



# National Center on Student Progress Monitoring

## Monitoring Student Progress in Individualized Educational Programs Using Curriculum-Based Measurement

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### Abstract

Curriculum-based measurement encompasses an assessment methodology that can be used to develop goals, benchmarks, or short-term objectives for individualized educational programs for students with disabilities. Teachers also use curriculum-based measurement as a means for monitoring student progress across the year. This paper describes curriculum-based measurement in reading and mathematics and provides sample goal statements for each area. In addition, the process by which teachers can examine data and make meaningful decisions about the overall effectiveness of their instruction is described.

After a multidisciplinary team determines that a student requires special education services, the Individualized Education Program (IEP) becomes the tool for developing and documenting the student's educational plan. The IEP must include assessment information pertaining to the student's individual needs, educational programming that addresses those needs, and a system for monitoring student progress. Curriculum-based measurement (CBM) is a type of alternative assessment methodology that can be used both to fulfill these IEP requirements and to assist educators and parents in developing an IEP that is educationally meaningful (Yell & Stecker, 2003). The purpose of this paper is

to describe how CBM can be used to enhance IEP development. First, CBM is explained. Then, the process is outlined for using CBM information to develop IEP statements for present levels of performance, long-term goals, and short-term objectives in both reading and mathematics. Additionally, how teachers use CBM procedures to monitor student progress is described.

### What Are the Critical Features of CBM?

CBM is a reliable and valid assessment system for monitoring student progress in basic academic skill areas, such as reading, writing, spelling, and mathematics (Deno, 1985, 1992, 2003; Shinn, 1989). CBM is an alternative assessment system that also borrows some features from standardized, norm-referenced assessment. The CBM procedures, including test administration, scoring, and interpretation, are standardized; that is, tests are given and scored in the same way each time. The content of the CBM tests may be drawn from a specific curriculum or may represent generalized outcomes for a student at that grade level. In either case, CBM test content represents important, global outcomes for the year and not just an individual objective or series of objectives representing current instructional lessons. Teachers give short, alternate assessments of these important, grade-level skills once or twice each week across the year and plot student scores on a

graph. Thus, teachers are able to use CBM in a formative way to gauge student progress over time.

### ***CBM Procedures in Reading***

For reading measurement, oral reading fluency on grade-level passages in which the student is expected to be proficient by year's end constitutes the CBM score. Oral reading fluency is a quick, reliable measure that correlates highly with reading comprehension (Deno, 1985). Students who are fluent readers typically are good comprehenders; they are able to devote attention to the meaning of the text. Similarly, slow readers tend to comprehend little. Thus, the CBM score represents overall reading achievement. The teacher randomly selects a passage from the pool of selections that represent reading mastery by the end of the year. The teacher tells the student where to begin reading aloud and times the student for 1 minute. Omissions, mispronunciations, and transpositions are recorded as errors. Insertions are ignored, and self-corrections are counted as correct if supplied within 3 seconds. If a student pauses longer than 3 seconds when trying to say a word, the teacher can supply the word but also marks that word as an error. The total number of words read correctly in 1 minute comprises the CBM score plotted on the graph.

### ***CBM Procedures in Mathematics***

For either mathematics computation (e.g., addition, subtraction, multiplication, and division with whole numbers, fractions, and decimals) or mathematics concepts and applications (e.g., place value, time and money, charts and graphs, and problem solving), the teacher identifies 25 problems that represent the important skills to be mastered by the end of the year. Alternate forms of 25 problems then are developed with each form containing the same proportion of problem types at the same level of difficulty but using different numerals. Commercially prepared alternate

forms are available for elementary and some middle school grades (e.g., L. S. Fuchs, Hamlett, & Fuchs, 1998, 1999). Depending on grade level and type of mathematics test (i.e., computation vs. concepts and applications), the teacher allots 2–8 minutes for students to work, although the time allowance never changes across the year for a particular student/grade level. Thus, mathematics fluency as well as accuracy is addressed by this measure, and scores can be compared. The CBM score is derived by determining the number of correct digits in the student's final answers per specified unit of time.

### **How Is CBM Used for Describing Present Levels of Performance on the IEP?**

The IEP team can transform the student's average initial scores on CBM tests into an IEP statement of present level of performance. Because neither test administration nor scoring procedures differ and because the difficulty level of the tests remains the same over time, CBM scores can be compared across testing occasions. Current performance can be compared to subsequent performance later in the year. Thus, present level of performance can be written in the same fashion as a measurable, long-term goal that includes the learner behavior and conditions or stimulus materials. However, instead of projecting what constitutes student mastery, present performance merely describes the student's current level of attainment in an academic area affected by student disability. When the IEP team knows how children typically read or perform mathematics calculations at particular ages or grades, the present level of performance written with CBM data also suggests how substantially the disability affects student performance in that academic area. Usually, the first three to six CBM scores are averaged to determine the present level of performance.

