the word in context, and opportunities for practice and application. Based on a review of research related to vocabulary instruction, Baker et al. (1998) concluded that vocabulary interventions such as semantic/syntactic features analysis, the keyword method, and computer-assisted methods are superior to traditional instructional procedures that focus on transmitting a single definition of a target word.

A meta-analysis of instruction research conducted by Marzano (1998) found four different approaches using direct instruction in vocabulary to be highly effective. These approaches are 1) present students with a definition or description of a target word; 2) have students determine definitions from context; 3) have students generate their own definitions; or 4) use a balanced approach that integrates all three methods. Semantic mapping was also found to be highly effective in vocabulary learning. Multiple exposures to vocabulary are effective, but the effect is enhanced when meanings are discussed with each repetition.

Comprehension Strategies

Students who are poor readers process text with great inefficiency. They may not be aware of the structure of the text, the purpose of the author, or what they expect to learn by reading. Good readers learn to use specific cognitive strategies informally to assist their comprehension. Explicit or formal instruc-

tion on these strategies can lead to improvement in text understanding and information use. The National Reading Panel (NRP) (2000) reports that various instructional practices have a firm scientific basis for improving reading comprehension and recommends that students should be explicitly taught to use specific cognitive strategies to guide them as they read and write. A brief description of the strategies relevant to the *Pacemaker*® curriculum follows.

Question answering Students answer questions posed by a teacher and are given feedback. This strategy is effective, particularly when used in combination with other strategies (NRP, 2000, Marzano, 1998).

Graphic and semantic organizers Students create a visual representation of the meanings and relationships of the ideas in the text. Examples include tree diagrams, semantic maps, flowcharts, and timelines. Semantic mapping has been shown to be an effective technique to help students generate some type of internal representation for new knowledge (Marzano, 1998). Dickson, Collins, Simmons and Kame'enui (1998) concluded that graphic organizers and semantic maps help students differentiate important from unimportant ideas and comprehend relationships among ideas.

Strategy instruction Teaching students to use metacognitive (learning) strategies to guide and regulate their own learning has been proven to be very effective, particularly for low-performing students (Bos and Anders, 1992; Dickson, Collins, Simmons and Kame'enui, 1998; Curtis, 2002; Deshler, et al., 1996; Gersten et al., 1998; Kletzien, 1991; Lauterbach and Bender, 1995). In general, strategic knowledge is presented in the form of a heuristic, set of steps and a way of representing the outcome of applying the heuristic. Teachers model the use of the

strategic knowledge, provide guided and independent practice for students in learning how to apply the steps, and cue students as they learn to generalize the strategy in new situations. Strategy instruction in mathematics also shows positive effects, although the term *strategy instruction* applies to a wide variety of techniques. Overt strategy instruction in mathematics problem solving was more effective than direct drill. Effective strategies incorporated explicit instruction (Dixon et al., 1998; Jones et al., 1997).

Cooperative learning The use of cooperative groups with or without competition has been found to increase learning (Marzano, 1998). For example, students work together to learn to apply comprehension strategies while they are reading (reciprocal teaching) (NRP, 2000). Cooperative work, in combination with a well-structured instructional mathematics program had strong positive effects for students with special learning needs as well as higher-performing students working with their lower-performing peers. Active student participation in mathematics learning can be achieved by frequent questioning through peer interactions or student centered discussion (Dixon, et al. 1998; Jones et al. 1997).

Concepts, Procedures, and Algorithms

Dickson, Collins, Simmons and Kame'enui (1998) and Ellis and Worthington (1994) concluded that low-performing students benefit from a didactic approach, or explicit instruction in a range of subject matter. Dixon et al. (1998) report similar findings. However, Dixon et al. point out that studies have shown a slight advantage for guided discovery methods for some types of mathematical content and for higher-performing students on higher order learning tasks.

Concepts The optimum instruction techniques to employ with concepts, generalizations, and principles is to present

organizing ideas in a direct fashion (as opposed to asking students to induce them), and then have students apply that general knowledge to specific situations. The effects of these application activities can be enhanced if they are accompanied by general instruction and specific techniques for deductive reasoning (Marzano, 1998).

