APPLYing

Curriculum-Based Assessment

in Inclusive Settings

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So what's a teacher to do when the 30 students in her class have 30 greatly differing achievement, performance, and interest levels—not to mention learning styles and family backgrounds and language preferences? One strategy is to find ways to discover—early, often, and at the end of a unit or semester—what the students know and can do. And these tests must be efficient and fast. Here's where curriculum-based assessment (CBA) can help.

This article shows how to use CBAs, step by step, until, with practice, it may become second nature to you and your students—and provide the boost in motivation and success your students need.

Given individual student characteristics (e.g., learning level and targeted outcomes), the first step in a process describing how to develop and use CBAs, using the mnemonic APPLY (see Figure 1), is to analyze the curriculum to select critical skills from an instructional unit.

APPLY: The Steps to Effective CBAs

Analyze the Curriculum

Educators select critical skills based on students' individualized education program (IEP) goals and objectives or general education curriculum competencies. Sources for curriculum analysis include national standards (i.e., science, math), state standards, and local school district standards. First, consider that a given curriculum is divided into instructional units, which are taught across grading periods, semesters, or the school year. Then, from each curriculum unit, the primary task during curriculum analysis is to narrow the scope of all possible skills targeted for learning in a unit and select the following:

- *Foundational skills* (e.g., students need to identify vocabulary words in order to comprehend reading passages).
- *Pivotal competencies* (e.g., students need to describe the steps in problem-solving so that they can then use the steps to solve problems).

Figure 1. Steps in APPLY

- 1. A nalyze the curriculum.
- 2. P repare items to meet curriculum objectives.
- 3. **P robe** frequently.
- 4. L oad data using a graph format.
- 5. Y ield to results-revisions and decisions.

Source: King-Sears, M. E. (1994). Curriculum-based assessment in special education (p. 17). San Diego: Singular. The primary task during curriculum analysis is to narrow the scope of all possible skills targeted for learning in a unit.

- Important principles (e.g., students apply academic rules to a range of problem types) and concepts.
- *Ultimate outcomes* (e.g., students can proficiently write persuasive paragraphs).

Although many curriculum objectives may be taught, narrowing the scope to develop a brief CBA requires educators to focus on specific types of endpoints, or benchmarks, within a curricular unit. Curriculum analysis may initially be time consuming; but thoughtful planning at this stage about the curriculum and student outcomes enables educators to more strategically target the CBA content.

Prepare Items to Meet the Curriculum Objectives

Critical skills that educators target during curriculum analysis drive the items used on a *CBA probe*. The probe itself can take on many formats, such as these:

- A worksheet or computer software with math computations can be used to determine a student's acquisition and fluency with regrouping two-digit multiplication facts.
- A student's writing can be measured by the number of required elements noted on the corresponding scoring rubric.
- Comprehension of science terms can be measured by how many definitions a student accurately matches to terms, writes correct definitions from memory.
- Completing a checklist noting how many steps a student correctly performs using the scientific process can indicate skill proficiency.

CBA probes contain items for students to respond to that can be observed and counted in some manner (e.g., writing the correct answer, orally describing problem-solving steps in order, identifying the rules and applying them to problem sets). Quantifying students' output is essential to the CBA process; correspondingly, CBA probe items enable students to more clearly identify targeted content and criteria for successful performance (see Table 1 for more examples of CBA content in various subjects).

Moreover, when teachers develop brief, timed CBA probes (e.g., the number of problems solved within one minute, defining a random selection of terms from a unit within 1 minute, writing responses to questions within 2 minutes), the time necessary to administer CBA is less likely to detract from instructional time and more likely to effectively guide instructional content.



Students listen as the teacher explains graphing.

Probe Frequently

By administering the CBA on several occasions across days during an instruc-

Table 1. Examples of Curriculum-Based Assessment (CBA) Probe Content and Analysis

Content Area	CBA Probe Examples and Analysis
Geography	 * Identify each state's location on a map by writing the correct state abbreviation. * Match the terrain of an area to corresponding industry and products. * Compare and contrast regions so that two similarities and two differences are provided.
Language Arts	 * Provide a topic or story-starter, and score students' spelling and grammar based on a brief (i.e., 5-minute) writing sample. * Students choose their own topic and "free write" for 5 minutes! Score the writing sample for items related to instructional unit. * Analyze students' persuasive writing to note whether five components (e.g., opinion stated, three supporting reasons given, and summary noted) are present.
Science ,	 * Given science terms to define, write the correct definitions. * Identify steps in the scientific process, and describe how to apply each step to a given hypothesis. * Describe the human body systems so that each system's function and relationship to other systems is stated.
Reading	 * Use maze tests written on each student's corresponding reading level to determine growth in some aspects of reading. * Analyze characters' traits by describing two similarities and two differences. * Given a brief passage to read, answer five questions that include recall, inferential, and prediction responses.



