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*The Components of Direct Instruction**

Objectives

After studying this chapter you should be able to

1. Identify the three major elements of Direct Instruction.
2. Explain what it means to teach a general case.
3. Describe each of the five juxtaposition principles and explain how they contribute to clear communication.
4. Explain the shifts that occur in formats over time.
5. Explain what tracks are and how track design differs from more traditional instruction.
6. Explain the guidelines for sequencing tasks.
7. Describe effective student–teacher interaction techniques.
8. Summarize the results of Project Follow Through.

The purpose of Direct Instruction is to teach subject matter efficiently so that all the students learn all the material in the minimum amount of time. Every strategy, tactic, and specific technique employed in Direct Instruction is designed to serve this purpose. Accomplishing this goal requires keen attention to all aspects of teaching. It would be much easier if we could focus on one or two "key issues" and produce measurably superior instruction, but this is not the case. Producing highly effective teaching requires that we attend to a wide variety of details concerning the design, organization, and delivery of instruction. If any one element of instruction is not done well, high-quality instruction in other areas may not compensate for it. For example, superior instructional delivery cannot make up for poorly designed instructional materials. Likewise, well-designed programs cannot compensate for poor organization.

Three main components enable Direct Instruction to accomplish the goal of teaching all children effectively and efficiently: (a) program design that identifies concepts, rules, strategies, and "big ideas" to be taught and clear communication through carefully constructed instructional programs to teach these; (b) organization of instruction, including scheduling, grouping, and ongoing progress monitoring to assure that each student receives appropriate and sufficient instruction; and (c) student–teacher interaction techniques that assure that each student is actively

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engaged with instruction and masters the objectives of each lesson.

Direct Instruction has been the focus of a vast amount of research and has been shown to be highly effective for a wide range of content and with diverse learners—from those identified as gifted, to students who require special education services. Studies have shown excellent outcomes in basic skills, complex cognitive tasks, and affective areas such as students' self-concepts and confidence. This chapter will describe the three main components of Direct Instruction, and briefly review the research base on the effectiveness of Direct Instruction.

Main Components of Direct Instruction

In this section, we describe the three main components of Direct Instruction: the program design, organization of instruction, and student–teacher interactions that make Direct Instruction effective.

Program Design

Program design includes five main elements. First, program design begins by carefully analyzing the content matter and identifying central organizing ideas and generalizable strategies that enable students to learn more in less time. Second, clear communication is designed to minimize ambiguity for students. Third, instructional formats are designed to structure the dialogue between teachers and students. Fourth, skills are sequenced to maximize student success and minimize points of confusion. Fifth, instructional topics and objectives are organized into tracks that allow for systematic skill development across the length of a program and support cumulative review and application. Together, these elements result in instructional programs that are highly effective for a wide range of learners.

Content Analysis. The goal of Direct Instruction is to teach generalized skills; thus, the first step in developing a Direct Instruction program is analysis of the content and identification of concepts, rules, strategies, and "big ideas" (i.e., those concepts that provide strategies that students can use to further develop their expertise in a subject matter) to be taught. The content area, such as reading or earth science, is carefully analyzed to find key big ideas that can be taught to students to enable them to exhibit generalized performance to the widest possible range of examples and situations. Identification of these generalizations is the foundation of Direct Instruction.

Becker (1971) illustrated the power and efficiency of strategy-based instruction with an example from the area of basic reading. A nonstrategic or rote teaching approach would teach students to recognize whole words. In this rote approach, each word would be taught as a separate entity with no system for teaching generalizable strategies for decoding new words. In the rote approach, after the teacher has taught 10 words, students should be able to read (at best) 10 useful words. In contrast, a strategic approach would be to teach 10 letter–sound relations and the skill of sounding out words. When students have learned these 10 sounds and the sounding-out skill, they can read 720 words made up of 3 sounds (e.g., *cat*), 4,320 words of 4 sounds (e.g., *cram*), and 21,600 words of 5 sounds (e.g., *scram*) for a total of over 25,000 words. Not all of these words would be real words, some would be pseudowords (e.g., *blums*), but the example illustrates the power of strategic instruction. (This strategy and other reading strategies are described in more detail in Chapter 4.) The efficiency that results from teaching generalizable big ideas is the goal of the content analysis that underlies Direct Instruction. This example also illustrates that even in difficult content areas that are fraught with exceptions, such as reading in English, powerful generalizations are possible.

Spelling is often taught by rote memorization of whole words resulting in little or no generalization. However, wide generalizations are possible. Teaching the skill of detecting individual sounds in a spoken word and matching sounds to written letters is a very efficient beginning point. In addition, if students learn to spell the parts of words called *morphographs* (prefixes, base words, and suffixes) and rules for combining them, they can correctly spell many new words that they have never encountered. Table 2.1 shows seven morphographs and some of the words that can be correctly spelled by using rules to combine them. The Direct Instruction program, *Spelling Mastery,* teaches 750 morphographs that can be combined to form over 12,000 words. (This program is described in detail in Chapter 6.)

These examples from reading and spelling illustrate the goal and importance of content analysis to Direct Instruction. Direct Instruction is about teaching strategies that enable students to go beyond the particular items that are taught and to apply their learning to new items or situations.

A common and persistent misunderstanding is that Direct Instruction teaches students to memorize simple responses to specific stimuli, commonly referred to as *rote learning.* In reality, Direct Instruction programs enable students to learn more in less time for the very reason that they are *not* learning isolated, unrelated bits of information by rote, but are learning strategies that can be broadly applied across numerous examples, problems, and situations.

This mistaken notion that Direct Instruction is a rote learning approach not only reflects a fundamental misunderstanding of the approach but also fails to recognize that so-called higher order thinking depends on the mastery of more basic skills and involves the integration of concepts, rules, and strategies. Virtually all Direct Instruction programs concern higher order thinking skills: classifying, learning rules, making inferences, testing generalizations, analyzing arguments, and solving problems. Carnine and Kameenui (1992) have described how the principles of design have been applied to teach sophisticated problem-solving skills to a variety of learners and across various domains. As the

Table 2.1

Seven Morphographs and Some of the Words Derived From Them

Prefixes	Bases	Suffixes
re dis un	cover pute	ed able
Words Formed		
recover, recoverable, recovered, unrecoverable, unrecovered, repute, reputable, reputed, disreputable, disrepute, coverable, covered, uncover, uncoverable, uncovered, discover, discoverable, discovered, undiscoverable, undiscovered, dispute, disputable, disputed, undisputable, undisputed, etc.		

American Federation of Teachers (1998a) noted, although the early mastery of basic skills is a key element, Direct Instruction programs also address students' general comprehension and analytic skills.

Clear Communication. Identification of generalizable strategies that students can use to solve a wide variety of problems is the foundation of Direct Instruction. The first step of building on this foundation is designing a sequence of instruction that communicates these strategies and enables students to display generalized skills to the full range of appropriate situations. Becker, Engelmann, and Thomas (1975) and Engelmann and Becker (1978) called this "general case programming" because the goal is to teach the general case rather than to teach a set of discrete specific cases. General case programming is the design of instruction that clearly communicates one and only one meaning and enables students to exhibit generalized responding.

General case programming is based on principles for the logical design of teaching sequences (Engelmann & Carnine, 1982). It enables Direct Instruction program developers to design effective and efficient "learner friendly" instruction. In order to teach a general case, it is necessary to show students a set of items that includes examples and nonexamples arranged so that similarities and differences are readily apparent. Irrelevant aspects of the teaching must be held constant to minimize confusion, and relevant aspects must be carefully manipulated to demonstrate important differences. Engelmann and Carnine (1982) developed five principles for sequencing and ordering examples to communicate clearly:

1. *The wording principle.* To make the sequence as clear as possible, we should use the same wording on all items (or wording that is as similar as possible). This wording helps focus students' attention on the details of the examples by reducing distraction or confusion that may be caused by variations in teacher language. Figure 2.1 shows a pair of items that follow the wording principle; teachers use nearly the same wording for the two items. The figure also shows a pair of items that does not follow the wording principle; teachers add potential confusion by excessive variation in their wording.

Figure 2.1

The wording principle.

Following the wording principle		Not following the wording principle	
$\frac{3}{2}$	$\frac{2}{3}$	$\frac{3}{2}$	$\frac{2}{3}$
The larger number is on top.	The smaller number is on top.	The larger number is on top.	In this ratio statement, the denominator is greater than the numerator.

2. *The setup principle.* Examples and nonexamples selected for the initial teaching of a concept should share the greatest possible number of irrelevant features. In Figure 2.2 the pair of items on the right does not follow the setup principle. The two items differ in several ways, so there are many possible interpretations. Naive students might think that the label *on* means 'rectangle' or 'things with corners.' It might mean 'gray.' It might mean 'horizontal.' Or, it could mean 'on.' Any of these interpretations is possible, and there is no way of determining which interpretation students will make. From a Direct Instruction perspective, this ambiguity is considered poor communication.

   The pair on the left of Figure 2.2 follows the setup principle. The items are exactly alike except in the critical aspect of being (or not being) on. The other interpretations (rectangle, having corners, gray, horizontal) are eliminated because these features are shared by both the positive and negative examples. This pair of positive and negative examples differs in a single feature, so only one interpretation is possible. In later lessons, additional examples would be used to further expand the range of the concept. For example, by changing the setup (that is, by using different materials) in subsequent lessons, we would demonstrate that the concept *on* holds for all objects and surfaces.