*Sample IEP Statement of Current Level of Performance in Reading*

Given randomly selected passages at the third-grade level, J. R. currently reads aloud 65 words correct per minute.

*Sample IEP Statement of Current Level of Performance in Mathematics*

Given 25 problems representing the third-grade level, J. R. currently writes 20 correct digits in 3 minutes.

**How Is CBM Used for Developing Long-Term Goals and Short-Term Objectives?**

Instructional programming first is addressed by establishing expected year-end goals. Because the CBM tests represent skills the student is expected to master by the end of the year, the IEP team also can write a measurable CBM goal statement that reflects long-term mastery. Teams can refer to normative CBM information for assistance in establishing ambitious, yet realistic goals for students (e.g., Deno, Fuchs, Marston, & Shin, 2001; L. S. Fuchs, Fuchs, Hamlett, Walz, & Germann, 1993). A goal line on the CBM graph is depicted by connecting the student's average initial performance (i.e., baseline) to the end-of-year goal and shows the rate of progress the student must maintain across the year in order to meet the long-term goal. By subtracting the average current performance from the long-term goal and dividing the difference by the number of weeks occurring between baseline and goal, the IEP team also can figure the weekly rate of improvement, or short-term objective, that the student needs to achieve in order to stay on track toward meeting the long-term goal. In fact, the teacher can use the goal line in benchmark fashion to determine at any point in time the level at which the student should be performing in order to make adequate progress toward the goal. The CBM graph showing both student performance data and the goal line, then, provides an efficient and effective visual tool for communicating student progress with parents or other

professionals (Deno, 2003). The graph in Figure 1 shows a fourth-grade student's progress in mathematics computation from October through March. October scores comprised Donald's current level of performance, and the goal was set at the end of October. CBM scores reflect Donald's actual performance across the year, and the goal line shows the expected rate of progress Donald must make in order to reach the year-end goal of 44 correct digits.

*Sample IEP Long-Term Goal in Reading*

Given randomly selected passages at the third-grade level, J. R. will read aloud 115 words correct per minute by the end of the year (or in 35 weeks).

*Sample IEP Short-Term Objective in Reading*

Given randomly selected passages at the third-grade level, J. R. will read aloud 1.4 additional words correct per minute each week  $[(115 - 65)/35 = 1.43]$ .

*Sample IEP Long-Term Goal in Mathematics*

Given 25 problems representing the third-grade level, J. R. will write 40 correct digits in 3 minutes by the end of the year (or in 35 weeks).

*Sample IEP Short-Term Objective in Mathematics*

Given 25 problems representing the third-grade level, J. R. will write .6 additional correct digits in 3 minutes each week  $[(40 - 20)/35 = .57]$ .

**How is CBM Used for Monitoring Student Progress?**

The goal line illustrates the average rate of progress the student must maintain across the year in order to meet the long-term goal. Using standard decision rules, teachers compare the rate of improvement (i.e., trend line) for CBM scores against the goal line at approximately monthly intervals to determine whether student progress appears adequate for eventual goal attainment. If the

trend of CBM progress is steeper than the goal line, teachers raise the year-end goal. If the trend of CBM progress is less steep than the goal line, as had been the case for Donald in November–December, January, and February–early March, teachers modify instruction in some way to better address individual student needs. (Teaching changes are depicted as solid vertical lines on the graph in Figure 1.) In this way, teachers use CBM information to monitor student progress across the year and to determine the overall effectiveness of their instructional programs. Research validates this use of CBM: Students whose teachers used CBM to monitor academic progress and to make adjustments in instructional programs when necessary significantly outperformed comparable students whose teachers did not use CBM (Fuchs, Deno, & Mirkin, 1984; L. S. Fuchs, Fuchs, Hamlett, & Ferguson, 1992; Stecker & Fuchs, 2000). In addition to the graphed data, some computerized CBM systems (e.g., L. S. Fuchs et al., 1998, 1999; L. S. Fuchs, Fuchs, Hosp, & Hamlett, 2003) provide skills profiles that summarize student level of mastery for skills assessed by CBM across a particular unit of time. For example, in mathematics computation for fourth grade, boxes below the CBM graph represent student performance aggregated across 2-week intervals for the particular year-long skills assessed, such as A1: adding with regrouping, M3: multiplying by two digits, D1: dividing basic facts, and F1: adding and subtracting simple fractions (refer to Figure 1). Increasingly darker boxes represent higher levels of mastery, from a white box representing a skill that the student did not attempt to calculate during a 2-week interval to a completely blackened box representing skill mastery. By examining the skills profile, teachers can determine areas in which students need additional instruction or can identify previously instructed skills for which mastery has not been maintained (see Fuchs, 1998, and Whinnery & Stecker, 1992, for additional information about

classwide and individual skills analyses, respectively). The graphed CBM data help teachers decide whether particular instructional programs are strong enough to produce desired student achievement or whether an instructional program needs modification. When a program does need modification, the skills profile can yield specific information for instructional planning purposes. Consequently, teachers respond to unique student needs and characteristics by adjusting components in the instructional program that may enhance student achievement.

