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Cathy J. Pearman
Missouri State University

Shirley Lefever-Davis
Wichita State University

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Supporting the Essential Elements with CD-ROM Storybooks

Cathy J. Pearman
Missouri State University

Shirley Lefever-Davis
Wichita State University

CD-ROM storybooks can support the development of the five essential elements of reading instruction identified by The National Reading Panel: phonemic awareness, phonics, fluency, vocabulary, and comprehension. Specific features inherent in these texts, audio pronunciation of text, embedded vocabulary definitions and animated graphics can be used to support readers' development of various reading skills. In addition, the International Society for Technology in Education states that computer technology should be used with young children to build their technological skill and comfort level. The use of CD-ROM storybooks for instruction in the five essential elements is an effective means of incorporating technology in a meaningful way.

ENSURING THE READING SUCCESS of America's school children has been at the forefront of public attention in recent years. In response to this agenda to raise reading achievement, congress mandated, through the National Institute of Child Health and Human Development, the creation of the National Reading Panel (NRP). The NRP was charged with the goal of identifying evidence based practices most likely to increase reading achievement of children in kindergarten through third grades. The findings from this group resulted in the identification of five essential elements of reading instruction including:

- phonemic awareness;
- phonics;
- fluency;
- vocabulary; and
- comprehension.

Additional findings from the panel suggest computer technology can be a valuable tool when used as an instructional support to facilitate the development of these essential elements. After reviewing the small sample of research available on technology and reading, a subgroup of the NRP reported "that it is possible to use computer technology for reading instruction" (National Institute of Child Health and Human Development, 2000, p. 6-2). Additionally, the International Society for Technology in Education (ISTE) argues it is becomingly increasingly important to recognize the value of computer technology for young students. They urge educators to use technology to support student learning not only because it provides an efficient instructional resource but also because it develops students' technological skills. Technology standards published by this group outline goals for using computer technology effectively and emphasize the importance of an early introduction to technology to produce technology literate students (ISTE, 2002).

Both the NRP and the ISTE advocate for increased research in the use of computer technology for instructional purposes. One specific instructional practice using computer technology for enhancing the reading instruction for young children is the use of CD-ROM storybooks. Many features of CD-ROM storybooks make them particularly well

suiting for instruction in the five essential elements identified by the NRP. For example, many CD-ROM storybooks include audio and graphic animations where book characters talk and settings come alive. Many pages contain “hotspots” that appear, and when activated by the child, produce animated graphics, sound effects and word pronunciations. Additional features allow students to manipulate and individualize the reading environment by choosing to highlight a word or phrase to produce a digital pronunciation or they can click on a word to access its definition (Labbo, 2005). In other instances, CD-ROM storybooks will present spelling analogies for readers when they click on a word within the text. CD-ROM storybooks may also read the entire story automatically, simulating a read-aloud experience for the child. These features will be described in more detail as they relate specifically to each of the five essential elements.

Research on the computer pronunciation feature of CD-ROM storybooks has shown potential for fostering reading fluency in beginning readers (Oakley, 2003). Other research has investigated the impact of CD-ROM storybooks on reading comprehension. Lefever-Davis and Pearman (2005) found that CD-ROM storybooks develop the story setting through animated graphics and sound effects signaling story mood and events and thereby supporting comprehension. Additional research by Higgins and Hess (1998) supports the use of CD-ROM storybooks for promoting vocabulary development. In this study, third graders using CD-ROM storybooks for supplemental activities to enhance target word acquisition outperformed students in the control group in defining vocabulary words. These studies support the use of technology in reinforcing acquisition of the essential elements outlined by the NRP.

Phonemic Awareness and Phonics

Phonemic awareness refers to the learner’s ability to recognize and manipulate the sounds in spoken language. Once children become conscious of the individual sounds in words and learn they can change a word by changing the sounds within a word, they develop knowledge of the letter-sound relationship. Phonics, related to the alphabetic principle, refers to the connection between the sounds of spoken language and the

symbols of written language (Tompkins, 2003). Specific skills necessary to build competence in phonemic awareness as well as phonics include knowledge of letter sounds, letter identification, segmenting, blending, using onsets and rimes, and adding, deleting and substituting phonemes (Mesmer & Griffith, 2005).