3. *The difference principle.* In order to illustrate the limits or boundaries of a concept, we should show examples and nonexamples that are similar to one another except in the critical feature and indicate that they are different. The difference principle is most effective when the items are *juxtaposed*—that is, they are shown next to each other or consecutively in a series—making the similarities and differences most obvious. In Figure 2.3, the juxtaposed items on the left side follow the difference principle. The nonexample (not horizontal) is highly similar; it is just different enough to change a positive example of the concept (horizontal) into a negative example of the concept (not horizontal). In the pair that does not follow the difference principle, the item that is *not horizontal* is quite different. Failing to follow the difference principle leaves students with limited information about the point at which an example is no longer horizontal. Students might assume that an object must be quite tilted in order to be *not horizontal.*

4. *The sameness principle.* To show the range of variation of the concept, we should juxtapose examples of the concept that differ

Figure 2.2

The setup principle.

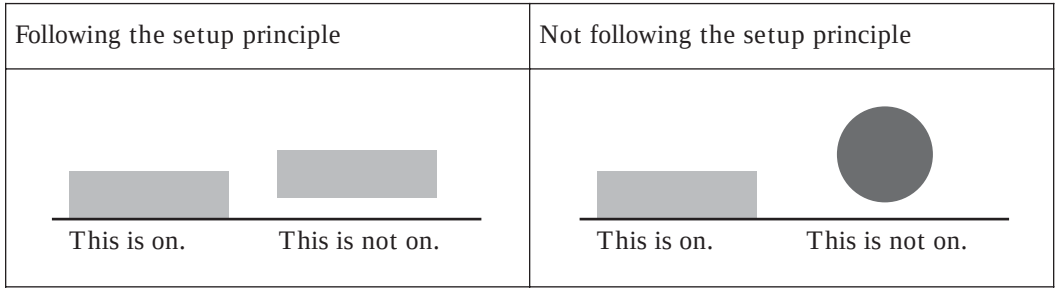


Figure 2.3

The difference principle.

Following the difference principle		Not following the difference principle	
			
The line is horizontal.	The line is not horizontal.	The line is horizontal.	The line is not horizontal.

from one another as much as possible yet still illustrate the concept and indicate that they are the same. This sequence is intended to foster generalization to unfamiliar concept examples that fall within the demonstrated range. In Figure 2.4, the set of examples on the left demonstrates the sameness principle by presenting a sequence of examples that are greatly different from one another, but are treated the same; that is they are all called *dog.* The set of examples on the right does not show the possible range of variation. Presenting students with a set of examples that are very similar to one another may suggest to them that the label *dog* only applies to examples that are very similar to those shown. Thus, students may not show generalized responding to the full range of possible examples.

5. *The testing principle.* To test for acquisition, we should juxtapose new, untaught examples and nonexamples in random order. The left side of Figure 2.5 shows an unpredictable order that provides a good test of students' understanding of the concept of *improper fraction.* The right side of the figure shows an alternating order. This order could be predictable; it is possible for students to get all answers correct simply by responding *yes* or *no* in accordance with the

Figure 2.4

The sameness principle.

Following the sameness principle		Not following the sameness principle	
	example shown		example shown
"This is a dog."	Chihuahua	"This is a dog."	Cocker Spaniel
"This is a dog."	Irish Wolfhound	"This is a dog."	Beagle
"This is a dog."	Cocker Spaniel	"This is a dog."	Fox Terrier

pattern. Therefore, it is not a good test because teachers could receive inaccurate information about students' understanding.

Instructional Formats. After the concepts, rules, and strategies have been identified and sequences for clear communication of the general case have been outlined, then instructional *formats* are constructed. A format specifies the way that teachers will present each example, explanations that they will give, questions that they will ask, and corrections that they will use. Formats are carefully designed to be clear and concise, to help students focus on the important aspects of items, to provide appropriate support for students' developing skills, and, above all, to communicate clearly with students. The consistency of wording helps students focus on the content to be learned rather than on irrelevancies such as how teachers are asking for a response. This consistency is also very helpful to teachers as it allows them to use very effective, well-designed, and precise language to communicate clearly with all students.

For example, suppose that a group of students is learning the strategy for reading words that end with the pattern of a vowel followed by a consonant, followed by the letter "e" (VCe words) such as *rate, note,* and *slope.* The main difficulty of reading these words is to say the long sound for the medial (middle) vowel. In order to know when to say the long sound for the vowel, students must distinguish these words from words that end with the pattern of a vowel followed by a consonant (VC words) such as *rat, not,* and *slop.* The reading program could use a format like the one shown in Figure 2.6 (format 1). This format would be used with many examples of words that end with a VCe pattern (e.g., *rate, slope*) and a VC pattern (*rat, slop*).

Formats change as students become more proficient. Initially, formats include a great deal of structure and support for students' use of skills. Format 1 in Figure 2.6, for example, gives students strong support in use of the VCe rule. This support is important to ensure

Figure 2.5

The testing principle.

Following the testing principle		Not following the testing principle	
2/4	Is this an improper fraction?	4/3	Is this an improper fraction?
3/5	Is this an improper fraction?	3/5	Is this an improper fraction?
8/5	Is this an improper fraction?	8/5	Is this an improper fraction?
48/32	Is this an improper fraction?	15/32	Is this an improper fraction?
18/12	Is this an improper fraction?	18/12	Is this an improper fraction?
6/7	Is this an improper fraction?	6/7	Is this an improper fraction?
9/3	Is this an improper fraction?	9/3	Is this an improper fraction?
		Note the alternating order: yes, no, yes, no, yes, no, yes	

Figure 2.6

A series of formats for teaching students to read words that end VCe.

Format 1.

1. Teacher: Remember, when there is an 'e' on the end, this letter (point to it) says its name.

2. Teacher: Is there an 'e' on the end? Students: Yes.

3. Teacher: Will this letter (point) say its name. Students: Yes.

4. Teacher: What is its name? (Or what sound will it make?) Students: a.

5. Teacher: So what is the word? Students: rate.

Repeat Steps 2 through 4 for each of the following words: name, not, vote, rat, him, fine.

Format 2.

1. Teacher: Is there an 'e' on the end? Students: Yes.

2. Teacher: What sound will this letter make? Students: a.

3. Teacher: So what is the word? Students: rate.

Repeat Steps 1 through 3 for each of the following words: name, not, vote, rat, him, fine.

Format 3.

1. Teacher: What sound will this letter make? Students: a.

2. Teacher: So what is the word? Students: rate.

Repeat Steps 1 and 2 for each of the following words: name, not, vote, rat, him, fine.

Format 4.

1. Teacher: What is the word? Students: rate.

Repeat Step 1 for each of the following words: name, not, meat, first, boy, turn.

Format 5.

Students encounter VCe words in story reading with no additional assistance.

a high level of success when strategies are initially introduced. However, formats must gradually be modified so that the students learn to apply the skills independently. If teachers continued to use this format indefinitely, some students would come to depend on the sequence of questions to apply the rule and would falter when they encountered new examples of VCe words in story reading.

The support that is so important during initial instruction must be gradually reduced until students are using the skill independently, with no teacher assistance. The process of fading the format from highly supportive to highly independent is shown in the series of five formats in Figure 2.6. In the early stages of instruction of a particular strategy, teaching is highly teacher directed. However, by the completion of the instructional program the students' performance is independent, widely generalized, and applied in various contexts and situations. Becker and Carnine (1980) described six "shifts" that should occur in any well-designed teaching program to facilitate this transition.

Shift from overtized to covertized problem-solving strategies. Initially, formats assist students by leading them through the steps of a strategy out loud (overtly). Later, formats gradually shift to allow students to complete the strategy "in their head" (covertly).

Shift from simplified contexts to complex contexts. Formats for introducing each skill use a simplified context so students can focus on the critical new learning. Later, formats include increasing complexity. By the end of instruction on a skill, students should be applying it in a natural and complex context.

Shift from prompted to unprompted formats. In the early stages of instruction, formats include prompts to help focus students' attention on important aspects of the item and to increase their success. These prompts are later systematically removed as students gain a skill. By the end of the instruction, students apply the skill without any prompts.

Shift from massed practice to distributed practice. Initially, students learn a new skill best when they have many practice opportunities in a short period of time. In later learning, retention is enhanced by practice opportunities conducted over a long period of time. Thus, formats begin with massed practice and progress to distributed practice.

Shift from immediate feedback to delayed feedback. Early in an instructional sequence, teachers provide immediate feedback to encourage students and to provide them with immediate information about the accuracy of their responses. As students become more capable and confident, feedback is increasingly delayed to create a more natural situation.

Shift from an emphasis on the teacher's role as a source of information to an emphasis on the learner's role as a source of information. Initially, teachers model new skills and provide very explicit instruction in concepts, then later they fade out as the students themselves become the source of information on how to solve a problem.

Taken together, these six shifts in instruction constitute a coherent system for providing sufficient support to ensure initial success with learning and applying complex strategies and skills, then maintaining a high level of success as students systematically move to independent, generalized, real-world application of strategies and skills.