Students enjoy using the word cards.

What Is Curriculum-Based Assessment?

Curriculum-based assessment (CBA) consists of direct and frequent measurement of observable student behaviors toward progress within a curriculum. In addition to using pretests and posttests, curriculum-based assessment features brief measurements—or "probes"—during instructional units.

CBA probes are designed to be administered and scored quickly (e.g., the number of science unit terms and definitions a student can match within 1 minute, or how many word problems a student can solve within 2 minutes). Thus, teachers and students can efficiently monitor acquisition of new content, as well as fluent performance. The premise for CBA is not to measure all skills students acquire within a unit (which would be difficult to impossible to do), but to select critical skills that serve as indicators, or benchmarks, of student progress (Carpenter & King-Sears, 1998).

Teachers frequently use CBA as a *formative assessment* during instruction, and teachers typically combine CBAs with other types of *summative assessments* to determine students' grades and overall progress (e.g., posttests, scoring rubrics, homework assignments, projects). tional unit, educators can make timely decisions about how well students are learning and how effective instructional techniques are. As noted earlier, teachers can use CBA probes after a pretest (some teachers use the initial CBA as the pretest) but before a posttest. In the absence of CBA measures, educators and students may not be aware of when reteaching, more studying, different kinds of practice, clearer examples, or alternative techniques need to occur.

The frequency of CBA data-collection sessions vary, depending on the length of the instructional unit. Ideally, students' progress via CBA administration occurs every day during the instructional unit. Optimally, CBA data are collected for half of the instructional sessions. Realistically, CBA data are collected during one-third of the total instructional sessions. For example, if the unit's duration is 3 weeks, CBA probes may occur two or three times a week, providing a range of six to nine data points. Some instructional units span an entire grading period; whereas, others may last 9 weeks; consequently, the content for the CBA probe and the quantity of data points varies considerably, depending on the duration of the unit.

oad Data Using a Graph Format

The teacher or the student transfers to a graph the quantifiable information provided from a student's performance on a CBA probe. Graphic depictions of student performance encourage students to concretely and visually note their progress toward targeted curriculum outcomes. Noting student performance on a graph accomplishes four purposes for students with disabilities:

1. Successive numerical performances of 41% to 67% to 82% to 97% display *more concrete progress* for students and teachers when shown on a bar graph, or when data points are connected to display an ascending line of progress. The preceding percentages represent increasing amounts of information that students are learning during the unit; initial CBA data are not test scores (a critical point that must be made clear to students who are not accustomed to What is a CBA probe? CBA probes contain items for students to respond to that can be observed and counted in some manner (e.g., writing the correct answer, orally describing problem-solving steps in order, identifying the rules and applying them to problem sets).

formative assessments such as CBA), and the intent is not that high performance is expected immediately. In fact, high performance on an initial CBA indicates that the student already knows the information and should be working on a higher-level learning outcome. Sometimes teachers use the progress that students make on a CBA as a *summative assessment* such that individualized and differentiated grading occurs.

- 2. Graphed data also enhance communication to parents and educators about their youngster's performance. Viewing a progress chart is an efficient and effective way for a parent to "see" his or her child's performance in relation to the child's previous performance. Some teachers have students take their personal CBA graphs home to show their parents midway through a unit of instruction, or at the end of the unit, so that parents are aware of their child's ongoing performance. Relatedly, using CBAs to monitor IEP goals and objectives can provide IEP team members with visual information denoting student progress. General educators who use CBA take the probes and graphs to IEP meetings to share information about the student's progress within the general education curriculum, which may be differentiated to best meet that student's needs (King-Sears, 1997).
- 3. Students can participate in reviewing their CBA progress to *set goals* for

next-day or next-session performance. Their goals can be incremental, such that the natural progression of learning that occurs is evident. The CBA goals can be used as benchmarks or indicators that let students know they are getting closer to the learning goal.

