CHAPTER 2

Problem-Solving Assessment

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Assessment occurs when a decision is to be made and the decision makers are seeking information to inform the decision. The history of education and psychology is replete with evidence regarding the use of assessment to make screening, classification, and placement decisions. Within the schools, achievement testing has been conducted to provide information for evaluating programs, and schools and for making system-level comparisons. The No Child Left Behind Act (NCLB; 2002) clearly illustrates the use of achievement testing to make such comparisons.

Most commonly, school assessment activities have focused on aiding the process of determining special education eligibility. Traditional school assessments have been severely constrained by rules and regulations that have left very little room for reflective problem solving. There will always be a need for classification and placement of students in special and compensatory programs; however, alternative conceptions exist for how assessment can inform the wide range of decisions that are made while implementing educational interventions. The conceptual model provided here portrays assessment as directed toward problem solving.

Professional Problem Solving

What makes work "professional" is not easy to identify. Historically, advanced training and work—more mental than physical—have defined a professional practice. Another characteristic that typically defines professional work is problem solving. For example, physicians address problems in physical health and development. Lawyers focus on legal problems. Engineers solve design problems. Psychologists intervene to reduce interpersonal and mental health problems. Less obvious perhaps is that successful professionals in education must also be effective problem solvers. The problems that

education professionals must address are those deriving from efforts to foster intellectual and social development.

Problem Solving Defined

The view that educators must be professional problem solvers is based on the idea that their role routinely creates for them cognitive conflicts that they must resolve. Those conflicts arise when they sense differences between the student performance or behavior they desire and the performance or behavior they perceive. Throughout this book, the term *problem solving* is used whenever people act to eliminate a difference between what they currently sense or perceive and alternative conditions that they value. In short, problem solving occurs when people act to reduce the discrepancy between "what they want and what they get." In education, the perceived differences that motivate problem solving are those discrepancies between students' present levels of development and some other expected or desired level of development. The approach described in this chapter is based on the idea that problems exist in the eye of the "beholder" rather than in the behavior or performance of the student. This is not to say that a problem identified by the educator doesn't exist. Indeed, a problem is said to exist as long as a discrepancy is identified. Problem solving refers to the activities undertaken to reduce or eliminate the perceived discrepancies.

A broad conception of problem solving is useful for professionals in education because, when used, it clarifies the nature of the professional role and its attendant responsibilities. In addition, recognition that problem solving is required enables the problem solver to undertake an organized, explicit, and systematic approach to solving the problem. The problem-solving model provided here is also useful to those who would address the problem because it avoids the common argument over whether a problem truly exists. Since the position taken here is that a problem exists whenever a discrepancy is perceived between what a student does and what someone expects the student to do, the focus in disputes must shift to whether the problem, once identified, is important enough to take action.

Problem Solving in U.S. Schools

In most respects, determining whether a problem is important enough to solve is the most difficult step in problem solving. The controversy surrounding high-stakes testing in American education is a good example of how subjective arguments can be over whether or not important educational problems exist. Many educators argue that schools are more effective than they have ever been. In contrast, politicians and some members of the business community believe that the United States is experiencing a major educational crisis. Educators point to increased scores on national assessments, while politicians pass legislation calling for higher performance standards. Clearly, it is not only the actual level of achievement that is at the core of this difference in problem perception. At issue also is that whether or not student achievement is satisfactory depends upon the standards applied to that achievement. Not only do legislators perceive a difference between current student achievement and the level of achievement they desire, but they also view that difference in achievement as important enough to act on through advancing legislation.

Individual Problem Solving

The difference in opinion between politicians and educators regarding school achievement is also observable at the level of teacher and parent. Almost anyone consulting with teachers and parents has been confronted with the situation where a teacher viewed a child's progress as acceptable and the parents were unhappy because they saw their child as underachieving. The disagreement, of course, results from a difference in perspective on what the child *ought* to be accomplishing. In situations like this, teachers and parents sometimes have difficulty in resolving their differences. At the same time, with some consultation, the discussions over whether the child truly has a problem can become opportunities for constructive problem solving. Constructive problem solving in such situations calls for a professional with skills at structuring the communication so that steps can be taken to address the differences in perception. A successful approach to resolving the differences begins with the following three steps:

1. Factual description of the child's *current level and rate of development*.
2. Complete specification of the *desired level and rate of development* by parents and teacher.
3. Thorough discussion of the *importance of the difference* between the child's current rate of development and the rate desired.

While the first step in clarifying whether a problem exists can be objectively accomplished, and the second step can be accomplished through careful probing, the third step is certain to be entirely subjective. This is so because people necessarily will have different views on which discrepancies are important and how large a discrepancy must be before it is viewed as a problem.

Schooling as Intervention

The role of professional educators as problem solvers is best understood when education is viewed as a deliberately conceived "intervention" into children's lives. The intervention of schooling has been created by society to produce specific developmental outcomes. While members of a society often disagree on the outcomes, there should be no question that the primary purpose of schooling is to intervene in children's lives to produce those outcomes. As extensions of our society, then, educators are required to accept the developmental outcomes around which schools are organized and to work toward their attainment. Teachers and parents often do not like or agree with the outcomes that have been specified, but those whose children attend the public schools and those who are public employees are bound by the law and regulations. In the public schools, parents must accept that the state will direct their children toward the state's preferred outcomes, and educators must accept the responsibility to organize activities in the direction of those outcomes. Given these circumstances, the "problems" to be solved by educators ultimately are derived from their schools' responsibilities to promote growth and development in the direction of societally mandated outcomes. The term *intervention* underscores the fact that schools are designed to have an impact on what otherwise might be unstructured development.

Problems

In a problem-solving conception of schooling, the focus of educational intervention is on how to eliminate the difference between students' level of development at any point in time and the level of development expected by society in the future. The current emphasis on standards and high-stakes assessment clearly underscores this focus on solving the problem of where students *are* and where society *wants them to be*. With full implementation of NCLB (2002), considerable pressure has been applied to both schools and students to ensure that any discrepancies between societal standards and students' performance are eliminated. Whether or not this is realistic is not the issue here, of course. As stated previously, what is relevant is the public perception—articulated through federal and state governments—that problems with school achievement exist.

Outcomes

An examination of the standards set by state and federal governments easily leads to the conclusion that literacy and numeracy are the most fundamental outcomes toward which schooling is to be directed. This conclusion is supported by observation of time allocation to subject matter during the school day. Particularly in the elementary school years, far more time is allocated to fostering development in reading, writing, and arithmetic than in other subjects. At the secondary level, language, literature, and mathematics are consistently required of all students, especially those who plan to attend college. In addition to the prominence of literacy and numeracy in curriculum organization, evidence of the primary nature of these two sets of outcomes can be obtained from emphasis in national assessments of student achievement. For example, the National Assessment of Educational Progress, contracted for by the federal government, focused first on national trends in reading, writing, and math achievement. As greater attention has been given to setting standards, science has been added to the outcome emphasis placed on literacy and mathematics (National Center for Education Statistics, 1993).