Sequencing of Skills. The sequence in which skills are taught in an instructional program is another important contributor to its success. Learning can be made more or less difficult for students depending on the order in which skills are taught. The key principle is that students should be well prepared for each step of the program to maintain a high rate of success. That is, instructional programs should set students up for success. Direct Instruction uses

four main guidelines for deciding the order, or sequence, of skills.

First, prerequisite skills for a strategy should be taught before the strategy itself. Students learn strategies most easily when they have already mastered the components or prerequisites of that strategy. For example, students will learn column addition most easily if they have already mastered basic math facts.

Second, instances consistent with a strategy should be taught before exceptions to that strategy. Students learn a strategy best when they do not have to deal with exceptions. Once students have mastered the basic strategy, they should be introduced to exceptions. For example, when the VCe rule is first introduced, students apply the rule to many examples (e.g., *note*) and nonexamples (e.g., *not*). Only when they are proficient with these kinds of words will they be introduced to exception words (e.g., *done*).

Third, easy skills should be taught before more difficult ones. Students are more likely to experience success if they begin with tasks that are easier to accomplish. For example, some sounds are easier to produce than others. Easy sounds (such as /a/, /m/, and /s/) are taught before more difficult sounds (such as /t/, /d/, /p/) are introduced. (Note: When a letter is enclosed in slashes [e.g., /a/] it refers to the *sound* of the letter. Thus, /a/ refers to the first sound in *at*.)

Finally, strategies and information that are likely to be confused should be separated in the sequence. The more similar things are, the more likely it is that students will confuse them; therefore, items that are most confusable should *not* be introduced together. For example, the symbols *b* and *d* look very similar, and they make sounds that are very similar. Therefore, students are likely to confuse these two letters. In the Direct Instruction beginning reading program, *Reading Mastery Plus Level 1,* the sound /d/ is introduced in Lesson 27, while introduction of /b/ is delayed until Lesson 121. Thus, 94 lessons separate the introduction of these two very similar sound–symbol correspondences.

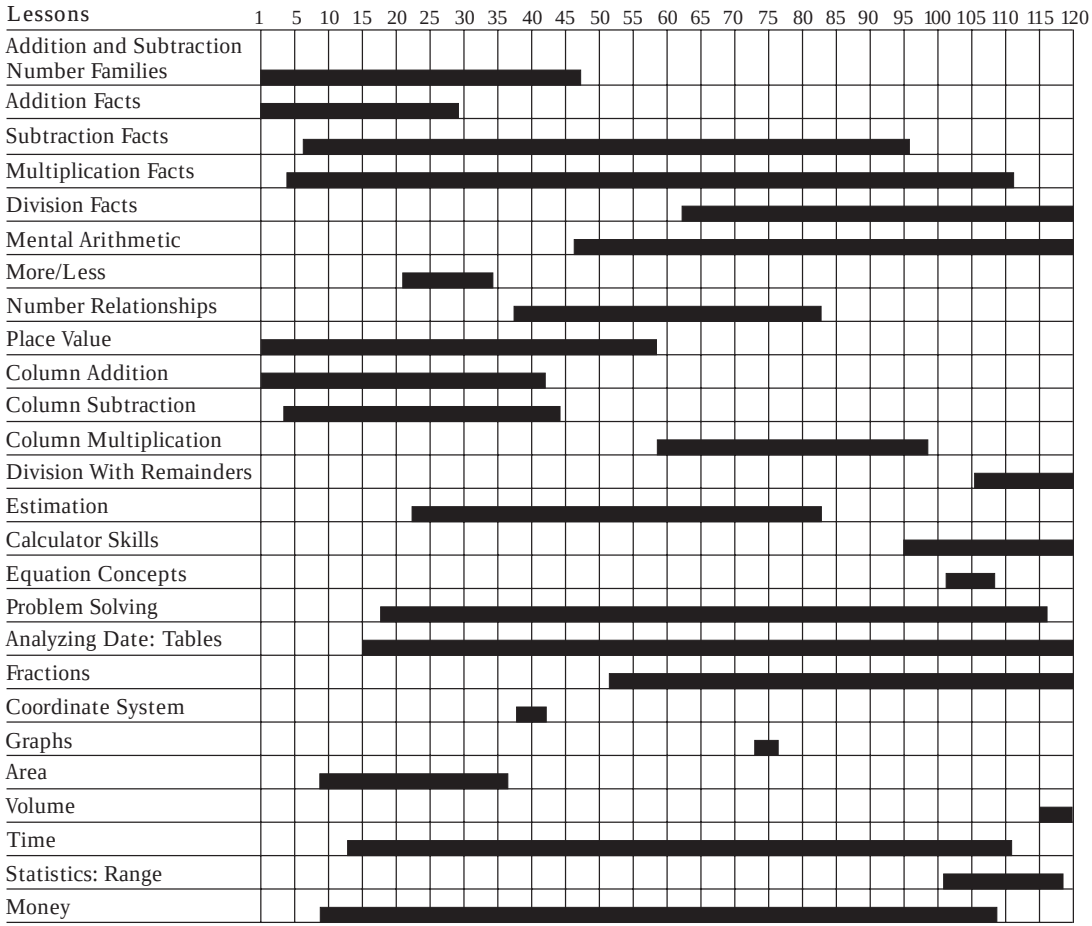
Track Organization. Traditional programs are typically organized in units where skills and strategies are introduced, practiced, and tested within a limited period of time. For example, a math program may have a unit on adding fractions with different denominators. In this unit, there may be a great deal of work on finding common denominators and adding the numerators. But after this, when students go on to the next unit (perhaps on multiplying fractions), practice on adding with different denominators often ends suddenly. Information in one unit is seldom incorporated into subsequent units. This lack of incorporated information results in predictable errors when students (a) forget to watch for different denominators when adding fractions, (b) forget how to find common denominators, and (c) confuse the multiplication procedure with the addition procedure. In contrast, *tracks* rather than units, provide the organizational framework for all Direct Instruction programs. Tracks are sequences of activities that teach a skill across multiple lessons. Each lesson contains activities from several tracks. This way, Direct Instruction can extend teaching and practice of a skill across many lessons and weave prerequisite skill tracks into the tracks that integrate these skills into more complex strategies.

Figure 2.7 shows the scope and sequence chart for *Connecting Math Concepts Level C.* The horizontal rows show skill development tracks and the vertical lines show lessons. For example, Lesson 1 includes activities from the tracks on Addition and Subtraction Number Families, Addition Facts, Place Value, and Column Addition. Lesson 30 includes Addition and Subtraction Number Families but does not include Addition Facts. The Addition Facts track has been completed at this point and is folded into the tracks on Column Addition,

Estimation, and applications such as Analyzing Data: Tables. As shown in this scope and sequence chart, no Direct Instruction lesson is devoted to a single topic. Instead, each lesson consists of activities that develop skills from several instructional tracks, so each lesson provides instruction and practice on multiple concepts, rules, and strategies. In essence then, each lesson is composed of a collection of mini-lessons on a variety of objectives.

Figure 2.7

Scope and sequence chart from Connecting Math Concepts Level C.



Connecting Math Concepts, Level C places a strong emphasis on higher-order thinking. Students learn a variety of mapping techniques for relating problem solving to real life situations. With word problems, measurement, money, time, and various projects, students graphically represent information before they attempt to calculate an answer. The detailed instruction leads both teachers and students to develop positive feelings about problem solving.

In addition, instruction covers place value, geometry, estimation, calculator use, and statistics. Concepts and computation skills are also taught for regrouping, multiplication, division, and fractions. The Scope and Sequence Chart shows where each track or major topic begins and where it ends.

There are numerous advantages to designing programs in tracks. First, student attention is better maintained because they do not work on a single skill for an extended period. Instead, lessons are made up of relatively short exercises that call on a variety of skills. Difficult tasks are interspersed among easier ones. Newly introduced skills are mixed with well-practiced ones. Each lesson includes a variety of skills, formats, and difficulty levels. This variety can be seen in the scope and sequence chart by scanning down a line and noting how many different tracks are touched in a single lesson. Second, skills can be introduced and developed gradually over a number of lessons. Each lesson can include a very small step in the development of the skill because skills may be developed across many lessons. Note, for example, that the track on Analyzing Data: Tables extends across 105 lessons. This track development provides the time necessary to elaborate the strategies gradually. Third, practice can be massed within a lesson to promote learning and distributed across lessons to promote retention. Students receive a sufficient number of examples in each exercise so that they can master each step in the sequence. In addition, practice is distributed over a substantial period of time. Organizing programs in tracks also makes it possible to integrate information. In Direct Instruction programs, no skill is ever introduced and then dropped. However, some tracks are discontinued as the skills in that track are incorporated into other tracks. For example, when the track on Addition Facts ends, other tracks such as Column Addition provide ongoing practice in these facts.

Organization of Instruction

In addition to program design whereby the characteristics are embodied in the written program, we turn to the second major component of Direct Instruction: how the teacher organizes instruction. There are four key elements to organizing instruction. First, Direct Instruction teachers organize students into groups to best meet the needs of each individual. Second, Direct Instruction teachers allocate sufficient time for teaching and assure that the time is used well. Third, Direct Instruction teachers implement precise and careful plans for instruction through the use of a scripted presentation. Fourth, Direct Instruction teachers engage in continuous assessment of student performance.