Most CD-ROM storybooks can be programmed to automatically read the text aloud. This computer pronunciation of text offers opportunities for learners to hear the words spoken at the same time they are being highlighted in the passage thereby providing an auditory/visual link fostering an awareness of letter-sound relationships. This feature is particularly helpful in building phonemic awareness when individual words are highlighted rather than entire sentences. Knowledge of sounds and letters is acquired gradually over time through repetition and frequent exposure to words in the story. Repeated pronunciations provide a model of the sounds in words while the highlighting feature reinforces the symbol representations of the sounds.

Particular versions of interactive CD-ROM storybooks include additional phonemic awareness and phonics support for learners. These books, when prompted by the reader, will segment a word into syllables. For example, when a reader clicks on a word or picture in an illustration, the computer will pronounce the word. If the button continues to be held down, the computer will elongate the pronunciation and emphasize the syllables.

Phonics games may also accompany the CD-ROM storybooks. However, caution is warranted when using these programs. Some versions of CD-ROM storybooks insert phonics games and activities into the story. When this happens, reading comprehension can be hampered. In this situation, the games take the reader away from the reading event to a new screen containing new activities. The reader may not return to the story or, when they do, the sequence of story events may be so disrupted the reader is unable to follow the story plot causing a breakdown in comprehension. When selecting CD-ROM storybooks in the classroom, it is most advantageous to select those which do not insert activities within the story. In addition, games embedded in the CD-ROM storybooks may encourage children to view reading as a collection of

playful activities rather than as a meaning-making event (Lefever-Davis & Pearman, 2005). Therefore, CD-ROM storybooks with phonics games or activities presented prior to or following the reading are more likely to provide instructional supports that actually contribute to reading achievement.

Vocabulary

The auditory feature of CD-ROM storybooks enhances vocabulary development as well (McKenna, 1998). Along with knowledge of letters and letter sounds, reading development is also influenced by a readers' vocabulary. Readers with larger vocabularies are better able to understand sophisticated text. In turn, this exposure to more sophisticated text puts readers in contact with higher level vocabulary words and the cycle continues. Since children learn most words in their oral language and in their reading lexicons incidentally, reading aloud exposes them to new vocabulary words modeled by a fluent reader and nested in context (Baumann, Kame'enui, & Ash, 2003). Struggling readers, who typically read fewer books themselves, particularly benefit from having books read aloud to them. Since the majority of storybooks on CD-ROM have the feature of auditory computer reading of the complete text, the read-aloud experience can be simulated over and over for the reader helping them "develop knowledge about a word slowly, through repeated exposure to the word" (Tompkins, 2003, p. 217). In addition to the benefits of the read aloud experience, struggling readers can echo read and engage in repeated readings even when assistance from a teacher, tutor, or parent is not available.

Proficient readers, even those who may independently deduce a word's meaning from context, may encounter words they do not know how to pronounce. Exact phonetic decoding does not always guarantee accurate word pronunciation. Because so many words in the English language are pulled from other languages, often retaining the spelling of the original language, relying solely on phonics will not ensure accurate reading. For example, the word gazebo, to someone unfamiliar with the word, may look like it should be pronounced with a long "a" and a silent "e" as in the word gaze. However, pronunciation of unknown vocabulary words is made easy when the computer pronounces words for the reader

at the same time the word is highlighted, ensuring more accurate pronunciations. This support is important even for proficient readers who may apply what they know about semantics, syntax, and phonics and still generate an incorrect pronunciation.

Vocabulary development is further enhanced when strategic readers use context clues to figure out the meanings of unknown words. CD-ROM storybooks provide animated graphics and audio effects that provide richer contextual support than static, traditional texts. When referring to sound effects and animations embedded in CD-ROM storybooks, researchers distinguish between supplemental and incidental features of interactive CD-ROM storybooks. Supplemental animations are those that contribute to the readers' understanding of the story. Cued animations and sound effects provide contextual support by supplying illustrations, accompanying animations, and audio clips that supplement readers' understanding of a text (Trushell, Maitland, & Burrell, 2003). For example, when book characters visually react to an event via animations, it is easier for readers to infer word meanings. When readers do not know a word, they watch an event that exemplifies that word or concept and meaning is suddenly attached to the unfamiliar word. For instance, in a story like *The Three Little Pigs*, when the pig shows fear while being pursued by the wolf, a word like intimidation becomes personified thus clarifying the word meaning.