Under the guidelines of NCLB, the recently adopted Common Core standards, and related state requirements, outcomes related to personal, social, and physical development apparently will be left to families and schools as secondary considerations. Standard setting, then, is the process of making the public's values explicit. In doing so, standard setting clarifies and establishes the priorities that will be assigned to the problems of ordinary educational intervention. In the model presented in this book, the term *problem solving* is not reserved solely for efforts to promote change in atypical development. Instead, problem solving, or the problem-solving model, provides a framework for reflecting on the nature of schools, the purpose of schooling, and the nature of professional work in the schools.

Problem Solving through General and Compensatory Education

Two major types of intervention occur in education. The first, which we call general education, has been described previously as the mainstream instructional program created for all children. A second, smaller set of interventions consists of the various special and compensatory education programs created for students from diverse cultural

and economic backgrounds and for students with disabilities who so often seem not to be on track to attain the general standards. Different from the general education interventions, this second set of interventions is intended for smaller subsets of the student population. These two general types of intervention create somewhat different roles and responsibilities for school psychologists and other educators who engage in school-based problem solving. Much of that difference stems from the fact that interventions in special and compensatory programs are characterized by increased intensity and resource allocation, since they occur when a student's response to the ordinary interventions of the general program is deemed unsatisfactory.

Intensification of Educational Intervention

Until quite recently, the idea that educators functioned as problem solvers would have seemed inappropriate, the primary reason being that schooling was viewed as an "opportunity" for students to learn and grow rather than a place where educators deliberately engineered environments to increase growth. In such an "agrarian" model of education, the emphasis in teaching was on the teacher's responsibility to create the climate for growth. The general education program was to function as the fertile field prepared to nourish children's growth. The assumption was that students grew at different rates because it was "in their nature," not because educators were failing to prevent or overcome those differences. The classroom was a place where children were "free" to learn at their own rate, achieving to the level of their individual capabilities. Once the field was prepared, teachers were expected to "weed and feed," but differences in growth rates were assumed to be the natural outcome of organic differences. In this model, the expectation was that the distribution of academic achievement would inevitably result in an approximation of the normal bell curve. In the agrarian model, assessment is used to identify which students are the "best" and the "brightest" fruits of the field who merit further academic nurturing. While it might be possible to see the role of educators as problem solvers in the agrarian model, accepting a normal distribution in achievement as appropriate—even inevitable—is not compatible with standards-based education policies under which all students are expected to learn certain skills to at least a minimum criterion.

Over the past several decades, a "sea change" has occurred in society's charge to America's schools. Beginning with a report entitled *A Nation at Risk* (National Commission on Excellence in Education, 1983) by the Reagan administration, specific deficits in U.S. schools were identified. The change was made explicit toward the end of the century by the "Education 2000" challenge introduced during the administration of President George H. W. Bush (National Center for Education Statistics, 1993). In that document, and in many state initiatives since then, American educators were challenged to create schools in which "all children" would learn. The assumption was that schools should be a place where "equity and excellence" could be expected for all students. This idea that all students could achieve at a high level if the schools would function properly led to standards-based reform efforts in virtually all states.

Standards-based reform begins with the setting of criterion-referenced outcomes by political entities, typically state legislatures. Once the outcomes are specified, mandates are established compelling school districts to ensure attainment of those outcomes

for all of their students. Often, positive and negative incentives are attached to success and failure for both school districts and students. These same ideas were codified in law through the NCLB legislation passed in 2001 during the administration of President George W. Bush. The original regulations that flowed from NCLB offered no surcease from the demand that the schools educate all children to a high standard of proficiency. Further, the assessment requirements were designed to ensure that educators would regard the achievement of anything less than high standards by all students as a problem.

An important effect of this sea change for American education was to alter the roles, responsibilities, and expectations for everyone working in the schools. The pressure of meeting existing standards replaced the luxury of a relaxed approach, where it was possible to sit back and "watch the garden grow." Educators everywhere are now pressured to find those "evidence-based practices" that will provide them with the means to overcome inadequate growth rates. The idea that all students are capable of meeting the same standards and that educators are responsible for attaining that ideal represents a significant departure from the normal bell curve model that was the former basis of educational practice in the United States. Even with the recent offer of waivers to states that cannot meet the 2014 achievement goals, the U.S. Department of Education still has a focus on student attainment of specified outcomes. In American education, the model of industrial engineering has replaced the agrarian approach to schooling. Problem solving is now a primary responsibility of all educators in the current educational environment.

Compensatory Programs as Intensified Problem Solving

Students do not grow at the same rates physically, nor do they grow at the same rates academically. When government agencies arbitrarily set standards for "acceptable" performance in different curriculum domains, the differences in students' rates of development inevitably result in some students failing to meet the standards. In response, schools create special and compensatory education programs designed to intensify problem solving beyond those organized as part of the general curriculum. Compensatory programs such as Title I and those for English language learners contain relatively large numbers of students, all receiving a common approach to improving their school success. As standards-based reform was implemented, additional remedial programs had to be created to intensify problem solving for those students who failed to meet standards. Beyond these compensatory programs, special education programs are provided for a smaller number of students whose developmental problems are even more intractable. During the 1960s, 1970s, and early 1980s, the efforts to solve the problems presented by this smaller number of students were organized through a continuum of options, or "Cascade of Services" (Deno, 1970). The levels described in this administrative model consisted of different types of programs where special educators served decreasing numbers of students. Since these special education programs added significantly to the cost of education, determining eligibility for special education programs has dominated the assessment responsibilities of school psychologists.

With the passage of NCLB, the demand increased for all educators to intensify problem-solving efforts. NCLB requirements have also heightened attention to

the achievement problems for students in all types of compensatory programs. An increased focus on adequate academic progress among even the lowest achieving students has replaced the historic preoccupation with the procedural requirements that were necessary for determining eligibility for these programs. As a result of NCLB and related state policies, special and compensatory school programs now face the challenge of shifting their focus to demonstrating improved developmental outcomes for the students in those programs. Another significant result of this intensification of problem solving for students who are at risk for not meeting the established standards is the effort to implement multi-tiered systems of support (MTSS), often known as response to intervention. This movement that has produced additional "tiers" of intensified effort to reduce the likelihood for failure.

Societal Priorities in Problem Solving

In the problem-solving approach presented here, a "problem" is said to exist whenever expectations for performance exceed current performance. In this view, "problems exist in the eye of the beholder." Whenever the schools or teachers—or parents or politicians—are not satisfied with student achievement, a problem exists. At the simplest level, a problem exists when a teacher expects students to read a story and answer questions and some students do not do so. The problem exists regardless of whether the teacher's expectation is too high or the level of student performance is too low. No attribution of cause is necessary. Similar problems can be easily imagined for story-writing when students do not have the necessary writing skills and for completing mathematical story problems when students do not possess the necessary computation skills. Whenever student performance is perceived to be discrepant from expectations, a problem is said to exist.