Instructional Grouping. Every teacher faces choices about how to group students for instruction. Teachers may teach to the entire class or may arrange the class into smaller instructional groups. If teachers use smaller groups they must decide how many groups to create and which students should be in each group. The principle that guides grouping in Direct Instruction is that each student should receive instruction that is appropriate to his or her individual needs. That is, students should be placed at a level where they have the necessary prerequisite skills and have not yet mastered the objectives. The skills that are to be taught are close to those that students have already learned but somewhat beyond their current competence. Psychologists refer to this as the student's "zone of proximal development" (Vygotsky, 1997). To enable all students to participate in instruction that is well suited to their individual needs, Direct Instruction teachers organize their class into groups of students who have similar zones of proximal development. This type of grouping enables teachers to present instruction to the *group*, to interact with the *group*, and to address the needs of all the *individuals* in that group.

Of course, each student has individual strengths and needs. Therefore, students who are in the same group for reading may not be in the same group for math; their placement in each subject depends on their needs in each subject. In constructing groups, we are less concerned with students' general achievement or broad cognitive skills than we are with their mastery of the specific skills that are prerequi-

site to a given lesson and the particular skills that are taught in that lesson. A placement test within each Direct Instruction program (or other placement guidelines) aids teachers in forming appropriate groups. The placement tests are designed specifically to identify students' performance on the key skills that are important for them to be successful in the program. The results of these tests indicate the program level and lesson that is an appropriate starting place for students. However, no test is perfect. Therefore, when teachers form groups based on placement test scores, they should anticipate making adjustments when they see how students respond to the first several lessons. Students who make no errors and appear to be bored should be moved to more advanced groups, and students who make many errors should be moved to less advanced groups.

Even if students are placed into ideal groups at the beginning of the year, we expect students to progress at different rates. Some students who were appropriately placed into less advanced groups learn quickly and show that they would now be better served in a more advanced group. Conversely, other students may struggle to learn the material at the rate of other members of their group. Direct Instruction grouping should be flexible to accommodate students' changing needs.

This flexible skill grouping based on students' instructional needs is very different from the practice of "tracking" in which students are assigned to rigid, inflexible groups based on general characteristics such as "intelligence." Tracking is *absolutely incompatible* with Direct Instruction because it does not allow for adjustment according to students' changing needs.

Instructional Time. An important factor in determining how much students learn is the amount of time students are directly engaged with the material. Of course, this makes logical sense to most people, but anyone who needs to be convinced can refer to a large amount of research that demonstrates this simple fact (e.g., Rosenshine & Berliner, 1978). Thus, Direct Instruction teachers must allocate sufficient time in their schedule for teaching the most important academic areas. Of course, it is not sufficient to allocate or schedule time for instruction; this allocated time must also be used efficiently. Direct Instruction teachers will organize smooth transitions, have materials at hand, and develop efficient routines to maximize the time that is actually available for instruction. Teachers must ensure that students are actually engaged in instruction during the designated time. However, it is even more important that students are engaged in tasks they can perform with high levels of success. The time that students are engaged and have high success rates is called *academic learning time* and is one of the strongest predictors of student achievement. In other words, we must allocate sufficient time, then make sure that we use that time efficiently and make certain that students are involved in learning activities that they can perform successfully.

Scripted Presentation. When we attempt to create performances of great complexity and we want consistently successful outcomes, we generally plan very carefully. For example, critical parts of space missions such as liftoff, difficult operations in space, and reentry are scripted in detail and practiced extensively. In the theater, sophisticated drama with complex characters and multiple levels of meaning are scripted in advance and practiced thoroughly. Casual planning and dependence on extensive improvisation are simply not successful ways of producing these complex results. Similarly, from a Direct Instruction perspective, teaching important and complicated skills such as reading, math, and language arts requires careful planning and precise implementation. Therefore, Direct Instruction programs employ detailed scripts with carefully developed explanations, examples, and wording.

Scripts are tools designed to accomplish two goals: (a) to assure that students access instruction that is extremely well designed

from the analysis of the content to the specific wording of explanations, and (b) to relieve teachers of the responsibility for designing, field-testing, and refining instruction in every subject that they teach. One of the main premises that leads to the use of scripts is that students deserve precisely planned instruction. Some might argue that the level of thought about the content of instruction, the details of clear communication, and the careful sequencing of tasks that are embodied in Direct Instruction scripts are not really important and that instruction that is largely improvised is sufficient. It is certainly true that some students will master some of the objectives with instruction that is casually planned and loosely organized. But it is also true that many students will fail to master many objectives with casually planned instruction. Students who, for whatever reason, are most at risk of learning difficulties are disadvantaged by instruction that is not carefully planned and well implemented. Flaws in instruction are reflected in students who have poor skills. Even those students who are capable of learning from weak instruction can learn more if instruction is well planned. If we aspire to reach all the students and teach all the objectives, we must plan instruction very carefully. Careful and detailed planning of instruction is important to the degree that we value excellent educational outcomes.

As we might guess, planning lessons is extremely time-consuming. Even for a team of expert instructional designers, developing a new math or language arts program is a daunting task. For an individual teacher who has several hours of planning time each day after school and must prepare lessons for several subject areas, it is simply impossible to produce instructional plans that meet these high standards. Scripts can provide carefully developed, field-tested, and detailed plans for teachers. However, as with any plan, there are limits to what scripts can accomplish.

Armed with these Direct Instruction scripts, the teacher's role becomes similar to an actor's. Actors have a critical role in delivering planned performances. They are the ones who breathe life into the words that are written on the page. Without their skill and art in conveying the script, there is no drama. However, depending on the actors' inspiration to perform is far different from asking them to go on stage and spontaneously create drama. Like actors, Direct Instruction teachers are performers who put life into scripts. They relate to the students through the words in the scripts. These teachers are the source of warmth, excitement, and life in the presentation. They make the expected adjustments for individual differences among students. Teachers are the only ones who can motivate students with praise and other feedback on their work. Teachers are also the only ones who can adjust the pace to the needs of the group, allowing more time for tasks that are difficult for a particular group and moving more quickly through tasks that are easier. Teachers must also play the critical roles of problem solver and decision maker, identifying problems with student learning and adjusting the instruction accordingly. These jobs are extremely demanding but are made much easier if teachers are given excellent tools including a well-designed scripted curriculum. Relieved of the instructional design role, teachers can focus on the critical job of delivering instruction, adjusting it to the unique needs of individual students, and solving unexpected problems.

Continuous Assessment. It is important to monitor students' progress toward program objectives continuously. All Direct Instruction programs include various types of ongoing in-program assessments. These assessments provide teachers with feedback on the effectiveness of their teaching and allow them to evaluate the adequacy of their students' skill development. Data provided by these assessments can be used to make critical instructional decisions. If progress is inade-

quate, teachers need to adjust instruction. They may determine that some students are inappropriately placed and regroup students accordingly. They may develop additional instruction and practice for students who have not yet mastered a particular skill.

On the other hand, students may perform above the specified criterion on these measures. Teachers may elect to skip lessons when data indicate that a group of students is capable of moving at a faster pace. Or, teachers may find that some students in a group are able to move at a faster pace and may elect to change those students' group placement. All decisions—from initial placement and grouping, to acceleration of instruction—are made based on students' assessment performance not on "hunches."

Teacher–Student Interactions

Direct Instruction defines the teacher's role more clearly and explicitly than most other forms of instruction. Scripted programs relieve teachers of the role of instructional designer. Instead, their role is to deliver instruction in a way that is effective and motivating to the particular group of students and to make the critical decisions about how the program should be adapted to the needs of the particular group. This role emphasizes (a) knowing the students as individuals and creatively motivating them through presentation of the script and by adding motivational systems that are appropriate to the particular group, and (b) knowing the students' ever-changing skills and adjusting the pacing of lessons, amount of practice, and other factors according to their needs. These roles emphasize problem solving and creativity. However, this creativity is not unstructured and undirected. It is creativity within the context of well-conceived lessons and with the clear goal of enhancing learning and motivation.

There are seven components for promoting effective teacher–student interactions: active student participation, group unison responding, signals, pacing, teaching to mastery, correction procedures, and motivation.

Active Student Participation. Students learn best when they are actively engaged with the material. Active engagement is important for three reasons. First, and most obviously, students learn when they interact with the instructional material and receive relevant feedback. More interaction and more feedback result in more learning. A student who reads 20 words and receives feedback on each will tend to learn more than a similar student who reads only 5 words. Thus, actively responding to a large number of relevant items would be expected to increase learning directly.

The second reason for maximizing engagement has to do with the pragmatics of the classroom. When students are engaged, they are less likely to become distracted and to distract others. Therefore, active engagement reduces time that would otherwise be devoted to management of behavior problems. In this way, active engagement can actually increase the time available for teaching. (Martella and Nelson, in press, provide further information on behavior management issues related to the teaching of Direct Instruction.)

The third reason to maximize active engagement involves knowledge of student skill levels. When teachers have an excellent understanding of each student's current level of mastery, they can make the best decisions about instruction. Ideally, they would have very rich information on students' skills in order to make well-informed decisions. When we consider these three reasons for active engagement, it becomes clear why active engagement is one of the centerpieces of Direct Instruction.

Group Unison Responses. There are many ways to organize active student engagement.