Incidental animations are those which do not advance the storyline (Trushell et al., 2003). For example in some CD-ROM storybooks, clicking on a flower pot shows a dancing flower, clicking on a shovel causes it to move in and out of a sand pail, or a bird will fly across the sky when selected. None of these actions further the storyline or reinforce story events. In fact, Trushell, et al. notes that these incidental animations negatively impact readers' ability to recall story events. For some readers, these features become a distraction taking attention away from deriving meaning and, in many cases, prolonging the reading event causing fatigue and a breakdown in comprehension.

Unfortunately, not all context clues in traditional texts provide an adequate amount of information to enable the reader to determine word meaning. Baumann & Kame'enui (1991) determined that context clues

are most beneficial when they contain definitions of words or concepts. Therefore, one of the most obvious ways interactive CD-ROM storybooks can enhance vocabulary development is through the use of hypertext links where readers can click on a word to have the meaning of the word provided immediately by the computer. Reinking and Rickman (1990) found students were more likely to access definitions when they were presented on the screen in an immediate format than if they had to access them in a separate location such as a dictionary or glossary.

Fluency

A third essential element of reading instruction identified by the NRP is fluency. Fluency refers to more than just reading speed. Moats (2004) stresses that reading speed must be adequate for the message contained in the text to be comprehended, but processing meaning and phrasing the text are better indicators of fluent reading than measuring speed alone. Chard (2004) adds accuracy and prosody to the definition of fluency. Automatic word recognition, or automaticity, refers to accuracy in reading and influences both reading rate and prosody, or the ability to expressively read phrases rather than reading text word-by-word. CD-ROM storybooks have many features that facilitate these components of fluent reading.

A child's sight word vocabulary is directly linked to reading fluency. The automatic recognition of words increases not only reading rate but also conserves cognitive energy for making meaning of text. McKenna (1994) reports that repeated readings of CD-ROM storybooks results in substantial gains in sight word acquisition. If words are not recognized immediately, readers need to be able to quickly employ decoding skills to determine pronunciations so that fluent reading is not interrupted and meaning does not break down. Features that allow readers to highlight specific words to be read aloud for them by the computer can provide automatic support when needed by the reader. This removes the burden of decoding for the reader and increases the chance they will maintain the thread of the story.

Chard (2004) and Rasinski and Padak (2001) assert that reading fluency can be developed by engaging students in repeated reading

activities. Providing readers with texts they will listen to and read multiple times is essential to encouraging the necessary multiple readings to build fluency. However, one of the frequent drawbacks of using repeated readings is the tendency of children to become uninterested in the text after the first couple of readings. Animated CD-ROM storybooks can prolong student interest and engagement with texts through the use of animation and other features that contribute to student motivation to read. Motivational factors are key to fluency because they can strengthen the likelihood that readers will increase the amount of time they spend reading. CD-ROM storybooks aid in this goal because their format tends to be more engaging, interesting and thereby more motivating to readers. Research findings of Labbo and Kuhn (1999) indicate many readers will interact with CD-ROM storybooks in excess of 45 minutes when provided the opportunity.

Listening to repeated readings of the same text becomes more interesting when a story is read using different voices for each character, another distinguishing feature of CD-ROM storybooks. Many times these voices are the professional, modulated voices of actors and celebrities thus increasing student interest. As students actively engage in repeated readings of the CD-ROM storybooks, they model the prosody of the computer voices. This function of providing a fluent model of expression, intonation, and punctuation guided pauses is of particular benefit for strong beginning readers who are in the process of fine-tuning their reading skills (Lefever-Davis & Pearman, 2005).

Along with providing a model of fluent reading, CD-ROM storybooks have another advantage with regard to repeated readings. Students can independently choose to have the book read to them multiple times without requiring the patience of an adult or more adept reader. During independent reading, readers can self-select which words they need help with and can obtain computer pronunciations over and over without embarrassment or assistance. This ability to select which words they need help with and how often they need help increases feelings of self-efficacy within beginning and struggling readers (McNabb, 1998). However, as with any supplemental instructional resource, the value is enhanced when monitored by a knowledgeable

classroom teacher or a more adept reader who is available to guide the reader's use of effective strategies.