Person-Centered Disabilities and Situation-Centered Problems

Before considering how priorities are established among problems, an important distinction must be made between an academic disability and an academic problem. The term *academic disability* is used to refer to the relative incapability of a person to perform common academic tasks. In the foregoing examples, the students who are relatively unskilled in reading and computational math would be considered to have academic disabilities if their performance in these domains was extremely poor. In this sense, then, academic disabilities are centered in the individual. The term *academic problem*, in contrast, refers to differences between what the person can do and what the environment requires of the person to be successful. In the prior reading and math examples, problems exist because the conditions set by the teacher exceed what the students can do. From those examples, we cannot determine whether the students are academically disabled or whether the teacher's expectations are unreasonably high. Thus, we can say that an academic problem exists, but we cannot say that the appropriate solution lies in increasing student ability, altering the teacher's expectations, or making adjustments in both. In this perspective, we can see that problems are defined contextually in terms of the discrepancy between performance and environmental demands. Academic problems, then, are centered in the situation, while academic disabilities are centered in the person.

The Role of Cultural Imperatives

A useful approach for understanding how priorities among academic problems are established is the framework provided by the idea of "cultural imperatives" (Reynolds & Birch, 1977). Cultural imperatives are the implicit or explicit standards of conduct or performance imposed on anyone who would become a member of a culture. One example of an imperative in American culture that increasingly produces conflict is the requirement that all citizens speak English. As the United States becomes more culturally and linguistically diverse, the demand that citizens speak one language has been challenged. Even as the challenge has been raised, however, school districts in some states are legally required to provide all of their instruction in English. While imperatives such as speaking English are codified in law, other imperatives are not explicitly formal and legal. The expectation that adults should be independent, for example, is sanctioned socially but not legally. Inculcating many socially sanctioned, but not legally required, cultural imperatives is a primary charge of the public schools. Controversy has existed for some time over what constitute the cultural imperatives of American society that are to be transmitted by our schools (see Hirsch, 1987). As NCLB was implemented, and states were required to establish curriculum standards, political conflict ensued. Conflicts over what students should be required to learn may be interpreted as cultural struggles that derive from different value orientations over what the imperatives of American culture truly are.

One thing that becomes clear with conflict over cultural imperatives is that, while agreement can be obtained at a general level, disagreement exists when specificity is required. For example, widespread agreement exists that "basic skills" should be given high priority in school instruction. Different viewpoints emerge, however, when efforts are made to specify the basic skills that must be learned by all students. One thing seems quite clear in examining the cultural imperatives toward which schooling is directed: Substantial instructional time has been, and is, allocated to teaching functional skills in reading, written expression, and arithmetic. At the very least, we can say that reading, writing, and arithmetic are cultural imperatives in the early school years.

Cultural Electives

As we attempt to establish priorities among academic problems, it is important to recognize that there are aspects of culture that may be valued by a majority of people in a society but are not required of all members. These valued, but optional, aspects of individual development are cultural electives. Playing a musical instrument is a good example of a cultural elective since it is widely valued but not required for successful membership in American society. Because instrumental performance is an elective, opportunities to learn how to play an instrument are sometimes provided by the schools, but basic instrumental skill is not required for promotion through the grades. The distinction between reading as a cultural imperative and the playing of a musical instrument as a cultural elective is at the heart of establishing priorities among problems to be solved. The first consideration in problem solving is inevitably given to cultural imperatives. Clear evidence of this fact is the effect of the standards-based reform movement made explicit in NCLB. As outcomes become written into law, they serve to establish what the body politic views as cultural imperatives.

The Role of Normative Standards in Problem Definition

The distinction between cultural imperatives and cultural electives provides only a partial basis for identifying those problems important enough for organizing problem-solving efforts in the schools. A second criterion that must be added is the size of the difference between what a culture requires in its imperatives and what a member must do to be considered "at risk" for violating cultural expectations. How much must performance differ from the standards set by the culture for an individual to be considered seriously disabled? From an empirical, psychological point of view, the answer has been found in the normative behavior of the members of the culture. In this view, establishing important differences requires development of empirical norms that largely, but not exclusively, determine the performance standards imposed by the culture. For example, commercially developed achievement tests are based on the use of norms that provide a framework for judging performance in reading, written expression, and arithmetic. The standards are established by measuring student performance at different points throughout the school year to determine the distributions of performance for same-age cohorts. Students who widely diverge from their peers at the low end of these distributions are those typically thought of as disabled.

While academic *disabilities* are normatively defined, academic *problems* are situational and depend on the performance expectations in that situation. Thus, judgments that a discrepancy is serious reside in, and are conditioned by, the contexts within which a student's behavior occurs. This perspective means that teachers make judgments based not only on their experience with broad cultural norms but also on the behavior of students in the context of their classrooms and schools. The local frame of reference will always affect an individual's judgment. This point is important to remember when choices must be made among problems to be solved.

The standards-based reform movement clearly illustrates how standards other than those derived from prevailing norms influence problem identification. This call for reform was driven by the view that the normative performance of American students was markedly decreasing or inferior to the norms of other cultures. In the early 1980s, the schools were sharply criticized for apparent decreases in the national averages on the Scholastic Aptitude Test. Further, considerable alarm was created by evidence that students in Japan were superior in their mathematical performance to students in the United States. The result was a call to reject the normative criteria in favor of higher standards as cultural imperatives.

Academic disabilities contribute to the existence of academic problems, but they are not the sole basis for the existence of those problems. A lack of reading skill becomes a problem only when the standards for success in the environment require a level of reading skill not possessed by the individual. A reading disability becomes a problem when the teacher expects the students to study text they cannot read or when a person is required to read instructions in order to assemble a bicycle. Since these problems are created in relation to environmental demands, they are situation centered rather than person centered. Problems, then, are ecologically defined, since they can be described only in terms of the network of social and physical environmental relationships of which the individual is a part.

Establishing Priorities among Problems

Problems have been defined here as situation-centered performance discrepancies. Although such a definition is useful as a starting point for intensifying problem solving, two issues need to be addressed when allocating resources: (1) the situation-specific nature of problems and (2) the myriad expectations that define performance as discrepant. Since performance discrepancies are always defined with reference to a specific situation, people performing at the same level in two different situations might be viewed as having a problem in one situation (e.g., the school) but not the other (e.g., on the job). Students who do not compute well enough to complete word problems successfully in their math class may experience no difficulty in accomplishing the computation required for working in a fast-food restaurant. Indeed, most of us who might have been marginal math students in school do not have mathematical problems in our daily lives. It is also common to find differences in the acceptability of the same academic skills between schools or classrooms. For example, a student whose performance in reading might have led to eligibility for a compensatory education in a high-achieving suburban school district might, upon transferring to a low-achieving urban school, be placed in a top reading group. Even within the same school, a student's behavior is likely to be judged differently by different teachers from one grade to the next. Indeed, evidence exists that it is quite normal for a student to be identified as having a significant behavior problem during the elementary school years (Balow & Rubin, 1978). This situational character of educational problems makes it difficult to determine whether a problem is sufficiently important for precious supplementary time and money to be invested in its solution.

