Curriculum-Based Measurement Reading Scores as Dynamic Indicators of Basic Reading Skills

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The use of curriculum-based measurement reading scores (i.e., see/say words orally in context or oral reading rate) as dynamic indicators of basic skills is described. Oral reading rate is a valid measure of overall reading ability for elementary students. Reading rate scores were used to make educational decisions and to evaluate the effectiveness of interventions at an elementary school. Grade level, classroom, and individual data are presented to demonstrate the different levels of analysis that are possible with reading rate scores.

Many states and school districts now require schools to administer tests to evaluate student progress. One concern is the reliability and validity of such tests, which, particularly the district-made tests, are likely to vary widely. But even if the tests are reliable and valid, the utility of such tests is limited. First, the tests are administered on an infrequent basis, usually once or twice per year. Second, state and district tests cannot be administered on a repeated basis because practice effects would invalidate the test results. Third, the cost and time required to develop, administer, and score such tests is substantial. But there are alternative assessment methods without these drawbacks. One such alternative assessment is "curriculum-based measurement" (CBM). CBM, according to Marston (1989), refers to a set of assessment procedures with the following characteristics:

[CBM is:] (1) tied to a student’s curricula [accomplished by using curriculum materials for the assessment] (2) of short duration to facilitate frequent administration by teachers/educators [typically, 1-5 minutes], (3) capable of having many multiple forms [accomplished by using curriculum materials], (4) inexpensive to produce in terms of time in production and in expense [accomplished by using curriculum materials], and (5) sensitive to the improvement of students’ achievement over time (p. 30).

Numerous studies have used curriculum-based measures to evaluate treatment effects, thereby, demonstrating their sensitivity to student improvement (see Shinn, 1989, 1998). Because of this sensitivity, curriculum-based measures have been called “dynamic indicators of basic skills” or DIBS (Shinn, 1995). This sensitivity also makes them an essential tool in problem solving academic deficits.

CBM and Precision Teaching (PT) have similarities and differences as pointed out by Binder (1990). The basic metric in both CBM and PT is the rate of student performance as assessed by frequent, brief, timed measures. The focus of CBM is on long term measurement; that is, CBM probes are designed to measure general outcomes that students are expected to achieve over a school year (Shinn, 1998). Precision Teaching usually focuses on the measurement of recently taught skills until a given level of fluency is achieved.

The development of CBM can be attributed to the work of Deno, Fuchs, and Mirkin with the Minneapolis public schools (e.g., Deno & Mirkin, 1977; Fuchs & Deno, 1981). Deno et al. cite PT research in their articles, which indicates that the development of CBM was influenced by PT. Their major concern was the development of assessment procedures to measure individual student progress: "Where educational placements were once made to serve the majority interests, placements now must be made to serve the needs of the individual student" (Deno & Mirkin, 1977, p. 5). The most common curriculum-based measures are listed in Table 1.

The measures reported in Table 1 have been extensively researched and found to be reliable and valid indicators of student skill level (Shinn, 1989, 1998). CBM is limited to the assessment of basic skills in the elementary curriculum (Shinn & Bamonto, 1998), which means that administrators may wish to add additional assessments to evaluate more complex skills. However, basic skills (i.e., reading, writing, spelling, and mathematics) are an integral part of the elementary curriculum; therefore, a sensitive repeated measure of these skills is necessary. Because CBM scores are dynamic indicators of basic skills (Shinn, 1995), they can be used to make a variety of educational decisions, which makes them an essential component in problem-solving academic skill deficits. Teachers and administrators can also use CBM scores in a descriptive and predictive sense. CBM scores allow, for example, principals to track the "health" of student achievement at grade, classroom, and individual levels. The purpose of this article is to describe how CBM reading scores
Table 1