In addition, many books available on CD-ROM are accompanied by paper text versions making it possible for readers to read the story in both a paper format as well as an electronic one. This allows the reader to transport the story to any location to engage in repeated readings and is particularly beneficial for students who do not have home computers. Having identical texts available in both electronic and paper format also allows for scaffolding. Initially, the CD-ROM storybook features provide rich context clues, computer pronunciations, cued animations, and sound effects that enhance the story and support beginning or struggling readers. As readers become more proficient, this support can be decreased as the readers use the paper texts for repeated readings. Lewin (1996) voices concerns that easy access to computer pronunciations of unknown words may delay the development of decoding skills in young readers. Using the two text formats in tandem strikes a balance between providing pronunciations upon request in the electronic format and requiring readers to employ their own decoding skills in the paper format.

Controlling the pace of reading is also a feature available on some interactive CD-ROM storybooks. Reading rate, as an indicator of reading fluency, is one of the key elements of the NRP report. Encouraging readers to read along with a fluent reading pace is a recommended strategy for promoting students' reading fluency. This can be accomplished through the use of CD-ROM storybooks. Students can be encouraged to read along with the CD-ROM storybooks in an attempt to promote a reading rate conducive to fluency.

Comprehension

Comprehension is the fifth aspect of reading referred to as one of the essential elements outlined by the National Reading Panel. Comprehension requires readers to use a variety of skills and strategies to extract meaning from a text. Comprehension skills particularly suited to being developed through an interactive CD-ROM storybook format include building background knowledge, story schema and

metacognition. Story schema, defined as the child's prior knowledge of particular story types such as fairytales, is enhanced particularly well in CD-ROM storybooks. Sound effects and animation features rapidly and effectively place the reader directly in the setting. Sound effects, in particular, cue the reader to upcoming story events. For example, interactive storybooks include sound effects that are adept at setting a mood and quickly establishing the setting of a story thus contributing to reading comprehension.

With regard to reading, metacognition can be defined as the reader's self awareness of their own reading strategies and comprehension. The importance of metacognition has been identified by Wright and Jacobs (2003) as the reader's ability to plan and self-monitor strategy use. Metacognition can be promoted via CD-ROM storybooks because readers are provided with opportunities to prompt the computer to assist their reading. They can self-select vocabulary words they need help with pronouncing or defining. They can also choose to activate the auditory reading of the story if they determine they need assistance in reading the text. On the other hand, the drawback to this feature of CD-ROM storybooks is that the computer doesn't offer help unless the reader is metacognitively aware of their need for assistance. What is becoming apparent is if the reader has some level of metacognition in place, the CD-ROM storybooks can help advance the skill. However, it does little to build metacognition in students who lack any ability to monitor their own comprehension. If the non-metacognitive reader sets the auditory control to automatically read the text, when a child encounters an unfamiliar word, the computer has no way of knowing the word is unfamiliar, and therefore, cannot prompt the child's use of fix-up strategies to gain meaning. In contrast, a teacher, sitting beside a non-metacognitive reader, can frequently detect when an unfamiliar word is encountered and can prompt the use of fix-up strategies.

Summary

CD-ROM storybooks are a particularly effective application of computer technology to link the goals of the NRP to focus instruction of the identified essential elements of reading instruction and the goals of the ISTE to promote the effective use of computer technology in

elementary classrooms. ISTE states that computer technology should be used with young children to build their technological skill and comfort level. However, they also argue that technology for technology sake is neither effective nor recommended. This application of computer technology for instruction is an effective means of incorporating technology in a meaningful way.

Specific features inherent in CD-ROM storybooks, audio pronunciation of text, embedded vocabulary definitions and animated graphics can be used to support readers' development of various reading skills. They provide additional resources to supplement the reading instruction and opportunities already being provided in the classroom. Research supports the view that beginning readers need ample opportunities to read connected text (Allington, 2001). CD-ROM storybooks provide this opportunity and include a support system that may not be available when children read a traditional text independently. The technologies intrinsic in CD-ROM storybooks provide a text for students to apply strategies in a supportive environment.

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Cathy J. Pearman is a faculty member at Missouri State University, Springfield, MO and Shirley Lefever-Davis is a faculty member at Wichita State University, Wichita, KS.