A second issue related to performance discrepancies in problem solving is the myriad, and seemingly arbitrary, academic and social–behavioral expectations faced by students. In general, teachers expect (1) compliance with reasonable requests, (2) attention and participation in class, (3) completion of independent classwork and homework, (4) self-direction on projects, and (5) development of accuracy and fluency in a variety of curriculum skills. When the specific expectations within this general set of expectations are identified, however, some seem less important than others. Students are often held accountable for completing activities that are included in curricula even when no clear empirical rationale can be developed for requiring the activity. When considering both the wide range of expectations and the situation-specific nature of many problems, it becomes clear that some set of criteria, or system, must be used to establish priorities among problems as efforts to intensify problem solving proceed.

Norms, Standards, and Consequences in Establishing Priorities

In the history of educational and psychological testing, norms have weighed heavily in the judgment of student performance. Indeed, "problems" have traditionally been identified through establishing the difference between an individual's level of performance and the mean performance for age and grade. When this normative perspective is used to define problems, the magnitude of a student's problem is established by scaling the normative difference. A subtext always missing in this approach to identifying problems, however, is a consideration of the consequences of the failure to achieve expectations. If nothing else, the standards-based school reform movement that relies on benchmark testing makes it abundantly clear that academic problems can be criterion

referenced as well as norm referenced. Even more clearly, the movement has revealed that it is the magnitude of the consequences associated with failure to meet expectations that establishes the significance or importance of academic problems. High stakes have been attached to success and failure, and students can be denied grade promotion or even a high school diploma. Schools can be labeled as substandard and placed on probation, or school districts can be required to pay for supplementary programs. In this climate, priorities among academic problems are a function of the consequences attached to prevention, elimination, and continuation of those problems. Priority for academic problems with less significant consequences gives way to priority for problems defined by law and regulation.

The raised stakes for schools and teachers made it easier and more practical for teachers to establish collaborative priorities among academic problems. Although many do not agree with the politics and the outcomes of the standards-setting process, arguments over priorities among problems decrease once standards have been established. Where many educators once ignored or gave low priority to standardized tests, those tests have become the focus when evaluating achievement outcomes. The result is that academic problems defined by performance on state standards tests are given highest priority.

The Increased Need for Progress Monitoring

The dramatic increase in pressure on schools to document student attainment has resulted in a much sharper focus on assessment procedures. Without some means to establish that students are attaining the standards, of course, there can be no accountability. The key approach to establishing accountability has been to increase the number and types of assessments used to ascertain attainment of outcomes. Different states have taken different approaches to developing assessment procedures for establishing accountability. Initially, some states based their procedures on alternative approaches to assessment, such as performance sampling and portfolio assessment. With the broader range of assessment requirements introduced through NCLB, the emphasis on traditional objective test item formats for basic skills in reading, writing, and arithmetic became more practically feasible. Many states either developed or contracted for the development of new achievement tests that meet NCLB requirements. One remarkable aspect of this movement is that, in many cases, the procedures developed to meet accountability standards were implemented without extensive technical work on their reliability and validity. Thus, many students, and many schools, have been held accountable through assessment procedures of uncertain technical adequacy (Ysseldyke, Dennison, & Nelson, 2004).

In addition to developing tests to meet the accountability requirements of high-stakes assessment, educational agencies have also recognized the need for, and potential of, regular and frequent progress monitoring procedures. The need for progress monitoring stems from the fact that those being held accountable for student achievement on standards tests need to be able to forecast likely student success on the standards tests. Obviously, being able to anticipate outcomes creates opportunities to make corrections to forestall or minimize any negative consequences. Thus, interest increased in

the potential of progress monitoring procedures for formatively evaluating educational programs for the purpose of increasing the likelihood of program success.

The U.S. Department of Education made educational agencies more aware of the importance of frequent progress monitoring by requiring its use in evidence-based programs. In its invitation to apply for the Reading First grants (NCLB, 2002), the department required that all applications incorporate progress monitoring on the basis that there was sufficient evidence that success in attaining positive achievement outcomes in beginning reading increased when progress monitoring data were used formatively to evaluate programs. In a sense, progress monitoring has achieved a status akin to the "well checks" conducted by health care providers to monitor children's health and development. In education, as in health, regular and early inspection enables detection of students whose growth rates place them at risk for failure to meet eventual standards. The use of progress monitoring procedures has now become common practice as schools have moved to incorporate multi-tiered systems of support (MTSS) as part of their efforts to screen and identify students who are academically at risk and then to monitor their growth rates as they move into different tiers, or levels, of intensified intervention.

Successful implementation of progress monitoring can create more and clearer occasions for educational professionals to engage in problem solving. The early identification of discrepancies between desired and projected levels of accomplishment indicates that risk exists and a need exists to intensify problem-solving efforts. To accomplish this, however, requires the availability of progress monitoring procedures that provide data of sufficient reliability and validity so that problem solvers can effectively use those data to evaluate programs formatively. It is in this environment that growth monitoring procedures like curriculum-based measurement (CBM; Deno, 1985, 2003a) have become of particular interest.

Intensified Problem Solving as Action Research

In earlier writings on the role of school psychologists and special educators as problem solvers (Deno, 1986), the focus was on using single-case time-series research designs (Glass, Willson, & Gottman, 1975; Kazdin, 1982) as the basis for formatively evaluating individual student programs. The use of single-case research procedures to intensify problem solving adds systematic empirical evaluation of alternative interventions introduced into student programs. The primary assumption on which this systematic empirical problem-solving approach was recommended was that its application produces cumulative improvements in student programs and outcomes. Improvement occurs because the evaluation procedures are formative rather than summative; that is, changes in programs are made during their implementation when they appear not to be succeeding rather than waiting until programs are completed to evaluate their effects. The application of single-case research designs to evaluate programs formatively places educators squarely in the role of action researchers who are attempting to discover "what works" when they work to improve programs.

As with any idea, the roots for viewing educational reforms as experiments are old and deep. Donald Campbell (1969) advanced the empirical problem-solving approach

presented here more than 35 years ago in his presidential address to the American Psychological Association. In that address, he proposed that societal reforms be conceived as experiments whose effects need to be tested rather than assumed. When that proposition is applied to education, it becomes clear that changes in students' programs implemented to prevent or eliminate problems can and should be carefully tested using empirical procedures. In addition, empirically testing reforms helps to ensure that the precious resources allocated through compensatory programs do indeed lead to the reduction of those problems for which the resources have been allocated. Finally, the emphasis on empirical testing is consistent with one of the most desirable principles in NCLB: the need to use evidence to make educational decisions.