Description of the Most Common Curriculum-Based Measures

<table>
<thead>
<tr>
<th>Academic Area</th>
<th>Procedure</th>
<th>Dependent Measure</th>
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<tbody>
<tr>
<td>Reading-Decoding</td>
<td>Students read aloud for 1-minute from a passage from their curriculum.</td>
<td>The number of words read correctly per-minute.</td>
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<tr>
<td>Reading-Comprehension</td>
<td>Reading Maze: Students are given 5-minutes to read a passage and circle words to fill in blanks in the passage.</td>
<td>The number of words circled correctly per-minute.</td>
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<tr>
<td>Math</td>
<td>Students are given 3-5 minutes to complete a math worksheet that contains problems found in the curriculum.</td>
<td>The number of digits written correctly per-minute.</td>
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<tr>
<td>Writing</td>
<td>Students are given a story starter and 3-5 minutes to write a story.</td>
<td>The number of words written and/or the number of correct word sequences per-minute.</td>
</tr>
<tr>
<td>Spelling</td>
<td>Students hear a list of spelling words for 2-minutes.</td>
<td>The number of correct letter sequences per-minute.</td>
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have been used as indicators of basic reading skills in a Midwestern school. The CBM reading metric was the number of words read correctly per minute (WC/M), or, in PT terms, see/say words orally in context. WC/M is a valid measure of overall reading ability for elementary students, as determined by its correlation with a variety of standard reading tests (Good III & Jefferson, 1998; Marston, 1989).

**Reading Rate as a Dynamic Indicator of Basic Reading Skills at the Grade, Classroom, and Individual Levels**

CBM reading scores were collected across the first through sixth grades in a Michigan elementary school in the fall, winter, and spring from the 1997/1998 to the 1999/2000 school year. Approximately 50 students per grade level participated (range = 38-84), including general and special education students. Over 50% of the students were minorities and 70 to 80% qualified for the free/reduced lunch program. Students read three passages from their respective grade level storybooks. The median score for each student was used to compute the mean number of words read correctly per minute (WC/M) for each grade level and time period. Figures 1 through 6 show the number of WC/M within grades across years. The means and growth patterns are similar within grade levels. A large jump is seen from the fall to the winter reading average in first grade across all years. The growth from winter to spring in fifth grade is small to none. The increase in reading rate during sixth grade is small across all years. The growth from fall to winter is greater than the growth from winter to spring in the first, fourth, and fifth grades. In general, the celeration lines decrease as grade level increases. This suggests that, at least under these conditions, reading does not grow in a multiply fashion. Other researchers have found negatively accelerated reading growth using equal-interval graphs (Good & Shinn, 1990; Skiba, Deno, Marston & Wesson, 1986; Shinn, 1988). Good and Shinn (1990), for example, found that ordinary least squares slope estimates produced some degree of over-prediction using an equal-interval graph. A deceleration in growth across years may be due to the fact that as performance reaches fluency (Binder, 1996), the rate of growth slows down, but this does not explain the negative acceleration that is evident in first grade.

**Uses for the Reading Rate Grade Level Data**

The grade level averages (arithmetic means) have been used for placement purposes. Students are grouped according to reading skill within and across classrooms and grades. For example, a group of high second grade readers was successfully grouped with a mid-level third grade class for language arts instruction. Also, incoming students are administered see/say words in context.
Figure 5
reading probes to help determine classroom placement. The success of reading rate scores in placing students has lead to greater teacher interest and confidence in the measurement system.

The reading rate scores are also used to predict student performance on the state's fourth grade reading test, the Michigan Educational Assessment Program (MEAP). At the district level, a correlation of .63 has been found between the reading rate scores and the MEAP raw scores (McGlinchey & Hixson, 2001). The principal and teachers are now able to predict how well the overall grade, classroom, or student will score on the state reading test based on the reading rate data.

**Reading Rate Data in Special Education**

Reading rate scores are also used to evaluate pre-referral interventions and to determine special education eligibility. The reading rate scores permit comparisons between referred students and classroom/grade level peers. If a student is determined eligible for special education, then IEP objectives are created based on grade level reading rate averages and progress toward the objectives are monitored using see/say words in context probes (see Fuchs & Shinn, 1989). The goal of the pre-referral and special education interventions has been to bring the student's reading rate scores within the average range. When this happens, special education services may be terminated.