One of the most common is to call on individual students to answer questions orally. If the items are relevant and the questions well designed, oral responses can give individual students practice, keep them attentive, and give teachers immediate information on individual student skill levels. However, individual oral responses also have several limitations. While the teacher is interacting with one student, other students may not be paying attention. Each question that is directed to a single student may constitute down time for the other students and not promote active engagement. In addition, with individual questions, the teacher receives information about only one student at a time. It is possible that the student who answered the question is the only one who understood the material. This possibility is even greater if the teacher calls on volunteers. Students who do not know the answer are the least likely to volunteer. Calling on volunteers may give the teacher a distorted picture of the group's performance. Additionally, it directs the response opportunities to students who are the most skilled and away from those who are most in need of active engagement.

In order to provide practice and to assess many students, teachers can provide numerous individual questions. However, this questioning leads to a great deal of down time for students. If there are 10 students in a group, each student may waste nine-tenths of the time devoted to individual questions. In addition, if teachers repeatedly ask a small set of questions, then the first students to answer the question get a high-quality opportunity to figure out the answer. Other students who respond to a question after having heard several other students answer that same question get lower-quality opportunities because they may simply be repeating what they heard from the other students. They may not have had a chance to figure it out for themselves.

An alternative way to organize student responses is to pose a question to all the students and have them all write the answer. This technique can be very useful if written answers are appropriate and students have strong writing skills. However, many students we teach do not yet have strong and fluent writing skills, and much of the content does not lend itself to written answers. In addition, teachers must circulate around the group very quickly to assess the skills of all the students. If they do not circulate quickly and check answers as students write them, then they will not have the high-quality assessment information that is one of the goals of student engagement.

Another alternative, one that is often (though not always) employed in Direct Instruction, is to ask all the students to answer orally *in unison.* This responding is often described as *choral responding* because it is similar to a choir singing in unison. If students answer in unison, then (a) all students get high-quality practice on every item because they provide their own response and cannot echo other students, (b) all students are busy learning the material and are less likely to become distracted, and (c) teachers can assess the skills of all the students in an instant and be well informed about their skills. If teachers can orchestrate group unison responses, they can greatly increase students' opportunities to be engaged with the content and greatly increase their understanding of each student's skill level. Group unison responses are highly efficient. Suppose a teacher has a group of 10 students and he can ask 10 questions per minute. If he asks all individual questions, each student makes one oral response per minute. In contrast, if he asks group questions and gets unison responses, each student can make 10 responses per minute.

Group unison responses have some substantial advantages; however, they should not be the only form of response. Group unison responses are useful when the answer is relatively short and when all students would be expected to provide the same answer. For example, a teacher might show students a fraction and

ask, "Is this a proper fraction?" All students would respond "No." The teacher might then ask, "How do you know?" and the group would respond, "The top number is larger." In both of these instances, the use of a group unison response would be appropriate. On the other hand, if the teacher gave a request such as, "Give an example of an improper fraction," we would expect students to give a variety of answers so a group unison response would not be appropriate. For this item it would be best to call on an individual or to ask all students to write an answer.

In addition, group unison responses should be followed by individual questions. Individual turns provide information about the skill levels of different students to respond to a task when there is no support from the group. Individual turns are generally presented after the group has been brought to mastery. When teachers provide individual turns (usually signaled by teachers as "time for turns"), they provide an instruction to all students and then place an individual student's name at the end of this instruction. For example, "Read the second row of words, James" or "Say these sounds, Sally" as compared to "James, read the second row of words" or "Sally, say these sounds." In this way, all students are prepared to answer the teacher until a specific student's name is called.

Signals. The group unison oral response is a very useful tool. However, if answers are not quite in unison, if some students answer slightly earlier or slightly later than the others, or if students drone their answers, then these group responses become much less powerful and may even be counterproductive. The problem is that if responses are not crisp and in unison, then students who answer later may simply be echoing those who answered earlier. Thus, they may not be practicing the academic task but, rather, practicing the skill of chiming in after other students. In addition, when responses are crisp and in unison, teachers can easily hear a single error in a group. However, if answers are dragged out or unsynchronized, it is much more difficult to detect errors. As a result, it is very important that teachers use some system to enable all students to answer simultaneously.

In many noneducational pursuits, people want to coordinate their actions. In an orchestra or choir, musicians watch the conductor for visual signals and listen to each other for auditory cues about when to begin. In football, a quarterback usually gives auditory signals by yelling. Coordination of our driving in traffic is mostly arranged by visual signals of traffic lights, signs, and (depending on where you are driving) other drivers' turn signals. The common element among these diverse examples is that we use various kinds of signals to coordinate groups of people.

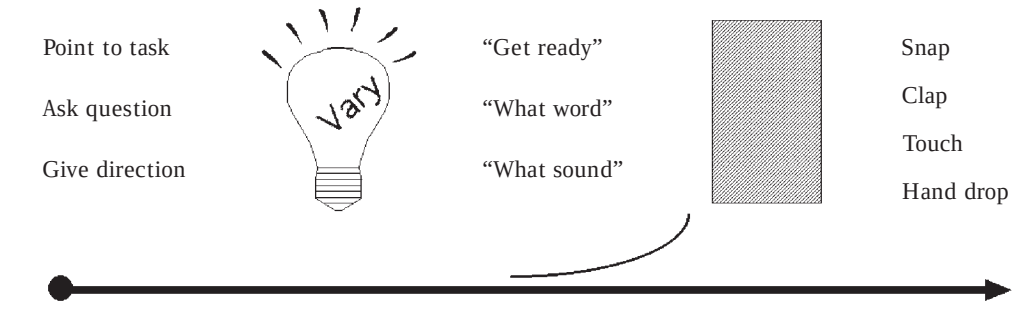
The goal in signaling for a group unison response is to enable all students to initiate the answer at exactly the same time. In this way, teachers gain precise information about student performance that one-to-one instruction permits, while still achieving the efficiency of group instruction. Teachers hear a single response, are able to evaluate the response, and can proceed accordingly. In order for students to initiate a response at the same time, we must use some kind of signal to coordinate their answers. Direct Instruction teachers use various signals, depending on the circumstances. For example, when students are reading words from a textbook, they are not looking at the teacher. Therefore, an auditory signal such as a snap, tap, or clap is useful because it does not require students to look away from their books. On the other hand, if students are reading words that are written on a chalkboard, teachers may use a visual signal, such as pointing to the word, because they are already looking at that word. In each Direct Instruction program, the teacher's guide and teacher presentation book specifies how to signal for each task.

Figure 2.8 illustrates the parts of a basic signal. To signal a unison response during group instruction, teachers provide (a) a focus cue to gain students' attention to the task, (b) think time that varies depending on the skills of the students, (c) a verbal cue followed by a pause (interval), and (d) a signal. To focus the students' attention, teachers may point to an item on the board or in a teacher presentation book or may direct students to point to an item in their book. In giving directions, teachers tell the students the type of response they will make. For example, they may say, "Spell each word after I say it" or "Read these words the fast way." Next, think time is provided. The length of think time depends on the difficulty of the task. If the task is relatively simple for students in the group, the think time may be very brief. For instance, after sufficient practice with letter–sound correspondence, most students would need little think time to respond to the question, "What sound does this letter make?" However, for more difficult tasks, teachers need to provide more think time. When asked to read words that follow the VCe pattern, students need sufficient time to determine if the word ends in an *e* to think about what sound the medial vowel makes, and then to sound out the word overtly with the appropriate vowel sound. This task obviously will take several seconds when the skill is being acquired. If think time is too short, students will not answer on signal or will make errors. As students become more proficient in application of a particular skill, teachers reduce this think time.

Following think time teachers provide a verbal cue such as "get ready" or "what word." This verbal cue has teacher voice inflection built in (e.g., get READY) as illustrated by the curved line under the verbal cue column in Figure 2.8; this cue is immediately followed by a short pause (interval). Right after this short pause, teachers provide a signal. Teachers may indicate this signal by making a gesture (such as touching the board or dropping their hand) or an audible cue (such as a clap or tap). It is critical that teachers do not "talk and move" at the same time; that is, teachers should not overlap what they say with their signal. The interval after the verbal cue and before the signal should be maintained. Students are to come in "on signal"; that is, they respond when teachers snap their fingers or tap the board.

Figure 2.8

Parts of a basic signal.



Note. Illustrated by Tracey Hall.

Signals tell students when to answer and provide all students the opportunity to participate. The signal is a tool that enables all students to be actively engaged with instruction and gives teachers the opportunity to monitor student responses and adjust their instruction accordingly.

Pacing. Active student engagement is further enhanced when teachers maintain a brisk pace in their teaching. Brisk pacing of instruction is important for several reasons. First, a rapid pace allows teachers to cover, and students to learn, more material (Brophy & Good, 1986). Second, a brisk pace holds student attention and reduces time between related information, thereby enhancing student learning. When we speak too slowly, we can actually be harder to understand, especially by distractible children. Third, well-paced instruction keeps students engaged and, in turn, reduces behavior problems. Inappropriate behavior often occurs during down time when students are not occupied with productive tasks. Engelmann and Becker (1978) reported that when teachers maintained a pace of about 12 responses per minute, students answered correctly about 80% of the time and were off-task only 10% of the time. However, when teachers asked only four questions per minute, the students' accuracy dropped to 30% and they were off-task about 70% of the time. Clearly, a brisk pace contributes to the effectiveness of instruction.