4. Teachers can efficiently glance at the graphs to sort for *flexible grouping* during instruction: One set of students may be doing very well toward the endpoint learning goal, while other sets of students may need review in specific areas.

Teachers can use software programs (e.g., Claris Impact or spreadsheet formats from Powerpoint, Clarisworks, or Microsoft) to graph data; some software programs include both the probes and graphing capabilities (Fuchs, Hamlett, & Fuchs, 1990). Although teachers may initially graph the data, we have found it most efficient to share that responsibility with students so they can keep up with their progress. Instruction and sufficient practice must occur for students to develop proficiency in graphing and using their data to make decisions. Having students graph their own data maximizes their responsibility and increases efficient recordkeeping for teachers.

ield to Results—Revisions and Decisions

Students' data on CBA graphs represent their progress within the instructional unit. Allinder (1996) found that when teachers set aside planning time to examine students' CBA data and make decisions about teaching implications, their students made significantly greater math gains. When CBA data indicate that an individual student is not making anticipated progress, then educators decide what types of revisions need to occur.

For example, the teacher might conference with the student about increasing or varying practice activities, reteach specific content using an alternative instructional method, or provide clarification related to particular error patterns the student is exhibiting. Fuchs, Fuchs, and Hamlett (1994) combined a probe and graph software program with teacher decision-making prompts, a feature that increased the likelihood that the teacher would make a teaching change by selecting from an alternative technique.

One guideline for determining when reteaching or alternative techniques need to be used is a 3-day or three-session rule: When a student has not made anticipated progress for three consecutive CBA probes, then the teacher needs to further examine the student's error patterns or weak areas and make immediate revisions in the instruction (e.g., change the level of instruction, use different teaching techniques for review of error pattern content).

Another guideline is to draw an "aimline" on a graph that connects the student's current performance level with the projected performance level and date. Aimlines are ascending lines drawn between the first CBA data point/date and the mastery data point/targeted date. Using aimlines enables students and teachers to make adjustments if formative performance across sessions is not satisfactory. Conversely, if the student is exceeding anticipated progress, then corresponding adjustments are made to provide the student with more challenging material. Note that one benefit of having guidelines for decision making is so that students and teachers do not make it through the unit all the way to the posttest to realize areas that need to be strengthened; consequently, when teachers yield to CBA data results, the likelihood that students achieve higher posttest scores is increased.

The next two sections describe APPLY as used by first- and fifth-grade general educators. in their inclusive classrooms. The first-grade scenario reports one student's CBA experience; the fifth-grade scenario depicts how a general educator used the same CBA with her entire heterogeneous class.

Emerging Literacy Scenario: Sight Word Recognition

The first scenario is about a first-grade classroom in which 25 students were enrolled. First-grade students come to school with a wide variety of academic levels. Consequently, their teachers



The CBA graph is helpful during a parent <u>conference.</u>

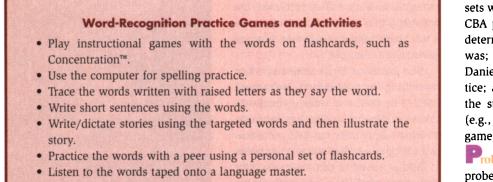
focus initially on the Dolch word list to determine which students need to be learning words from the preprimer, primer, first grade, or more advanced levels. Approximately 40 words are targeted at each level.

Analyze the Curriculum. Danielle was a first-grade student receiving bilingual special education services. Danielle had great difficulty pronouncing most initial and final sounds, yet she was very motivated about school and enjoyed practicing her sounds and words. The targeted objective for Danielle was similar to that for several students in the class who were also working on preprimer vocabulary:

Given 40 words from the preprimer Dolch list, the student will orally identify each of the words correctly.

Prepare Items to Meet the Curriculum Objective. The teacher divided the list of 40 words from the preprimer Dolch list in half, and at the beginning of the school year, Danielle focused on the first 20 words (among other reading goals). The teacher prepared 20 index cards with each of the targeted words written on them and presented them to the student to determine

If the unit's duration is 3 weeks, CBA probes may occur two or three times a week, providing a range of six to nine data points.