The real power of CBM and PT are their use in a problem-solving framework (Shinn, 1995). Since historical reading rate data are now available at this school, future interventions can be evaluated in comparison to historical data. A few interventions that have been conducted are summarized below.

Beginning in the 1998/1999 school year, the class sizes in grades K-3 dropped from approximately 25 students to 1 teacher to 18 to 1. Figures 1, 2, and 3 illustrate that this intervention made no positive change in the reading rate data for first through third grade students.

From January to May of 1997, one of three third grade classes participated in a class-wide peer-tutoring, re-reading intervention (Anderson, 1998). Half of the students read and re-read a passage of approximately 125 words for five minutes, while their partner followed along and corrected errors. Then the students switched roles. The average gain in WC/M from the winter to the spring probe for this class was 37. This considerable improvement was largely responsible for the biggest increase in reading rate from the winter to spring probes across any of the third grade years (see Figure 3).

In the fall of 1999, the fourth grade students were divided into three different classrooms based on their reading rate scores. The median WC/M for the high class in the fall was 95.5, the middle class was 62, and the low class was 33. A reading intervention was implemented for five weeks beginning in the middle of the fall semester with the low reading class. The intervention consisted of reading lessons from *Corrective Reading: Decoding B1* (Engelmann, et al., 1988) and precision teaching fluency building and charting. The median gains in reading rate from the fall to the winter for each class were as follows: high class = 28; middle class = 24; low class = 20. At this level of analysis, the intervention appeared to have no effect, or, perhaps, a negative effect—at least in terms of absolute change, but not in terms of relative change. Bi-weekly reading rate data was also gathered on the high and the low class, which permitted a finer-grained analysis (see Figure 7). The approximate celeration lines for the high class were x 1.1 before and during the period in which the low group was receiving the intervention. The celeration lines for the low group were approximately x 1.2 before and approximately x 1.4 during the intervention. This more specific level of analysis suggested that the intervention was having a modest effect.

Curriculum-based measures are most often used for individual progress monitoring. A fourth grade student diagnosed with a learning disability in reading received tutoring for approximately 40 minutes prior to the start of school for 10 weeks. The student was instructed in *Corrective Reading: Decoding B1* (Engelmann, et al., 1988), and he received a repeated reading intervention and points for meeting certain reading rates. The number of WC/M from the first reading of the passage from each lesson is plotted in Figure 8. Week four was spring break. During weeks 9 and 10, the student fell asleep while reading on a number of occasions. Despite the variability, the student made significant gains across the ten-week period, suggesting that the intervention was effective. In addition, the student's reading gain from the winter to spring reading probes increased by six words more than the average for his grade level.

**CONCLUSION**

CBM reading data can be used to make a variety of educational decisions, such as differentiating learning disabled and low-achieving students, determining special education eligibility, and evaluating program effectiveness (Shinn, 1989, 1998). CBM data can be collected and analyzed at
Figure 7: WC/M of High, Middle, and Low Classes

- **High Class**
- **Middle Class**
- **Low Class**

**Behaver:** Fourth Grade Classrooms

**Target:** See/Say Grade Level Passages
Figure 8: WC/M and Record Floor for Subject 1

Performers: Subject 1
Target: See/Say Passage

Successive Calendar Days

Count Per Minute

Spring Break
different levels. The present paper illustrated the use of reading rate data across the school, grade, and individual levels. Such data can also be used at the district level. Research has shown that the implementation of CBM resulted in improved student performance, particularly when used in conjunction with an expert system or with instructional consultation (Fuchs, Fuchs, & Hamlett, 1989; Fuchs, Fuchs, Hamlett, & Allinder, 1991; Fuchs, Fuchs, Hamlett & Ferguson, 1992; Fuchs, Fuchs, Hamlett, & Stecker, 1991). Future research is needed to demonstrate how CBM and PT can be further combined and implemented from a problem-solving perspective across various academic areas.

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REFERENCES