Proper pacing is a difficult teaching technique to master. The pace should be relatively quick, but must give students sufficient think time. Experienced Direct Instruction teachers become very sensitive to the demands of the task and the skills of the individual students and adjust their pace accordingly. Finding an appropriate pace is an important and subtle skill, one that is learned from experience and close observation of students' learning.

Teaching to Mastery. The difficulty of a learning task depends on how well students are prepared for it. When students are well prepared they will find a task easy, even "natural." However, those same students would find that same task extremely difficult if they were not well prepared for it. This simple, even self-evident, logic is the basis of the Direct Instruction principle of teaching to mastery. Mastery involves performing skills at high levels. Engelmann (1999) likens mastery to a stairway: "Mastery is the guarantee that students are able to reach each stair without falling" (p. 4). Effective teachers carefully design instruction around this goal.

Direct Instruction programs are designed to prepare students for each new challenge and set the students up for success. If students have mastered the skills taught in Lessons 1–80 of a Direct Instruction program, they will be well prepared for Lesson 81. However, if students are weak on the tasks from the previous lessons, then Lesson 81 will be more difficult. Therefore, we can make the program easiest for students and enhance their success by bringing them to mastery on every lesson. Some teachers are tempted to reduce their mastery standards for groups of students who are struggling. We often hear that a group's performance is, "pretty good for the low group." The problem is that students who tend to struggle are the very students who most benefit from mastery and are most disadvantaged when lessons are made more difficult. Thus, from a Direct Instruction perspective, it is very important to assure that every group reaches mastery on every lesson; mastery is particularly crucial for students who struggle with the material.

Mastery should generally be gauged by the performance of the lowest performing student in the group. If that student has mastered the material, we can assume that others in the group have as well. It also means that the student who is most in need of support will not be further disadvantaged on the next lesson. Engelmann (1969) advised that we "seek flattery from the lowest-performing children. When they succeed, the teacher should indeed

feel that she has received the highest form of professional compliment" (p. 46).

Four criteria allow precise interpretation of how students respond during lessons as noted by Engelmann (1999):

1. Students should be at least 70% correct on information that is being introduced for the first time. (If they are only at 50%, they are at chance levels and are probably guessing.)

2. Students should be at least 90% correct on skills taught earlier in the program (assuming previous skill mastery).

3. At the end of a lesson, all students should be "virtually 100% firm on all tasks and activities" (p. 6).

4. Student error rates should be low enough to ensure that teachers have sufficient time to complete a lesson.

Teaching to mastery involves closely monitoring student performance and making appropriate adjustments.

Correction Procedures. Effective instruction requires effective correction procedures. While Direct Instruction is designed to minimize student errors, mistakes are inevitable when students are acquiring new information. Teachers must notice every error, determine the type of error that was made, provide an appropriate correction, and arrange for additional practice on items of that type. Without effective corrections, learning is difficult or impossible.

Many different types of correction procedures are used in Direct Instruction. The particular correction procedure used depends on the teachers' diagnosis of errors. However, two features characterize all corrections in Direct Instruction: (a) They are immediate, and (b) They are direct. Teachers should correct mistakes immediately when they occur. Corrections explicitly and directly provide information that enables students to answer questions correctly. In addition, during group responses, corrections are presented to the entire group. The individual student who makes an error is never singled out. All students can benefit from the additional practice provided by the correction procedure. If the errors occur in individual responses, corrections are typically directed to the student who responded.

The basic correction procedure for student response errors in Direct Instruction programs consists of reteaching and retesting students. Figure 2.9 shows the basic Direct Instruction correction procedure of model–test–retest.

Immediately after the error, teachers (a) demonstrate the correct answer (*model*), (b) ask the students to respond to the original item (*test*), and (c) give several other items, then retest the item that was missed (*retest*). Each step in this correction procedure has a specific purpose. The model step clearly communicates what students should do. The test step assesses whether the model was effective and students can now respond correctly to that item. However, because the test immediately follows the teacher's model, it does not show whether students can answer correctly and independently. Thus, the retest step (also called "starting over") is crucial. The retest comes after several other items. If students can make the correct response after these other items, then teachers have greater confidence that students have learned the response. In addition to these basic steps, teachers may decide to use *delayed tests* of missed items after completing the exercise or lesson. Delayed tests may be given at varying intervals throughout the day and on subsequent days to ensure that students remember important information.

In some situations, teachers may add steps to the basic correction procedure. Chapters 3–8 provide specific correction procedures for the various academic programs (presented under

Teaching Techniques in the chapters). For example, if students err in applying an explicit rule, teachers can replace the model step with a *rule.* If students misread the word *note,* (saying *not*) teachers could assist students in applying the rule for reading VCe words by asking, "Is there an 'e' on the end of the word?" followed by, "So what do you say for this letter (pointing to the letter 'o')." They then proceed with the test and retest.

Students may make errors because they have trouble producing the response. For example, students may have difficulty making the sound for a particular letter, saying the sounds in a word without pausing between sounds, or reciting a list such as days of the week. In these situations, teachers should add a *lead* step after the model. They initiate the response by asking students to, "Say it with me," and respond with students on a lead step. Assume that students made a mistake when asked to say the sounds in *sat* without stopping. Figure 2.10 illustrates an appropriate correction procedure that includes a lead step. Teachers may lead (respond with the students) several times and must monitor the students' responses closely by watching and listening. Only when teachers are confident that students can produce the response without their assistance are students asked to respond independently.

The teacher's guide and teacher's presentation books for all Direct Instruction programs provide very detailed guidelines for effective correction procedures of common types of mistakes in that particular program. All of these

Figure 2.9

Steps in a basic correction procedure.

Step	Teacher says	Student says
Model Clear communication of what students should do.	This word is "eventually."	
Test Opportunity for students to perform skill correctly.	What word is this?	eventually
Retest Teacher intersperses several other items before retesting "eventually." Gives students opportunity to perform skill independently.	What word is this? (treatments) What word is this? (submarine) What word is this? (eventually)	treatments submarine eventually

corrections are variations on the basic correction procedure of model–test–retest.

In addition to correcting student response errors, teachers should also correct signal errors. When signal errors occur it means that students did not answer together on signal. To correct this error, teachers might say, "I need to hear everyone together" or "Everyone should respond right at my signal" and repeat the task (starting over).

Motivation. In Direct Instruction, learning and motivation are seen to be closely related. Motivation begins with success, and success requires motivation. The experience of success is one of the most important bases of motivation in the classroom. Thus, motivation begins, as instruction does, by appropriate placement. Placement in excessively difficult material results in failure and reduced motivation. Placement in excessively easy material results in boredom and reduced motivation. When placement is appropriate and instruction is well designed and well delivered, students experience a high level of success. Classroom experiences that produce success are one of the foundations for motivation. Thus, to maximize student motivation, we refer to the same instructional issues we have been concerned with in maximizing student learning.

In a well-designed program, day-to-day success will result in continual learning and improvement of skills. For students, the reward of seeing their own improvement can powerfully support motivation. Learning, of course, has other natural rewards. Learning basic language skills results in communicating more effectively, opening vast possibilities. Learning to read offers the great reward of access to literature as well as the social rewards of reading such as being complimented by one's parents.

Teachers play a key role in motivation. They arrange a classroom environment that results

Figure 2.10

Correction with lead step.

Step	Teacher says	Student says
Model	My turn to say the sounds in sat. sssaaat.	
Lead Teacher and students say the response together. The lead may be repeated several times if necessary.	Say it with me, sssaaat.	sssaaat
Test	Say the sounds in sat all by yourselves.	sssaaat
Delayed Test	Say the sounds in sat.	sssaaat

in success for all students. They recognize that success and make it more apparent to students. By frequently commenting on success and praising students for their efforts, teachers amplify the effects of the success and add a positive social element. Teacher recognition is a strong motivator for most students, but the effects of praise depend on the relationship between teachers and students as well as the way in which teachers deliver praise. When teachers have a warm and positive relationship with their students, their praise will be more powerful. Also, if they are sincere, specific, and age-appropriate in their praise, the effect will be most powerful.

Admonishments, reprimands, nagging, and other forms of attention given to undesirable behavior should be minimized. Reprimands and other forms of attention given to undesirable behavior are generally ineffective. Madsen, Becker, Thomas, Koser, and Plager (1968) compared the effects of reprimanding students for being out of their seats versus ignoring them and praising students who were in their seats and on-task. The authors concluded that, if the primary way that children get attention is by misbehaving, they actually misbehave more often. That is, teacher attention, even though intended to reduce the undesired behavior, may actually make it more frequent. Thus, one of the basic slogans of motivation in Direct Instruction is, "Catch them being good."

Much of the time the immediate rewards of success, learning, and recognition from the teacher are sufficient to produce strong motivation. However, when learning is harder, more rewards may be required. Also, for a wide variety of reasons, some children are not sufficiently motivated by these simple motivational techniques. Thus, additional strategies are necessary. These additional strategies may include more focused praise. For example, if teachers know that particular students are struggling with math facts, they may be alert for situations in which those students succeed with math facts. They may also make a point of recognizing student effort and persistence in this area. Teachers can make student progress more obvious. For example, they may teach students to graph their performance on certain skills or activities such as each day's math assignment. Beating one's own best score is often a powerful motivator.