Problem Solving as Hypothesis Testing

Single-case research designs are created to test hypotheses regarding functional relationships (Brown-Chidsey, Steege, & Mace, 2008). Were we able to predict with certainty precisely what interventions would be successful, evaluation would be unnecessary. Unfortunately, and despite the call to use only "evidence-based programs" in education, we cannot say with certainty that any one program will be effective with all students. For that reason, we must recognize that any problem-solving alternative can never be more than an operational hypothesis about what will affect student performance. We owe it to the students in whose lives we are intervening that those operational hypotheses be tested to either confirm or disconfirm our predictions.

The literature on problem solving is convincing in documenting that more effective problem solvers generate many possible plans of action prior to attempting a solution (Johnson & Johnson, 1982). Alternative plans of action are important for two reasons: First, selection of a "best solution" requires consideration of alternatives; second, our hypotheses regarding how to solve problems frequently are disconfirmed by the progress monitoring data. Successful problem solvers are able to develop many action hypotheses directed toward solving the same problem. To solve academic problems, educators must generate and consider the application of alternatives. No "one size fits all" is possible nor should be assumed.

Perhaps the most obvious illustration of the need, and the opportunity, to consider problem solution alternatives occurs when students are declared eligible for special education and individualized education plans (IEPs) are developed. During the IEP development process, a problem-solving team should be able to reflect on potential alternative-action hypotheses or reforms that could diminish the academic problems that led to the student being placed in special education. Unfortunately, limited resources too often now make it impossible to consider potentially effective alternatives. And too often pressures from well-meaning advocates result in conflict and rigid thinking in situations that require flexibility. When done right, compensatory programs like special education can become the basis for consideration, selection, and application of problem solution hypotheses intended to eliminate important performance discrepancies. This idea has recently been described as "experimental teaching" (Fuchs, Fuchs, & Stecker, 2010) and recommended as a best-practice approach for those students who are most difficult to teach.

A Problem-Solving Model and Problem-Solving Assessment

Systematic efforts to intensify problem solving can benefit from the use of a problem-solving model. A general problem-solving model that is simple, clear, and practical is the IDEAL model described by Bransford and Stein (1984). This model consists of five steps: (1) *I*dentifying the problem to be solved, (2) *D*efining the problem, (3) *E*xploring alternative solutions, (4) *A*pplying the selected intervention, and (5) *L*ooking at the effects. The basic steps are common to most problem-solving models, and the model can be easily applied to education. The primary contribution of the model to problem-solving assessment is that it clarifies and sequences the five major decisions that must be made in problem solving, thus providing focus and direction to assessment activities. Since assessment is conducted to provide information for decision making, educational problem solvers need to think carefully about the problem-solving decision they are making and the types of information that will be most helpful in making that decision.

Assessment and Evaluation

The IDEAL model, presented in Table 2.1, illustrates the relationship among problem-solving steps, the type of assessment required, and the evaluation decision that corresponds to each problem-solving step. In the model, assessment is distinguished from evaluation to clarify that the purpose of assessment is to provide descriptive information, typically numerical, whereas the purpose of evaluation is to make a decision. In assessing performance discrepancies, we seek objective, reliable, and precise data that can contribute to decision making. Evaluations of those discrepancies involve the consideration of data; however, they also require a weighing of values, laws, regulations, resources, and the probable personal and social consequences of selecting different courses of action. The point cannot be emphasized too strongly that while data from measurement can inform and direct decisions, they neither dictate nor determine those decisions. People will, and must, bring their values and their subjective judgments into decision making.

The Problem-Solving Model and Special Education

Although not central to this chapter, we can see that the problem-solving steps, assessment procedures, and evaluation activities represented in Table 2.1 correspond to the steps usually identified as requirements in providing special education service to students. Typically, students are referred to special education; the referral is screened to determine the need for further assessment; if appropriate, assessment for determining eligibility follows; if the student is eligible for service, an IEP is developed, including annual goals, short-term objectives, evaluation procedures, and the service to be provided; the IEP is then implemented and student progress toward IEP goals monitored; finally, the success of an IEP is reviewed periodically and annually to determine program success. The remaining chapters in this book describe assessment methods compatible with the problem-solving steps found in Table 2.1. Such methods can be used for all students, not only those with disabilities.

TABLE 2.1. A Data-Based Problem-Solving Model

Problem-solving steps	Assessment procedures	Evaluation decisions
1. *I*dentify the problem.	Determine who perceives discrepancy.	What is the discrepancy?
2. *D*efine the problem.	Quantify the perceived discrepancy and establish its value base.	Is the problem important enough for intervention?
3. *E*xplore alternative interventions.	Gather available evidence for alternative interventions.	Select the first intervention attempt?
4. *A*pply the selected intervention.	Monitor fidelity of intervention and collect progress data.	Is the solution attempt progressing as planned and are progress data being collected?
5. *L*ook at the effects.	Examine progress data to determine whether goals are being met.	Is the original problem being solved though this attempted solution? If not, repeat Steps 3–5.

Systems-Level Problem Solving Using CBM

Among the components of problem-solving assessment presented in this volume, CBM has the longest history and closest connection to problem-solving-based assessment practices. This section illustrates how CBM can be used to solve a wide range of problems perceived in education. More information about CBM methods can be found in Shinn (Chapter 11, this volume).

Standardized Assessment Procedures

The CBM procedures advocated for use in problem-solving assessment were developed to quantify student performance in reading, written expression, spelling, and arithmetic. These procedures are the product of a systematic research and development program that established the technical adequacy of the data collected through applying these measurement procedures to student performance (see Deno, 1985, 1986, 2003b). The fact that these procedures are standardized rather than ad hoc ensures a database for problem solving that is sufficiently reliable and valid. The issue of technical adequacy is especially important when comparisons are made between an individual student and the performance of that student's peers. The reliability and validity of data are also important when comparisons are made of the same student's performance at different times, such as before, during, and after various attempts to solve a problem. In general, any time the data obtained from two or more measurements are compared, the reliability of those measurements is an important issue. Further, any time a question arises as to whether or not a performance discrepancy is important, the validity of a particular measurement or set of measurements must be established. It is not possible to be confident that any of the myriad performance discrepancies that could be identified through measuring a student's performance on somewhat arbitrarily selected curriculum tasks would be sufficiently important to attempt problem solution.

An Early Multi-Tiered Systems of Support Model

In 1977, Deno and Mirkin presented their data-based program modification (DBPM) problem-solving assessment model. The basic premise of the model was that modifications in student programs could be tested by collecting progress monitoring data reflecting student growth in relation to changes implemented to increase student academic and social development. The model was created as a tool for educators to evaluate the success of their interventions and to determine the level of special education service required to solve the problems precipitating referral and initial assessment. The DBPM model was complete in that it included specification of the observational data to be used for evaluating problem-solving efforts. At the same time, the technical adequacy of the assessment procedures had not been empirically investigated, nor had the potential effectiveness of using those procedures to improve programs been tested.