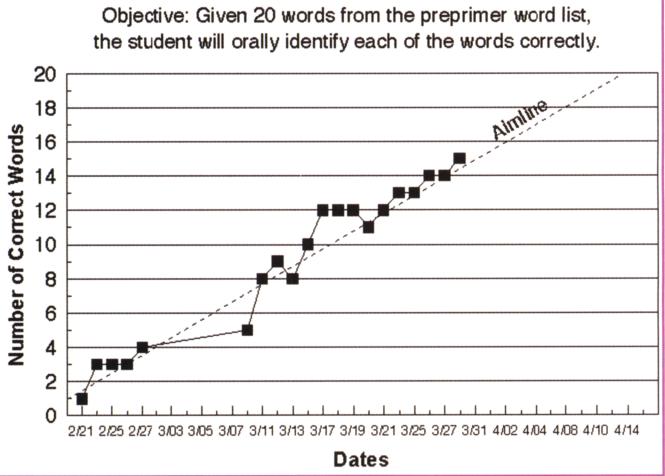
- Read books (i.e., emergent reader level) containing the targeted words.
- Highlight targeted words found within newspaper advertisements and magazines.
- Tally the number of words recognized within a passage.
- Play sight-word Bingo[™].

which ones she already knew. Several sets were used: One set was used for the CBA probe for the student each day to determine what the student's progress was; another set was sent home for Danielle and her parents to use for practice; and another set was available for the student to use for school practice (e.g., for studying or playing a word game).

Probe Frequently. Danielle's teacher probed her on a frequent basis throughout the month-long unit of instruction. Initially, Danielle could identify 2 out of 20 words correctly. Danielle's teacher varied the instructional and guided practice activities that Danielle and her peers engaged in during the unit. Danielle and her classmates had many

Figure 2. Curriculum-Based Assessment Graph of Dolch Words

Dolch Word CBA Results



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choices of activities for practice (see box, "Word-Recognition Practice Games and Activities").

Provided with a great variety of instructional and practice opportunities, Danielle learned more words, as evidenced by her progress from the daily probes.

boad Data Using a Graph Format.

Danielle's progress was visible to her and to her parents when the teacher displayed her graphed data (see Figure 2). In just over a month, Danielle increased her word recognition to 15 out of 20 words; her first-grade teacher predicts that she will know all 20 words within a week or two, based on her progress so far. Danielle was present for all recordings on her CBA graph, and she took a copy of the graph home to share her progress with her family. Danielle and her teacher also shared her graph with the English-as-a-second-language teacher. Danielle's parents were very pleased with her progress, and they set up a reward system at home as an additional source of motivation.

ield to Results—Revisions and Decisions. If Danielle were not benefiting from the varied instructional and guided practice activities her first-grade teacher was using, her CBA data would prompt the teacher to make a teaching change. On the other hand, the CBA data would also let the teacher know when Danielle was ready to move to the next half of the preprimer words; according to her CBA data, the current instructional methods are working well, and Danielle should master all 40 words in the preprimer list by the end of the first semester.

Variations:

- Assess the number of recall questions answered correctly after silently reading a passage containing the targeted words.
- Measure acquisition and fluency rates by noting the number of words read correctly in a minute.
- Examine student's journal entries for the number of new words used.

Setting a Strong Foundation Scenario: Multiplication Facts

The fifth-grade heterogeneous classroom had 34 students, including 5 students identified as gifted/talented, 4 students with learning disabilities, 3 students with emotional disturbance, 2 students with speech/language disabilities, and 20 students without disabilities.

Analyze the Curriculum. The fifthgrade teacher selected multiplication facts from the math curriculum for CBA because the students were having difficulty with several fifth-grade concepts (e.g., facts and word problems requiring multiplication with 2-digit factors, multiplication and division using multiples of 10).

Jeffrey was labeled gifted/learning disabled, and he received all of his special education services within the fifthgrade classroom. The special educator sometimes worked with Jeffrey within the classroom, and also consulted with the fifth-grade teacher frequently. Jeffrey had strong verbal skills and listening comprehension. His knowledge of a variety of topics (such as how engines work, facts about rain forests, information about animals) was extensive. He excelled in athletics, auditory discrimination, and public speaking. However, Jeffrey had dyslexia, and his reading comprehension and writing skills were his greatest areas of need.

Jeffrey did well in most mathematical areas, especially geometry, but he had difficulty solving multiplication and division problems fluently. He had a strong understanding of the concept of multiplication, and he could model the process with manipulatives as he orally explained it. However, he had great difficulty with his immediate recall of basic facts. For example, when asked the product of 5 and 2, he would need to draw a picture to respond correctly. Clearly this was slowing him down, which frustrated him.