Procedures Studies have shown that students should be presented with general rules or heuristics as opposed to specific steps if the instructional goal is to enhance students' ability to perform subject-specific tactics or processes. Students would then practice a tactic, or process, paying particular attention to how it might be improved (Marzano, 1998). Examples of a general heuristic include the four-step problem-solving strategy for mathematics, the steps of the writing process, and the scientific process.

Algorithms For subject-specific algorithms, it is more effective to present the various steps in an algorithm, and then have students practice the algorithm, paying particular attention to how it might be improved. Students should then apply the concept, generalization, or principle to new situations (Marzano, 1998).

Selection and sequencing of examples The majority of studies found positive effects for selecting and sequencing examples according to the principles of concept acquisition. Examples should be sequenced to show the range of examples covered by a concept and to show minimal discriminations of examples falling outside the range (Dixon et al., 1998). Mercer and Miller suggest that instructional examples in mathematics should provide for the systematic progression from concrete to more abstract representations and from simpler to more involved relationships among concepts and rules (as cited in Jones et al., 1997).

Use of calculators Mixed effects have been found for the use of calculators in computation problems. Three studies showed positive results when calculators were used as a supplement to intense programs of computation instruction. One study found that programmed calculators that gave problems and feedback were effective with low-performing students (Dixon et al., 1998).

Manipulatives Three studies conducted in elementary schools found no benefit for the use of manipulatives, whereas one study in middle school found positive effects for the learning of fractions and ratios (Dixon et al., 1998).

Assessment and Evaluation

Assessment and evaluation of student performance is a critical component of an instructional program. Measurement experts advocate that teachers use a structured and planned approach to classroom assessment. Teachers should first formulate the instructional objectives, then develop the assessment plan and approach, administer the assessments, and finally analyze the results. However, teachers typically prioritize their attention and effort on the instructional activities of their students. The classroom is an environment that requires ongoing, spontaneous, and largely informal evaluation processes before, during, and after instruction. Optimally, assessment ought to be considered as a record of classroom life that offers information about what the children know (Niyogi, 1995).

The characteristics of good classroom assessment do not differ from the characteristics used by measurement specialists for more formal, standardized measures. Characteristics of good classroom assessment include:

- 1) The behaviors or products observed and assessed are valid reflections of the

concept or skill to be assessed. To the extent appropriate, the judgments on products or observed behaviors are based on objective criteria and provide accurate estimates of student performance.

- 2) The ratings of products or behaviors elicited by the tasks or test items are consistent in order to provide reliable ratings— across both time and raters.
- 3) A match with the content and skills reflected in the educational or instructional objectives to be assessed. What is taught is what is tested.
- 4) The test items or tasks represent the full range of knowledge and skills that are the instructional targets.
- 5) The expectations for student performance are clear to both teacher and students (Dietel, Herman, Knuth, 1991).

The effects of frequency of testing were reviewed in a meta-analysis by Bangert-Drowns, Kulik, and Kulik (as cited in Crooks, 1988, p. 448). The evidence recommends a moderate amount of testing so that students can have more than one experience with testing practices. Cumulative tests were found to be more effective for courses with interrelated topics. Students in hierarchical courses (in which content and skills are built from earlier materials) did not benefit from direct retesting of earlier content. For higher level outcomes, less frequent testing may be desirable in order to help students adopt approaches that involve an active search for meaning and underlying principles and for relationships among ideas and concepts.

Crooks (1988) summarizes the impact of classroom assessments on student learning. For the short term, assessments serve to consolidate prerequisite skills, focus attention,

encourage active learning strategies, and provide opportunities to practice skills. In addition, assessments provide knowledge of results and corrective feedback that should enable students to monitor their own progress and feel a sense of accomplishment. For the intermediate term, assessments identify readiness for learning, influence motivation, and communicate the goals for students, including desired standards. Assessments also describe achievement in the module or course and influence future activity selections. Long-term consequences may influence students' ability to retain and apply the material learned, develop learning styles and skills, and continue motivation of students, particularly as relates to perceptions of self-efficacy as learners.

Research conducted by Shavelson, Baxter, and Pine (1992) compare the results generated by a variety of kinds of assessments in science (e.g., observed investigations, notebooks, computer simulation, short-answer and multiple-choice) in schools using different instructional approaches. They found that “measures of science achievement are highly sensitive, not only to the investigation samples, but also to the method used to measure performance. . . . Indeed each method provides different insight into what students know and can do” (p. 26).