To address the issues of technical adequacy and the effectiveness of the DBPM model, a program of research was conducted between 1977 and 1983 through the Institute for Research on Learning Disabilities at the University of Minnesota. An important result of that program of research was the development of standardized procedures for monitoring student progress in reading, spelling, and written expression. The use of those procedures formatively to evaluate instruction was examined experimentally, leading to the conclusion that teachers could successfully increase achievement using them (Fuchs, Deno, & Mirkin, 1984). At the same time, the progress monitoring procedures became known as Curriculum-Based Measurement (CBM; Deno, 1985). Subsequently, CBM as an assessment component of educational problem solving was presented as an alternative or supplementary approach to conventional standardized achievement testing (Deno, 1986, 1989, 1995, 2002; Minnesota Educational Effectiveness Project, 1987; Shinn, 1989).

The technical adequacy of the CBM approach to progress monitoring distinguishes it from other curriculum-based assessment (CBA) models. The technical adequacy of CBM has enabled problem solvers to use the data derived with confidence in both their reliability and validity. To achieve technical adequacy, the procedures have been standardized to the level that they include specification of *what to measure, how to measure*, and *how to score and interpret* the data on student growth. While it is beyond the scope of the present chapter to describe all of studies documenting the technical adequacy and development of the standardized CBM procedures, an illustration of the *core skills* used for standardized CBM in reading immediately follows.

Core Skill: Reading

The primary skill used to monitor progress and make instructional modifications in reading is *reading aloud from text*. Often, this is referred to as "oral reading fluency"; however, the use of the term *fluency* often confuses the purpose of reading aloud from text for evaluating intervention effects with a characteristic of good readers (i.e., "reading fluency"; Samuels & Dershwitz, 2006). Nonetheless, CBM oral reading fluency has been shown to be a highly reliable and valid way to measure overall reading skills. More recently, *recognizing words deleted from text* (the "maze" procedure) and, for beginning readers, *reading isolated words*, have been added as core skills for reading measurement. The core reading tasks are used with standardized administration procedures

to obtain samples of performance on those tasks. The performance samples are then scored to produce data with known technical adequacy (Shinn, 1989).

Standardized CBM data can be used to inform key decisions in the problem-solving model. For example, Steps 1 and 5 of the problem-solving model require decisions regarding the size of a discrepancy. As illustrated in Table 2.2, each of these questions can be informed by CBM data. At Step 1, the existence of a problem is evaluated. In order to determine the existence of a reading problem, an individual student's CBM reading scores could be compared with benchmark score ranges representing the average reading performance of all the students in a certain grade level. If the individual student's scores are lower than average for his or her grade, a problem could be identified. Again, at Step 5 of the model, the continuing existence of the problem is at question. Are the student's reading scores still below what is expected for his or her grade? If not, then it would make sense to conclude that the problem was solved.

Problem-Solving Assessment with CBM

CBM has been used to solve a wide range of educational problems. CBM offers a methodology for systems-level problem-solving applications. Those applications are illustrated in the following sections. The illustrations begin with the more common applications of CBM and move to recent applications and extensions of its use.

Improving Individual Instructional Programs

The primary purpose of developing CBM was to create a simple set of assessment procedures that teachers could use formatively to evaluate the instruction they were providing to individual students. The hypothesis that drove this development was that teachers using formative evaluation procedures would manifest higher rates of achievement than teachers who did not. The formative evaluation model using CBM as the database is represented graphically in Figure 2.1. As can be seen, individual student performance during an initial baseline phase is plotted and a goal is established. A progress line connecting the initial level and the goal establishes the rate of improvement necessary for the student to achieve the goal. A change in the student's program is introduced and indicated by the first vertical line. Continued measurement of that student's performance after the intervention reveals that a leveling off of performance follows the initial

TABLE 2.2. Application of Problem-Solving Stages 1 and 5 for Evaluation of Reading Skills

Stage	Questions	CBM components
1	Does a problem exist (in reading)?	Data reflecting the difference between current level and slope in reading aloud from text, and the desired level and slope in reading from that text
5	Is the original problem being solved through the attempted solution?	Data on the degree to which the current level and slope in reading aloud from text indicate that the original discrepancy is being reduced or will be eliminated

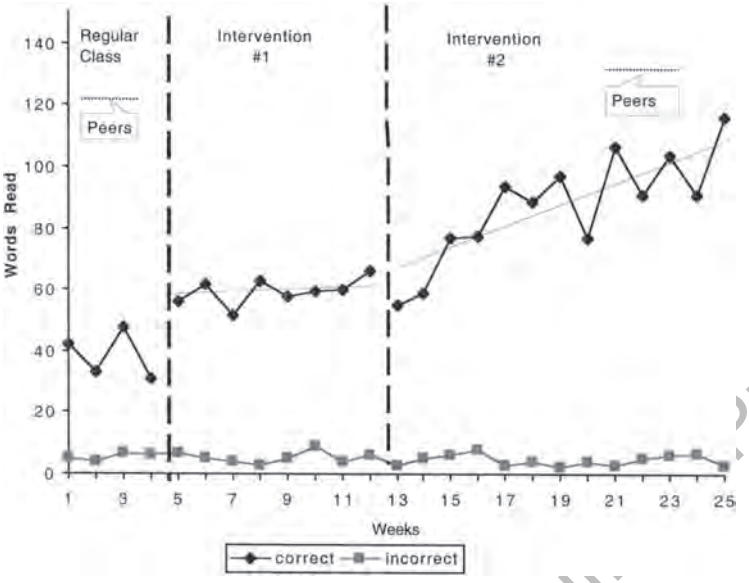

FIGURE 2.1. Curriculum-based measurement progress graph.

improvement. A second change is made in the program, and improvement occurs. This systematic approach to setting goals, monitoring growth, changing programs, and evaluating the effects of changes is the formative evaluation model. Research on the achievement effects of using this approach has revealed that teachers using systematic formative evaluation based on CBM produce greater achievement among their students (Fuchs et al., 1984; Fuchs, Fuchs, & Hamlett, 1989; Fuchs, Fuchs, Hamlett, & Stecker, 1991; Shinn & Hubbard, 1992; Espin, Wallace, Lembke, Campbell, & Long, 2003).

Increased Ease of Communication

While the effectiveness of CBM in increasing both teacher and student awareness of goals has already been discussed, it is important to point out that the CBM graph with its multiple references creates opportunities for clearer communication. It has now become common practice for teachers to use the CBM data in parent conferences and at multidisciplinary team meetings to provide a framework for communicating an individual student's status. Professional educators and parents easily use the CBM data graph, since little or no interpretation of the scores is necessary (Shinn, Baker, Habedank, & Good, 1993). This contrasts sharply with the complexities related to communicating the results of commercially available standardized test scores. A simple illustration of both the ease and effectiveness of communicating around CBM data can be found in the results of the teacher planning study mentioned earlier (Fuchs et al., 1984). In that study, students as well as teachers were asked whether they knew their annual reading goals and were asked to specify those goals. Those students whose teachers were using CBM and formative evaluation not only expressed that they knew those goals but were able to accurately specify their target reading scores.