These relatively simple techniques used consistently and thoughtfully are sufficient for creating a positive, motivated, and productive classroom. However, this is not to claim that these techniques will eliminate all behavior management problems. When problems arise, the first question for teachers should be whether these basic motivation systems are in place. They should ask whether students are placed at an appropriate level and are experiencing success in the program, and they should ask whether students are aware of their successes and are receiving sufficient recognition for their efforts. This simple analysis can unravel the reasons, and suggest solutions, for many behavior challenges. However, there will still be challenges that require even more focused analysis and intervention. Martella and Nelson (in press) describe strategies for working with a wider variety of classroom management techniques.

Direct Instruction and Effective Teaching

The practices that have been identified by the "effective teaching" literature (described in Chapter 1 as effective instruction) are integrated into Direct Instruction. The organization of instruction in Direct Instruction includes a general academic focus with an emphasis on maximizing engaged time and instruction in small interactive groups—all characteristics of effective instruction (Rosenshine & Stevens, 1986). Direct Instruction includes organizational elements beyond those described in the effective teach-

ing literature. These elements include grouping students with similar instructional needs and scripted presentations. Direct Instruction student–teacher interaction practices such as brisk pacing, high success rates, and explicit instruction, followed by guided practice and independent practice with emphasis on mastery of content, are all prominent recommendations from the effective teaching literature (Rosenshine & Stevens). Direct Instruction builds on these techniques by adding specific practices such as unison responding to further increase active participation by students, signals to coordinate student answers, and specific recommendations for error corrections.

The most important way that Direct Instruction extends effective teaching is in program design. Effective teaching does not deal with program design—it takes the program as a given and focuses on effective methods for delivering the content. Direct Instruction, on the other hand, is built on the foundation of instructional programs that embody efficient strategies and carefully crafted explanations. This attention to what is taught takes Direct Instruction beyond the recommendations of effective instruction. Thus, Direct Instruction is consistent with the recommendations of the effective teaching literature and goes beyond it by further specifying teaching techniques and attending to the design of programs.

Direct Instruction is often confused with the more general techniques described in the effective teaching literature. In fact, the term *direct instruction* (note the lack of capital letters) is often used to refer to any form of instruction involving direct interactions between teachers and students. Many professional educators and professional publications fail to distinguish between direct instruction, which is a set of teacher practices for organizing instruction and interacting with students, and Direct Instruction, which is an integrated system of curriculum and instruction (Schaefer, 2000).

In a recent popular educational psychology text, Slavin (2003) states that "the research on direct instruction models has had mixed conclusions . . ." However, he also points out, "Studies of Direct Instruction . . . a program built around specific teaching materials and structured methods, have found strong positive effects" (p. 239).

Students for Whom Direct Instruction is Appropriate

Research has confirmed that Direct Instruction has been effective for students with diverse learning needs (including students in special education and general education), students with diverse language backgrounds, and students of all ages from preschool through adult.

Students With Diverse Learning Needs

Students who are receiving special education services are particularly at-risk for academic failure. If these students are to be successful, they often require careful instruction in which details are carefully planned and well implemented. Direct Instruction has been successful in accelerating the achievement of students who receive special education services.

Even students who would be predicted to have low levels of achievement benefit greatly from Direct Instruction. Gersten, Becker, Heiry, and White (1984) examined the yearly achievement test profiles of students in Direct Instruction classrooms to determine whether annual gains made by students with low IQ scores differed significantly from the gains made by students with average or superior IQ scores.

Figure 2.11 shows the yearly gains made by students in reading as measured by the Wide Range Achievement Test. As shown in this figure, students with higher IQ test scores

started at higher achievement levels and ended with higher levels than their peers with lower scores. However, the pattern of growth of students with low IQ scores is remarkably similar to that of other students. The group with the lowest scores (under 70) gained nearly as much each year in reading as students with much higher scores. By the end of third grade, those students with the lowest IQ scores were performing at the 70th percentile, or a grade equivalent of 4.3.

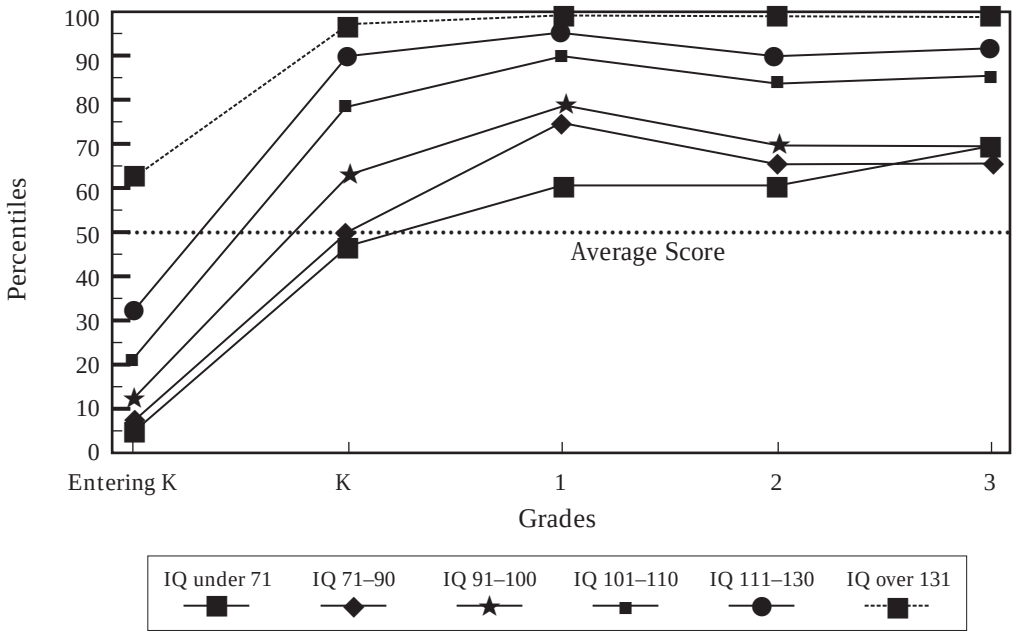
The results are even more pronounced in math as seen in Figure 2.12. This figure shows the students' performance on the Metropolitan Achievement Test. The growth rate for *all* groups of students corresponds to one grade equivalent for each year in school.

These results provide evidence that Direct Instruction is appropriate for, and effective with, a wide variety of individuals including those with low IQ scores, those with IQ scores in the average range, and those with high IQ scores. In addition, because children in this study were taught in small homogeneous groups (having students with relatively the same skill levels), the gains of students with lower IQ scores were not made at the expense of other students nor the other way around.

Several reviews of research focusing on the use of Direct Instruction with special education populations have all converged on the finding that Direct Instruction is measurably effective with these students. White (1988) reviewed 25 such studies and found that all comparisons

Figure 2.11

Results of Direct Instruction on reading as measured by the Wide Range Achievement Test for students with diverse IQ scores. Adapted from Gersten et al. (1984).



All testing was performed at end of academic year, except EK.

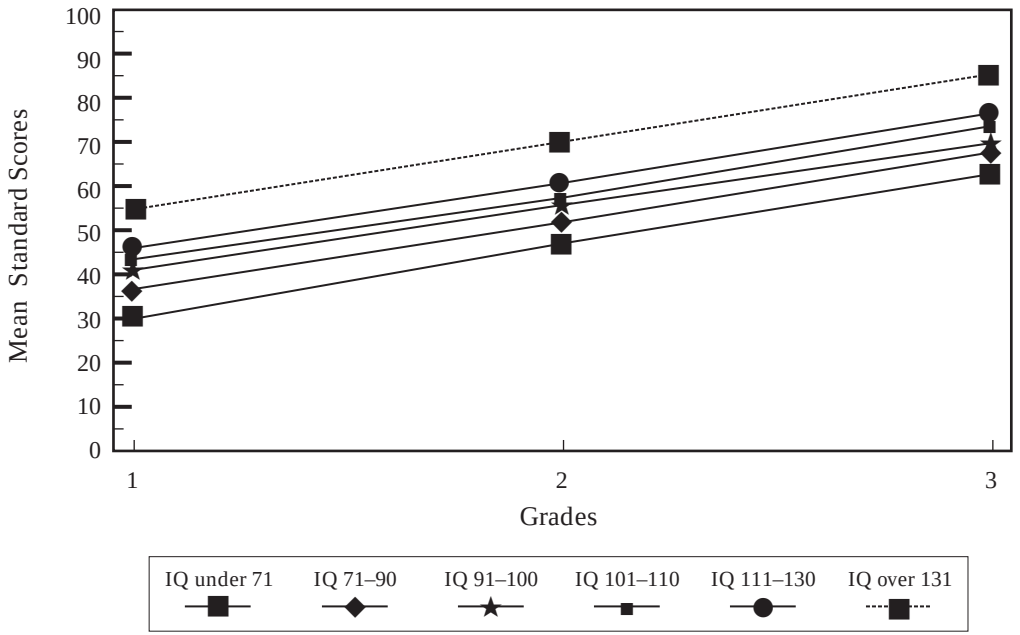
favored the Direct Instruction group. Forness, Kavale, Blum, and Lloyd (1997) conducted an analysis of various intervention programs for special education and determined Direct Instruction to be one of only seven interventions with strong evidence of effectiveness.

