

Background and Significance

the lowest two levels of literacy (below fourth grade) with 19% being completely illiterate (Lyon, 1997, 1998). Equally alarming is that poor reading portends adverse health disparities and outcomes including increased incidence of chronic illness, drug and alcohol abuse, risky sexual behavior, less than optimal use of preventive health services, difficulties accessing medical care, and difficulties understanding health risks (Lyon 2002a).

The Need for Continuous Progress Monitoring

While the statistics for the long-term outcomes of reading failure are grim, the solution (i.e., reading success for all students) has thus far eluded our schools. While ultimately we want all children to leave the early grades reading, the fact that so many children leave the early grades without a firm foundation for reading suggests to us that teachers in the middle grades require help to better serve their students. Importantly, a number of efficacy studies have demonstrated that middle grade students are able to “catch up” in critical reading areas with sufficient

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areas of reading in the middle grades are significant in understanding comprehensive reading ability in middle students: (a) word analysis of multisyllabic words, (b) reading fluency that allows attention to be focused on understanding, (c) vocabulary development that helps students recall terms and provides interaction with students' prior knowledge by exploring semantic and syntactic relationships of text, and (d) reading comprehension skills.

Significance of assessing word analysis. Accurate and automatic identification of multisyllabic words is critical to comprehension of middle grade content-area texts (Deshler et al., 2001; Gersten, Fuchs, Williams, & Baker, 2001) and distinguishes good and poor readers (Perfetti, 1986). Good readers use word components or parts, such as knowledge of syllable types, prefixes, suffixes, and roots, to identify long, multisyllabic words (Lenz & Hughes, 1990; Perfetti, 1986). Targeted instruction in advanced word analysis can improve reading outcomes by teaching students strategies to effortlessly recognize increasingly more complex words they encounter in text (Scammacca et al., 2007).

A valuable way to assess word analysis is through spelling. Correct spelling requires that a student possess fully specified orthographic representation for each word, thus providing valuable information about the word analysis skills owned by the student (Bourassa & Treiman, 2001; Ehri, 2000; Ehri & Wilce, 1987; Graham, 2000; Perfetti, 1997). We propose to ask students to spell multisyllabic words, carefully selected to contain the various aspects of syllables, affixes, and roots. Scoring will occur at the syllable unit, rather than whole word, allowing us to assess not only growth in word analysis, but also provide diagnostic information about which aspects of the structure English words a particular student finds challenging.

Significance of assessing fluency. The ability to read connected text with both speed and understanding is the true hallmark of a fluent reader. Successful older readers identify most of the words in text "automatically," allowing them to focus on higher order processes, such as understanding, inferring, and interpreting (Archer, Gleason, & Vachon, 2003; Osborn, Lehr, & Hiebert, 2003). While fluency does not cause comprehension, it does play a facilitative role (Rasinski et al., 2005). Further, measuring fluency has been shown to be a good gauge of overall reading health (Deno, 2003; Fuchs & Fuchs, 2008) in much the same way a thermometer measures general physical health. Current CPM measures of fluency consist primarily of oral reading tasks. However, such a task does not measure if students are monitoring meaning. We propose using a Maze task to measure both text processing speed and understanding, as required for assessing comprehensive fluency. In a Maze task, students read text in which every 5th to 7th word is blank. For each blank, students are given 3 or 4 choices with which to fill in the blank. Such tasks have been shown to highly correlate to oral reading tasks as well as to comprehension tasks (e.g., Deno, 2003; Fuchs & Fuchs, 2008). A second aspect of fluency that becomes increasingly more important as students matriculate up the grades is their ability to read text fluently while reading silently. We propose to assess fluency using both Maze and silent reading tasks.

Significance of assessing vocabulary. In the past decades, the importance of vocabulary knowledge in the development of reading skills has been extensively established in the literature (National Reading Panel, 2000). Moreover, for children historically at-risk of reading difficulties due to poverty and language background, oral language in general and vocabulary in particular are critical to reading success (Hemphill & Tivnan, 2008; Pearson, Hiebert, & Kamil, 2007). Students need instruction that accelerates their acquisition of new vocabulary and provides deep knowledge about words. Beck, McKeown, and Kucan (2002) suggest breaking words into three tiers. Tier 1 words are words students are likely to know (e.g., sad, funny). Tier 2 words appear frequently in many contexts (e.g., regardless, compromise). Tier 3 words appear rarely in text or are content specific (e.g., irascible, biogenetics). Beck and

colleagues suggest that teachers focus vocabulary instruction on tier 2 words drawn from content area materials that contain words that students are likely both to need (because they are encountered across contexts) and learn well (because students will have repeated opportunities for practice and use). However, Tier 3 words represent a specific challenge to students since these words represent the jargon of the content areas (Bravo & Cervette, 2008). We propose to focus our assessment on both Tier 2 words (general vocabulary) and Tier 3 words (content specific).

Significance of assessing reading comprehension. Reading well is a demanding task requiring coordination of a diverse set of skills (Irwin, 1991). Struggling readers, even those with adequate word-level skills and acceptable fluency, often fail to use these types of strategies, either because they do not monitor their comprehension or because they lack the necessary tools to identify and repair misunderstandings when they occur. Effective reading comprehension interventions have focused on helping students to become strategic readers by teaching them how to think while they are reading. Effective interventions have included single strategies such as finding the main idea and self-monitoring (e.g., Chan, 1991; Malone & Mastropieri, 1992) and multi-component strategies that targeted reading sub-strategies (e.g., Jitendra, Hoppes, & Xin, 2000; Schumaker, Deshler, Alley, Warner, & Denton, 1982). Additionally, student-led discussions of predictions, text structure, and summary development within interactive small groups have produced improvements in understanding and recall of expository text (Englert & Mariage, 1991). It is important that assessment of comprehension provide information about specific comprehension abilities that are amenable to instruction. We propose to assess four broad areas of comprehension that will allow us to assess general growth in comprehension, as well as provide diagnostic information to teachers to guide instruction. Specifically we propose to assess: (a) main idea, (b) cause and effect (c), inference, and (d) critical judgment. After silently reading passages, students will answer questions representing these four areas of comprehension ability.

The Foundation for CMARS

The current proposal represents an upward extension of previous work already completed by our group. We proposed and were awarded an NIH/NICHHD Fast Track Grant to design, develop and validate a computerized assessment tool called Continuous Monitoring of Early Reading Skills (CMERS: pronounced SEE-mers). At that time our focus was on the prevention of reading difficulties. Thus CMERS was developed to assess children from kindergarten through grade 3 to provide teachers the capability to feasibly universally monitor reading growth with all children and identify children at risk for reading failure as an integral part of the instructional routine. Because this assessment tool had to be easy to use and provide reliable and valid information to teachers, we developed the assessment tool so that even young children can complete the assessment independently within 20 to 30 minute sessions.

Following the completion of this first NIH/NICHHD SBIR product development effort, CMERS has now been successfully commercialized under the name iStation's Indicators of Progress (ISIP™) Early Reading (Mathes, Torgesen, & Herron, 2007). Since its release in 2007, it has received wide acceptance in the schools, with over 400,000 children currently being monitored using this technology. Further, ISIP Early Reading has been approved by several agencies, such as the National Center for Response to Intervention (NCRTI) and the Texas Educational Agency (TEA), as a reliable and valid screener and continuous progress monitoring measure. While CMERS/ISIP Early Reading is starting to have a significant impact on the assessment of young children kindergarten through grade 3, it is not an appropriate measure for students in the fourth grade and beyond.