Test-Taking Preparation

The current emphasis on statewide assessments for educational accountability continues to expand in response to federal requirements. While statewide assessments do not assess all of the required content of a state's standards, they do sample relevant learning objectives. Many states include short-response and expanded-response questions, as well as multiple-choice items. Testing accommodations are available in all statewide testing programs, although they vary in kind and applications (Elliott, Braden, and White, 2001).

High-quality instructional materials are needed to enable students to acquire the specific knowledge and skills assessed on the tests. Activities used in the materials should incorporate student responses of the types used on the tests (multiple-choice, short-response, and extended-response). Teaching students general test-taking skills can improve their test performances, if they have already acquired the knowledge and skills assessed on their test. Such skills and preparation help students to learn the importance of behaviors such as following directions, asking for clarification, pacing, and reviewing their own responses.

Instructional Design in <i>Pacemaker</i>® Curriculum		
Research-Based Principle	<i>Pacemaker</i>® Component	<i>Pacemaker</i>® Practice for Research-Based Principle
<p>Objectives Objectives are explicit. Objectives are attainable and suitable for students. Objectives are conveyed to students.</p>	<ul style="list-style-type: none"> • Writer’s Guidelines • Opening the Chapter, Teacher’s Planning Guide (TPG) • Chapter Opener, SE • Prerequisite Skills, TPG, Workbook (WB), CRB • Chapter Summary, SE • Goals and Self-Check Worksheet, CRB 	<ul style="list-style-type: none"> • The list of learning objectives focuses on the skills to be mastered in each chapter. • The language states what students will be able to do. • Learning objectives are written as measurable actions and cover every lesson in the chapter. • Prerequisite skills are specified and exercises are included for assessment and remediation. • The chapter summary recaps the learning objectives introduced to students in the chapter opener.
<p>Motivation and Context for Learning Student experiences are considered in the way materials are presented. Attention-getting techniques within the instructional content require students to link new learning to prior learning.</p>	<ul style="list-style-type: none"> • Writers’ Guidelines • Mini Features, SE • Opening the Chapter, TPG • Reinforcement and Enrichment Exercises, TPG, CRB • Chapter Project, SE, TAE, TPG • Practice examples, SE • Life Skills Workplace Applications, TPG • Certificate of Achievement, CRB 	<ul style="list-style-type: none"> • Mini Features are designed to provide an opportunity to connect content learning to the world and should contain a life application of the content introduced in the chapter. Students are instructed to respond in some way. • The purpose of the unit opener is to provide a high-interest photograph and a two-part caption that addresses the overall theme of the unit. • The photograph in combination with the two-part caption helps teachers pique students’ interest in the unit simultaneously, and tap prior knowledge. • The chapter project is provided to help students see how the new knowledge applies in life. The project is sustainable throughout the chapter and contains as many learning objectives as possible. • Wherever possible real life examples are used in practice exercises to capture students’ interest.