Screening to Identify Students Academically "at Risk"

An increasingly common use of CBM is to screen students who are "at risk" for academic failure. As mentioned, since CBM procedures are standardized, they can be used to contrast an individual's performance with that of the group. The use of local norms is common for this purpose, but norms are not required. CBM can be easily and quickly used to assess the performance of a group of students and to identify the lowest achieving at-risk students in the group (Marston & Magnusson, 1988; Shinn, 1995) in the area of reading with the inclusion of the maze task, which allows for group administration (Deno, Reschly-Anderson, Lembke, Zorka, & Callender, 2002). In the study by Deno and colleagues, all of the students in a large urban elementary school were given three standard CBM maze passages, and their performance was aggregated within and across grades. The lowest 20% of the students on the CBM maze measure in each grade were considered sufficiently at risk to require progress monitoring every other week with the more conventional CBM oral reading measure. Identification of high-risk students in this manner has now become commonplace among schools practicing CBM and implementing MTSS models.

Evaluating Classroom "Prereferral" Interventions

The cost and the consequences of special education are recurring issues in federal and state governments and in the literature of special education. Of particular concern is the possibility that students are being referred and placed in special education when they might succeed in regular class programs by classroom teachers but with different instruction. One approach to addressing this issue is to require that classroom teachers conduct prereferral interventions to establish that such accommodations are insufficient. A problem with this approach has been that little useful data are available to appraise the effects of those prereferral data. Since CBM data are sensitive to the effects of program changes over relatively short time periods, they can be used to aid in the evaluation of prereferral interventions. Using CBM to evaluate prereferral interventions enables general and special educators to collaborate in the early stages of child study to determine with some validity that the achievement problems faced by a student are more than failures in the instructional program being provided. In this approach, documentation that the problem is not readily solvable by the classroom teacher can be used to establish the basis for special education eligibility assessment.

Alternative Special Education Identification Procedures

Widespread dissatisfaction has existed for some time with traditional approaches to identifying students for special education that rely on standardized tests of either ability or achievement, or both (Reschly, 1988). Despite this dissatisfaction, few alternatives have been offered to replace those more conventional procedures. Over the past 20 years, the use of CBM within a systematic decision framework has been explored as a basis for developing alternative identification procedures (Marston, Mirkin, & Deno, 1984; Marston & Magnusson, 1988; Shinn, 1989). The use of CBM to test a student's "responsiveness to intervention" (RTI; Fuchs & Fuchs, 1998) has gained favor within policymaking groups that support MTSS efforts. The MTSS approach is an extension

of prereferral evaluation and the problem-solving model to evaluate increased levels of intensity in instructional intervention. In MTSS, while each level of an academic intervention (tier) is introduced, CBM data are continually collected to examine the responsiveness of students to that intervention. If students fail to increase their rate of growth in response to several regular classroom (Tier 1) interventions, then a period of additional brief "pull-out" instruction might be instituted and evaluated (Tier 2). If students succeed when receiving Tier 2 instruction, then no increase in intervention intensity is required. On the other hand, if Tier 2 intervention is unsuccessful, this lack of responsiveness establishes the likely need for special education. Some evidence has begun to emerge that the alternative approaches to eligibility determination that are rooted in the problem-solving model have created an entirely different perspective on the concept of disability (Tilly, Reschly, & Grimes, 1999).

Recommending and Evaluating Inclusion

As increased emphasis has been placed on inclusion of students with disabilities in regular classrooms, and as laws and regulations have required schools to ensure access to the regular class curriculum, the need to evaluate the effects of these changes on the academic development of students with disabilities has increased. CBM has proved to be a very useful tool for those accountable for the progress of students with disabilities as they seek to provide education of these students in the mainstream curriculum. The general strategy employed when using CBM to evaluate inclusion is to collect data before and after integration into regular class instruction, and then to continue monitoring student progress to ensure that reintegration of students is occurring "responsibly" (Fuchs, Roberts, Fuchs, & Bowers, 1996; Powell-Smith & Habedank-Stewart, 1998). The results of the research in this area have provided clear evidence that both special educators and classroom teachers can use CBM to provide ongoing documentation of student progress and signal the need for increased intensification of instruction when inclusive programs are unsuccessful.

Assessing Students Who Are English Language Learners

A continuing and increasing problem confronting schools in the United States is the large proportion of students whose first language is not English and who are still learning to speak English while already learning to read and write in English. Commercially available standardized tests have not been useful because they have not included within their norm samples the full range of languages represented among students who are English language learners (ELLs). More significantly, many achievement tests draw heavily on background knowledge of U.S. culture in structuring questions. Among other problems that exist because of the lack of technically adequate procedures is how to distinguish ELLs who are having difficulty learning because of their lack of proficiency in English from ELLs whose struggles also stem from specific disabilities. Several studies have explored the use of CBM to overcome the problems of assessing ELLs and to monitor their growth in mainstream classrooms. Baker and others (Baker & Good, 1995; Baker, Plasencia-Peinado, & Lezcano-Lytle, 1998) have focused primarily on using CBM reading scores of Spanish-speaking ELLs to evaluate their progress in regular class programs.

That research established levels of reliability and validity for the CBM procedures with ELL students in both their native and English languages that are comparable to native speakers of English. Further, longitudinal analyses revealed that students who begin with comparable proficiency in English often grow at very different rates. The apparent technical adequacy of CBM has led urban school systems to use CBM procedures for developing norms across reading, writing, and arithmetic based on its ELLs (Robinson, Larson, & Watkins, 2002). CBM also has been used to predict differences in the success rates of middle school ELLs on state assessments as a function of their level of reading proficiency (Muyskens & Marston, 2002). Additionally, research has been conducted using CBM with students in countries where languages other than English are spoken. The evidence from that research indicates that the procedures and tasks to be used for measurement need to be consistent with formal differences in the language. For example, oral reading can be used to measure growth in other phonetic languages like Korean, but the maze procedure appears to be more appropriate for measuring growth in an iconic language like Chinese (Yeh, 1992).

Predicting Success in Early Childhood Education

The criterion validity of CBM oral reading scores has been sufficiently established to become an important criterion for establishing the predictive validity of prereading measures and the effectiveness of early literacy interventions. With the ascendant interest in the role of phonological skills in learning to read, the utility of scores from measures of phonological skill has been established by examining their accuracy in predicting beginning oral reading scores (Kaminski & Good, 1996). As cited earlier (Good, Simmons, & Kame'enui, 2001), evidence has developed that CBM oral reading performance at the end of first grade is a significant indicator of subsequent reading success. Research in this area has established important linkages between measures of phonological skill in kindergarten, oral reading performance in grades 1–3, and success on state assessments. The evidence has become sufficiently persuasive that the federal government required projects funded under the Reading First grant program to include CBM oral reading data as a requirement for monitoring program effects. Finally, similar growth measures have been developed to assess preschool development and predict early literacy (McConnell, Priest, Davis, & McEvoy, 2002).