At the end of the first grading period, Jeffrey's teacher began developing and using multiplication CBAs for all fifthgrade students. For some students, their fluency rates were their goals; for other students, such as Jeffrey, both acquisi-



Student meets with the teacher to obtain approval for her personal goals.

tion and fluency rates were emphasized. The teacher developed differentiated goals for individual students around the following objective:

Given a worksheet containing 100 basic multiplication facts, _____ will write the correct answer to _____ % of the facts within a 3-minute time period.

Prepare Items to Meet the Curriculum Objective. The CBA probe was a worksheet containing 100 basic multiplication facts. Several variations of the worksheet were developed so that the order of the facts varied each session. The students' outputs were measured in terms of the percentage of problems they accurately completed within a 3-minute time period. Each student developed his or her own personal goal. and then the student conferenced with the teacher, who needed to approve each student's goal.

Jeffrey decided, after meeting with the teacher to discuss options, that his goal would be to aim for correctly multiplying 100 facts within the 3 minutes. Many other students in the class also opted for the maximum number of facts

Students' data on CBA graphs represent their progress within the instructional unit. Teachers use these data to adjust groupings, teaching strategies, individualized instruction, and peer tutoring opportunities. CBA can be combined with other assessment processes (e.g., portfolios, unit tests, projects, and demonstrations).

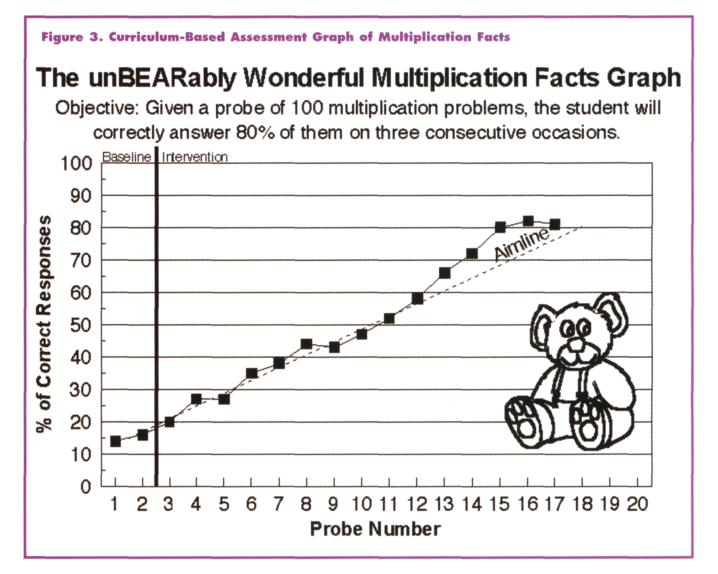
as their goals. Jeffrey's teacher recalls that she would have selected what she perceived to be a more reasonable goal for Jeffrey, but that she was reluctant to change his choice made after their discussion. Fuchs, Fuchs, and Deno (1985) noted that students who set higher goals for themselves than their teachers would recommend can sometimes accomplish more than teachers anticipate because of their involvement in the goal-setting. Jeffrey was very determined to challenge himself; he was persistent in persuading his teacher to let him try this goal, and they agreed to meet periodically to determine if the goal needed to be altered.

Probe Frequently. Students completed a CBA probe on the multiplication facts one time per week. The initial probe served as the pretest for the students. Jeffrey's first data point and goal date/performance was used to draw his aimline. Jeffrey's teacher noted that eventually (after initial instruction) students could administer and graph their own probes and results in approximately 5-7 minutes. CBA probe sessions occurred for each student one or two times per week across the grading period.

Load Data Using a Graph Format. The fifth-grade students created and maintained their own graphs. In addition, the teacher kept a record of each student's progress (see Figure 3). The students found graphing their own results highly motivating; the visual representation was helpful for them in determining their progress since the pretest, and how far they needed to go to reach their goals. Aimlines helped them to see how they were doing in relation to anticipated progress that week.

Vield to Results—Revisions and Decisions. When students reached their goal, they had their names written on cutout bears that were placed on a bulletin board labeled, "We're unBEARably good at our facts!" Students then met with the teacher to determine a new goal.