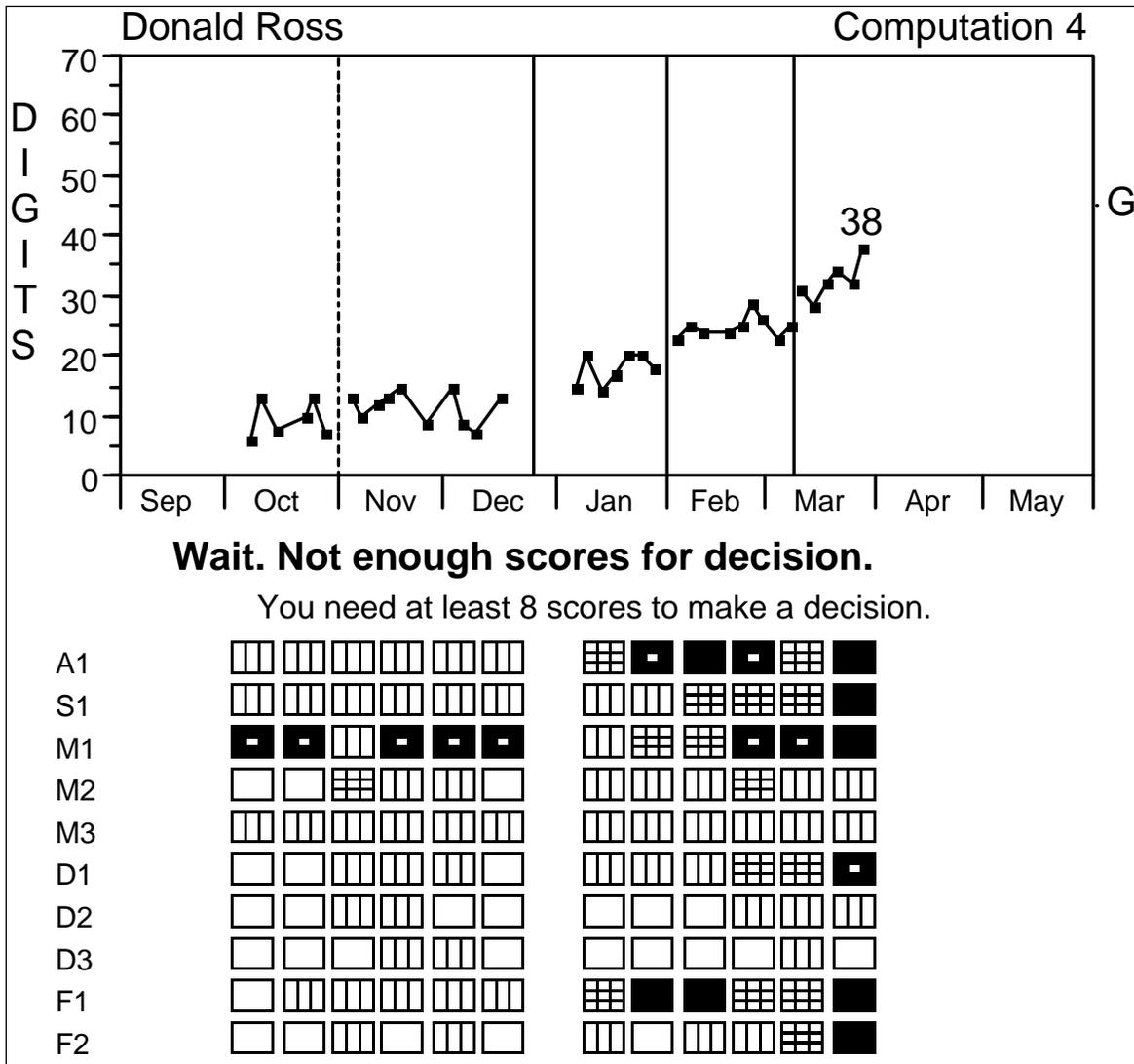
In summary, CBM comprises a research-validated assessment methodology that is particularly useful for IEP planning, documentation, and evaluation. CBM can assist in making IEPs educationally meaningful by aligning initial assessment information with instructional programming and progress monitoring. Software (e.g., L. S. Fuchs, Hamlett, & Fuchs, 1997, 1998, 1999) may assist with test administration, scoring, data interpretation, and skills analysis, so teachers can spend more time using CBM information to strengthen instructional planning and, subsequently, to enhance student achievement.

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Figure 1.

CBM graph and skills profile in mathematics computation for fourth-grade student.



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