Assessing Students Who Are Deaf

A problem paralleling the problems associated with assessing ELL students is that faced by educators seeking to assess deaf students' progress at developing competence in written English. As with ELLs, deaf students must learn to read and write English despite the fact that many deaf students do not speak English. The problems differ, however, in that most deaf students generally never learn to speak English and will not be able to use sound–symbol correspondence in learning to read and write. For that matter, they will not be able to use spoken English vocabulary referents to assist in comprehending text. In general, commercially available standardized tests have been of no use in assessing the achievement of deaf students.

Research using the CBM written expression measure that was developed for hearing students has revealed that the same measure can be used to assess the written

expression competence of deaf students as well (Chen, 2002). Assessing the competence of deaf students reading English has required a different approach. Oral reading is not possible with deaf students who do not speak English, and using American Sign Language (ASL) is not an option because the ASL signs do not correspond word for word to English. An effort has been made to have students sign Exact English rather than ASL, but this has not proved to be useful. More promising has been the use of the CBM maze task to measure the reading of deaf students. Since that task requires only that students read text silently and make correct maze choices, the requirements for deaf and hearing students on this task are the same. Research on using the maze task with deaf students has provided evidence of the validity and utility of the measure (Chen & Rose, 2009; Deno et al., 2002).

Summary

The perspective on problem solving provided in this chapter establishes the following:

- Problem solving is a characteristic of professional behavior.
- Problems are defined by the discrepancy between what someone wants and what someone gets.
- Schooling is an intervention organized to reduce the discrepancy between what a society wants children to become and where children are when they come to school.
- Compensatory programs are created to intensify interventions for groups and individuals whose rates of development do not meet societal standards.
- Progress monitoring can be a useful mechanism for increasing the success of educational interventions.
- Federal and state mandates have clarified priorities among problems by making cultural imperatives more explicit.
- Educational problem solving should be viewed as action research where interventions are hypotheses to be empirically tested.

The primary function of the schools is to affect student development, and the first responsibility of educators is to create environments that facilitate that development. Successful performance of those primary role functions will be defined by the extent to which students attain cultural competence in a timely manner. Problems occur when rates of growth and levels of attainment fall below what is expected. Increased efforts to assess students are a manifestation of intensified problem solving. Successful problem-solving assessment will always include a careful explication of the expectations for performance as well as the measured levels of that performance. Problems are always defined by this difference between actual and desired performance and exist in the "eye of the beholder" of that problem. The importance of any problem will be established only by examining the degree of difference between actual and desired performance. More complete determination of the priority to be given to a problem is obtained by examining the immediate and long-term consequences to the student should the problem continue or fail to be resolved.

Identifying important problems that must be solved by the schools has become easier as federal and state legislative mandates have made societal expectations more explicit through high-stakes testing. One rational response to the accountability demands has been to increase the development and use of progress monitoring procedures that enable educators to anticipate and prevent problems. CBM exists as one technically adequate approach for taking a more functional problem-solving approach to the prevention and solution of educational problems. Evidence exists that professional educators can increase their problem-solving effectiveness through the use of progress monitoring of student development and by systematically responding to those data as they reflect student growth.

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Suggested Reading

Deno, S. L. (1985). Curriculum-based measurement: The emerging alternative. *Exceptional Children, 52*, 219–232.

This is the original article on the development of CBM. The article includes a rationale for CBM development, a description of its use with individual students, and the empirical evidence on its reliability and validity.

Deno, S. L. (1989). Curriculum-based measurement and alternative special education services: A fundamental and direct relationship. In M. R. Shinn (Ed.), *Curriculum-based measurement: Assessing special children* (pp. 1–17). New York: Guilford Press.

The problem-solving model that subsequently became the basis for the problem-solving approaches to assessment are described in this chapter. The author describes the relationship between CBM data and a reconceptualization of the nature and purpose of special education programs.

Deno, S. L. (1997). "Whether" thou goest: Perspectives on progress monitoring. In E. Kame'enui, J. Lloyd, & D. Chard (Eds.), *Issues in educating students with disabilities* (pp. 77–99). Mahwah, NJ: Erlbaum.

This chapter includes a description of two alternative approaches to progress monitoring that are used to track growth in basic skills. A distinction is made between the utility of the two approaches for use in evaluation interventions and making educational decisions.

Deno, S. L. (2003). Developments in curriculum-based measurement. *Journal of Special Education, 37*(3), 184–192.

This paper provides an extensive summary of the past developments and current research on CBM. Included is a discussion of the unique contribution of CBM to special education practices.

Fuchs, L., Deno, S., & Mirkin, P. (1984). Effects of frequent curriculum-based measurement and evaluation on pedagogy, student achievement, and student awareness of learning. *American Educational Research Journal, 21*, 449–460.

This article summarizes an experimental field test of the use of CBM in formative evaluation of special education student progress. Data are provided revealing the positive effects on student achievement, student knowledge of progress and goal attainment, and teacher practice.

Fuchs, L. S., & Deno, S. L. (1994). Must instructionally useful performance assessment be based in the curriculum? *Exceptional Children, 61*, 15–24.

The issue of whether typical uses of CBM measurement procedures must include stimulus materials from the curriculum is discussed. Successful applications of the generic procedures with stimulus materials drawn from other sources are documented.

Fuchs, L. S., & Deno, S. L. (1991). Paradigmatic distinctions between instructionally relevant measurement models. *Exceptional Children, 57*, 488–501.

This article makes the distinction between typical approaches to CBA that are based on a task-analytic mastery monitoring approach to progress assessment and the CBM approach that is rooted in general outcome measurement approach to progress monitoring. The relative advantages and disadvantages are considered.

Fuchs, L. S., Fuchs, D., & Speece, D. L. (2002). Treatment validity as a unifying construct for identifying learning disabilities. *Learning Disability Quarterly, 25*, 33–46.

The article introduces the concept of student response to treatment as a basis for considering a student's eligibility for special education services.

Shinn, M. R. (Ed.). (1989). *Curriculum-based measurement: Assessing special children*. New York: Guilford Press.

This edited book contains chapters by original researchers summarizing the research and the procedures for using CBM in formative evaluation. The book serves as a resource for how CBM procedures are used in problem solving with students who have mild disabilities.

Shinn, M. R. (Ed.). (1998). *Advanced applications of curriculum-based measurement*. New York: Guilford Press.

This edited book contains chapters summarizing applications and extensions of CBM research and development to problems and issues not addressed in the original research on CBM.