Instructional Design in <i>Pacemaker</i>® Curriculum (Continued)		
Research-Based Principle	<i>Pacemaker</i>® Component	<i>Pacemaker</i>® Practice for Research-Based Principle
<p>Instructional Sequence A multiphase instructional sequence that incorporates effective teaching behaviors facilitates student achievement.</p>	<ul style="list-style-type: none"> • Writers' Guidelines • Opening the Chapter, Supporting the Chapter, Supporting the Features, Closing the Chapter, Assessing the Chapter, TPG • Chapter Resources, CRB • Lesson Planner, CRB 	<ul style="list-style-type: none"> • Each lesson begins with a concise paragraph or two of direct instruction. The understanding why comes from the progression of the previous lessons. The how is explained in the example(s). • Each lesson teaches a specific concept or skill and allows students to implement the knowledge they have learned by completing one or more activities. • Both guided and independent practice are included with systematic and explicit prompts and steps to build student skills. • Review and assessment exercises are included at the end of each lesson, each chapter, and each unit. In some titles (<i>Pacemaker</i>® Basic Math, <i>Pacemaker</i>® Basic English, <i>Pacemaker</i>® General Science, <i>Pacemaker</i>® United States History), questions are used at the end of each section to provide frequent assessment.
<p>Vocabulary Instruction Vocabulary can be learned from incidental encounters through listening and reading. The meaning of new terms should be taught prior to reading text. Readers need multiple exposures to new vocabulary in context with definitions.</p>	<ul style="list-style-type: none"> • Writers' Guidelines • Words to Know, SE, CRB, TPG • Vocabulary Review, SE 	<ul style="list-style-type: none"> • Words to Know are listed in the order in which they appear in the chapter. • On first appearance in the lesson, vocabulary words appear in boldfaced type and are defined context in the lesson. In running text, a term can be more fully explained. • The vocabulary review includes a vocabulary list (box) and a series of exercises. Definitions closely resemble the definitions in the chapter opener.
<p>Comprehension Instruction Students answer questions posed by a teacher and are given feedback. Teaching students to use meta-cognitive (learning) strategies to guide and regulate their own learning is effective. The use of graphic and semantic organizers prior to reading can enhance comprehension. When combined with a strong instructional program, cooperative learning and working with peers can result in increased achievement.</p>	<ul style="list-style-type: none"> • Section Review, SE • Graphic Organizers, CRB, TPG • Cooperative Learning, SE, TPG 	<ul style="list-style-type: none"> • Embedded questions and activities at the end of each section and chapter provide frequent opportunities for review. • Cooperative learning contains questions/activities that review the learning of the lesson. No new material is introduced. Pairs of students explain or summarize their learning to one another. Each student in a pair should have the opportunity to participate.

Instructional Design in Pacemaker® Curriculum (Continued)		
Research-Based Principle	Pacemaker® Component	Pacemaker® Practice for Research-Based Principle
<p>Concepts, Procedures, and Algorithms Students should be presented with general rules or heuristics to perform subject-specific tactics or processes. Students should be presented with the specific steps in an algorithm practice, and then apply the concept, generalization, or principle to new situations. Examples should be sequenced to reflect the range of examples for a concept. The use of calculators and manipulatives for mathematics has been found to enhance learning under certain circumstances.</p>	<ul style="list-style-type: none"> • Writers' Guidelines • Problem-Solving Skills and Strategies, SE, CRB • Problem-Solving Application, CRB • Critical Thinking, SE • Practice, CRB 	<ul style="list-style-type: none"> • Examples: Math problem-solving strategy includes the Polya problem-solving steps: read, plan, do, and check. • Science Lab includes background, purpose, materials, what-to-do, and draw conclusions subsections. Procedures are numbered and carefully mapped out. • Critical-thinking section tests students' understanding of the material (rather than memorization of facts) and asks them to draw a simple conclusion or interpret the material in relation to the information given in the section. • Math example "walks" students through a process, start with a direction line, and steps to explain the process. A concise verbal description of each step is given on the left, and a demonstration of the step is given on the right. A guided practice exercise for each example is partially stepped out, leaving some blanks for the student to complete. • Ask students to explain their answers or their thinking as appropriate. The exercises are organized by level of difficulty, from easiest to hardest.
<p>Assessment and Evaluation The characteristics of good assessment for use in the classroom are the same as those used by measurement specialists for more formal, standardized measures. Testing should occur on a regular basis. Cumulative tests are effective for courses with interrelated topics.</p>	<ul style="list-style-type: none"> • Classroom Management, CRB • Assessing the Chapter, TPG • Chapter Quiz, SE, CRB • Chapter Tests, CRB • Unit Assessment, TPG • Activity Rubrics, TPG • Test Preparation, CRB • Solution Key, CRB 	<ul style="list-style-type: none"> • The chapter project is introduced at the beginning of the chapter, is provided for portfolio assessment, and is intended to be used on an ongoing basis throughout the chapter. • Frequent assessment opportunities are included to check student comprehension of content: chapter reviews, chapter quizzes, unit reviews, chapter tests, and unit tests. • Content chapter quizzes will reflect the content of the lessons in the chapters and address specific chapter learning objectives. • Test preparation for standardized tests is provided through test-taking tips, unit tests, and cumulative tests for the course.