Jeffrey's progress was just below his aimline for the third session. He and his teacher met, they readjusted his aimline



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to 80%, and he decided to participate in a "fact group" comprised of students who could self-select to meet during class to bolster their performance on specific skills to help him increase and maintain his memory of multiplication facts. By the fourth week's CBA session, Jeffrey improved his performance by 10 facts, which put him just above his aimline. He continued to work with the fact group and continued to increase his fluency. Although he did not accomplish his initial goal of 100 facts in 3 minutes by the end of the second grading period, he did accomplish his readjusted goal during the third grading period.

Other fifth-grade students whose CBA data indicated that anticipated progress was not occurring (i.e., there were 3 consecutive weeks in which their data fell below the aimline) met with the teacher to determine what needed to occur. In some situations, as with Jeffrey, the goal and aimline were adjusted; in other situations, students participated in "fact groups" in which they brainstormed strategies for remembering the facts (see box, "Math Facts Practice Games and Activities").

To ensure maintenance of acquisition and fluency rates, students worked in randomly selected pairs for about 10 minutes to drill each other (each student used a set of personal flashcards that he or she created) as a warm-up activity for math class. Because the flashcards had the answer on the reverse side, it was not necessary for the tutor to have mastered the set of flashcards his or her partner was learning.

Students in this fifth-grade class made excellent progress; of the 34 stu-

Math Facts Practice Games and Activities

- Sing a multiplication song.
- Use computer software that features practice activities for basic facts.
- Peer tutor, with each partner taking a turn as the tutor.
- Play multiplication instructional games.
- Develop a personal set of flashcards to use for practice.

dents in the class, 19 were able to complete all 100 facts within the 3-minute time period by the end of the second grading period. Ten students met their goals by making reasonable progress, for each as an individual, each week. Five students required additional interventions (e.g., peer tutoring, instructional games); however, by the end of the third grading period, they, too, met their learning goals.

When given a survey about using CBA in math, students responded positively. They reported feeling confident about their ability to recall math facts more quickly than at the beginning of the second grading period. Students supported the use of CBA across the curriculum, and they stated that graphing and analyzing their results was the best part of CBA. In addition, students' performance on the fifth-grade multiplication objectives improved (e.g., solving word problems involving double-digit multiplication, division computations). Their foundational skills for quickly identifying correct answers enabled them to concentrate on higher-level skills of problem solving and analysis. Variations:

- Provide CBA points for both accuracy of word problems solved and student's description of how he or she arrived at the solution.
- Develop a brief CBA probe that features several computations, a word problem, and directions to construct an original word problem and solve it.
- Students construct or model concepts, such as showing equivalent fractions to demonstrate the concept of equivalency and differentiate it from the concept of equality.
- Write or orally explain processes used to find answers and solutions— "Explain how you found the answer to _____ without using numbers!"

Final Thoughts

Effective general educators are finding that specialized assessment techniques, such as CBA—which is traditionally used to note progress for students with disabilities—can provide them with student performance data for all their students (see box, "Tips for Organizing for

CBA"). Inclusive settings do not necessarily use specialized techniques only for the students with disabilities; such techniques benefit other students, too. The general educators in our study were also able to actively involve their students in graphing, setting goals, developing CBA materials, and determining the types of activities they could use to enhance their performance. Such involvement amplifies the benefits of CBA when each student views his or her graph, makes decisions about individual progress, and assumes more responsibility for determining practice and learning activities.

CBA can be combined with other assessment processes (e.g., portfolios, unit tests, projects and demonstrations),

Tips for Organizing for CBA

Here are some tips for organizing curriculum-based assessment in a general education setting:

- Set up a CBA probe center so that students can access the CBA and complete his or her probe independently.
- Add CBA graphs to portfolio notebooks so that the CBA progress is used in conjunction with other assessments in a content area.
- Administer group CBAs when possible (e.g., all students have 1 minute to complete the CBA).
- Train instructional assistants, volunteers, or other students to score the CBAs using an answer key.
- Involve the students themselves. In addition, involving students can shift CBA material development (e.g., students develop their own graphs, students make their own set of flashcards) from the teacher to students—a highly desirable timesaver for teachers in inclusive classrooms.

and CBA can be used for more than monitoring student progress; creative teachers are finding multiple ways to use CBA graphs that place more responsibility for learning on students. Although such responsibility is desired for all students, the implications for students with disabilities are even more critical for promoting self-control of current learning and self-determination of future educational goals. Using graphic CBAs and actively involving students with disabilities in data-based decision-making can encourage students' accountability for learning-a responsibility they can share with their teachers and family.

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