Historical Development of the Product

The *Pacemaker*® curriculum is a product line that has evolved over time. The first use of the term pacemaker by Fearon Pitman Publishers is with the *Pacemaker*® books (1968 catalog). They are described as text-workbooks and supplementary reading materials for the educable mentally challenged, the slow learner, the reluctant reader, and the culturally disadvantaged. Titles included *Eddie in School* and *Jerry Works in a Service Station*.

Pacemaker® *Core Vocabularies 1 and 2* (Fearon, 1980) were developed to provide a common set of words that could be used by individual authors and editors to achieve optimum readability for books published by Fearon Education. Nationwide readability studies were conducted by Dr. Robert Hillerich of Bowling Green State University to validate each of the vocabulary lists. Further investigation verified the readability of the lists by analyzing multiple 100-word passages from selected books using the Fry, Spache, and Harris-Jacobson measurements (as cited in Fearon, 1980). The vocabulary in Book 1 identifies a set of 1,021 words recognized by seventh-, eighth-, and ninth-grade students reading at the third-grade level, whereas Book 2 lists 730 words recognized by older students reading at the fourth-grade level.

The *Bestellers*® Reading Program, published in the late 1970s featured a series of books written in the style of paperbacks on an easy reading level for severely reading-disabled readers. The books were written to conform to *Pacemaker*® *Core Vocabulary 1*, at a third-grade reading level. Titles included *Diamonds in the Dirt*, *Wind over Stonehenge*, and *StarGold*. Support materials included a

teacher's guide with plot summaries, teaching suggestions, vocabulary, data and comprehension questions, Activity Cards for student use, and Reading Checks with reproducible skill-building worksheets.

The *Pacemaker*® curriculum appears for the first time in the Fearon Education Catalog of 1990. Carol Hegarty introduced the series in the publisher's letter: "The *Pacemaker*® curriculum—the kind of books we'd want for our own children—or ourselves—if we were in a special needs situation." Comprehensive instructional materials were developed for use in basic high school courses taught to students in special education programs. The content was developed to reflect on-level textbooks but written at or below a fourth-grade reading level. The textbooks were intentionally designed to look and feel like the textbooks used in regular education programs. Twelve hardcover textbooks for students and twelve Classroom Resource Binders for teachers were included in the 1990 catalog.

In 1994–95 an expert panel for special education was convened by the publisher to provide input on issues related to planning and special features of the *Pacemaker*® curriculum. Based on that research new titles were added, including *Pre-Algebra*, *Algebra I*, *American Literature*, *World Literature*, and *Skills for Independent Living*. Table 1 provides a complete list of the titles.

The *Pacemaker*® curriculum was originally designed to provide textbooks and other learning materials for special education students in middle and high school programs. The materials have been used for other learners with special needs, including English language learners, and learners at risk. ESL/ELL Teacher's Guides and Spanish Supplements are available for some titles

offering lesson enhancement for English language learners and key lesson features such as Words to Know and Learning Objectives translated into Spanish. A Web site (<http://www.esl-ell.com>) provides additional information to help teachers modify lesson planning for English language learners.

All new and revised editions are produced with a four-color design. Most titles include a consumable workbook for students with practice exercises for each chapter. Teacher support materials include a Teacher's Answer Edition and a Classroom Resource Binder with classroom management charts, lesson support, test preparation, visuals and graphic organizers, and an Answer Key. A separate Teacher's Planning Guide is available for some titles to provide additional suggestions for planning instruction. The planning guide includes a diagnostic and placement assessment, suggestions for opening and closing each chapter, support for

each lesson and feature, tips for assessing each chapter, and information about other related materials published by Globe Fearon.

In addition, some *Pacemaker*® titles include an Audio CD Program that offers a complete, unabridged version of the Student Edition, which allows for flexible access to the content and an Interactive Classroom Resources. The Interactive Classroom Resources is an easy-to-use electronic format of the Classroom Resource Binder. The Interactive Classroom Resources is also a tool that can be used for lesson planning, classroom management and meeting individual student needs. Worksheets, tests, and quizzes can be created and customized with ExamView® software. The Student Study Guide Online provides extensive practice and review in interactive format for students to use at their own pace and with immediate feedback. An Online Portfolio captures student practice scores

from the Student Study Guide and allows teacher to view and track student progress.

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