Perhaps because Direct Instruction programs have been so successful with students who have failed in other instructional programs, their use is commonly associated with children who are behind, who are failing, or who are at-risk for failure. And some have questioned their appropriateness for general education. However, Figures 2.11 and 2.12 provide direct evidence of the effectiveness of Direct Instruction for students with IQ scores in the middle range and those in the upper range.

Engelmann and Carnine (1989) found that typical second graders who had received 2 years of Direct Instruction scored an average 4.6 grade equivalent in reading on a standardized achievement test. The children's average scores in science and math were 4.0 and 3.4, respectively. Other researchers have arrived at similar findings. Tarver and Jung (1995) investigated the effects of a Direct Instruction math program (*Connecting Math Concepts*) and a discovery learning math program on the math achievement and attitudes of general education students in the primary grades. They found that, at the end of second grade, the children in the Direct Instruction program scored higher on measures of math computation and math concepts than children in the comparison group. In addition, children in the

Figure 2.12

Results of Direct Instruction on math as measured by the Metropolitan Achievement Test for students with diverse IQ scores. Adapted from Gersten et al. (1984).



All testing was performed at end of academic year.

Direct Instruction program had significantly higher scores on a survey of attitudes about math. Finally, Tarver and Jung reported that the Direct Instruction program was equally effective for lower and higher performing children who participated in the study. Other studies provide additional evidence that Direct Instruction programs accelerate the learning of high-performing students in language (Robinson & Hesse, 1981), reading (Schaefer, 1989; Sexton, 1989), and science (Vitale & Romance, 1992).

Students With Diverse Language Backgrounds

Children who have no English oral language are not ready to start in a Direct Instruction program any more than they are in any other program that delivers instruction in English. However, Direct Instruction programs are appropriate for students who have very basic English language skills (Grossen & Kelly, 1992). More generally, they are appropriate for those students who demonstrate the specific prerequisite skills necessary for success in the program based on performance on the placement test that accompanies every program. Gersten (1997) suggested that, because of the careful sequencing of prerequisite skills, controlled vocabulary, and ongoing assessment of mastery, Direct Instruction seems to provide "a workable basis for establishing a structured immersion program for limited- and non-English-speaking students" (p. 22). Gersten also suggested that the design of Direct Instruction programs "allow[s] for one of the cardinal principles of structured immersion—that new material be introduced in English but at a level understood by the children" (p. 28).

Duran (1982) showed that more rapid acquisition of math concepts was found with Hispanic students with limited English proficiency using instructional materials developed according to Engelmann and Carnine's (1982) instructional design principles (discussed earlier in this chapter) than with traditional math programs. Gersten, Taylor, Woodward, and White (1997) described the evaluation of a 14-year implementation of Direct Instruction in Uvalde, Texas, whose population is 98% Hispanic. The authors concluded that the approach had a consistent, positive effect on the achievement of language minority students. They reported that achievement levels were at or near grade level in math, reading, and written language for more than a decade. Scores in reading comprehension and vocabulary were at the 28th to 31st percentiles. These scores are, according to Gersten et al., "appreciably above typical levels for low-income Hispanic students" (p. 37). Perhaps more importantly, follow-up studies conducted 2 and 3 years after students left the program indicated that the achievement effects had been maintained.

Children With Various "Learning Styles"

Many educators believe that students have different "learning styles" and that learning can be maximized by matching instruction to individual students' learning style. However, despite its common appeal and widespread acceptance, reviews of controlled research studies have consistently failed to find *any* relationship between instruction and learning styles (Snider, 1992; Stahl, 1999; Stahl & Kuhn, 1995). That is, there is no empirical evidence that matching instruction to a student's so-called learning style results in better outcomes for the student than instruction that is not "matched." The idea is simply not supported by research findings.

Attempts to prescribe specific teaching approaches based on measures of learning styles have systematically failed. However, it is clear that effective teaching does depend on a much more focused approach to adjusting instruction to the needs of individual students. Students' instructional needs are based on the skills that they currently possess. Direct Instruction places a high value on continually adjusting students' placement in pro-

grams, pace of lesson coverage, and amount of repetition on each activity based on students' performance. This approach eschews the hypothetical and elusive characteristics of learning styles and instead focuses on students' needs that are clearly seen in their performance and are directly relevant to making specific adjustments in instruction.

Students of Different Ages

When educators discuss whether a particular instructional program is appropriate to a specific child or group of children, they often use the term "developmentally appropriate." According to Church (2002), developmentally appropriate practice is an approach that involves providing children with programs that fit their age and needs. The principles of Direct Instruction are entirely consistent with this position (Kozloff & Bessellieu, 2000). Each Direct Instruction program includes extensive techniques for assessing the individual needs of children and responding to those needs.

Studies have shown Direct Instruction to be effective in teaching learners of all ages, from preschool to adult. The origins of Direct Instruction are in the Engelmann-Bereiter preschool where children demonstrated a substantial increase in language skills as well as IQ scores (Bereiter & Engelmann, 1966). Later, Weisberg (1988) reported that preschool children who received 2 years of Direct Instruction consistently performed above the 98th percentile on measures of reading. More recently, research has demonstrated significant improvements in language and social interactions of preschool children (Waldron-Soler et al., 2002). Chapter 3 discusses further research conducted with preschoolers.

At the other end of the age spectrum are older learners. It is not surprising that Direct Instruction is also effective in teaching older students. Effective programs are not differentially effective; they are effective for learners of all ages. Research has demonstrated that it is possible for high-school students to make achievement gains of more than 2 years in only 9 months of instruction (Campbell, 1988). (See Chapter 10 for further information on studies involving high-school students in remedial reading programs.) Herr (1989) showed that even adult learners with a long history of failure and severe skill deficits can be successful when taught with Direct Instruction.

Research on Direct Instruction

More than any other commercially available instructional programs, Direct Instruction is supported by research. Numerous studies provide empirical support for the specific Direct Instruction design principles and teaching practices that were discussed previously (Engelmann & Carnine, 1982; Kameenui, Simmons, Chard, & Dickson, 1997). We have already seen a number of examples of research on Direct Instruction with diverse learners. Several summaries are available providing additional research with a range of learners, in various settings, and in different content areas (e.g., Adams & Engelmann, 1996; Becker, 1978; Kameenui et al.; MacIver & Kemper, 2002). In addition, current research and evaluation of Direct Instruction may be found in The *Journal of Direct Instruction.* In the following sections, we describe Project Follow Through, a large-scale research project that included Direct Instruction, independent reviews of research and evaluation literature related to Direct Instruction, and several studies of long-term outcomes from early experiences with Direct Instruction.

Project Follow Through

Project Follow Through was originally conceived as a large-scale comprehensive service program for economically disadvantaged children that would essentially extend Head Start

into the primary grades. However, because the funds needed for such an ambitious undertaking were not appropriated, the United States Office of Education (now the U.S. Department of Education) decided to implement Follow Through as an educational research program. Follow Through provided an opportunity to compare different educational approaches in order to accumulate evidence about their effectiveness in teaching children who are economically disadvantaged. Follow Through is the largest educational experiment in history, costing close to one billion dollars, and involving nearly 100,000 children from 170 communities throughout the United States. The experimental phase of Follow Through lasted from 1968 to 1976. Follow Through continued as a service program until funding was discontinued in 1995.

Follow Through created a sort of national learning laboratory, and the design, called planned variation, provided a unique opportunity to implement various instructional approaches (or models) in classrooms and then evaluate their effects (Watkins, 1997). Developers of the different approaches acted as "sponsors" of their model. The models fell into three categories: those that emphasized instruction of academic skills, those that emphasized cognitive growth, and those that stressed affective (i.e., self-esteem) development. The major models are described in Table 2.2.

The study measured three kinds of outcomes: *basic skills* (word recognition, spelling, language, and math computation), *cognitive–conceptual skills* (reading comprehension, math concepts, and problem solving) and *affective* (self-concept). Children were tested with these measures when they entered the program (in kindergarten or first grade) and at the end of each school year until they completed third grade. The evaluation data were collected and analyzed by researchers from two independent agencies. Two main analyses were conducted. One made comparisons between each model and a control group, the other made direct comparisons among the models.

In the first type of analysis, the performance of students at each Follow Through (FT) site was compared to the performance of a Non-Follow Through control group (NFT) in the same community with similar economic and social circumstances. If the difference on a given outcome favored the Follow Through group, that is, if the scores of the Follow Through group were significantly higher than the scores of the control group, the outcome was considered positive. Conversely, when the performance of the control group surpassed that of students in a particular Follow Through model, the outcome was considered negative. An index of significant outcomes (Stebbins, St. Pierre, Proper, Anderson, & Cerra, 1977) for each model is shown in Figure 2.13.

On this graph, a score of zero (represented by the vertical dividing line) would indicate that there was no difference on that measure between the Follow Through group and the control group. Bars extending to the right of the vertical line indicate positive outcomes for the Follow Through model. Bars extending to the left of the center line indicate negative outcomes for the Follow Through model (Stebbins et al.).

As can be seen, the Direct Instruction model was the *only* model to demonstrate significant positive outcomes on basic skills measures, cognitive–conceptual measures, and affective measures. The majority of the other models had negative outcomes, which means that the performance of students who participated in those models was lower than that of the control group.

It is particularly important to observe that the Direct Instruction model was more effective on cognitive–conceptual measures than any other model, including those whose explicit goal was cognitive–conceptual development (Parent Education, TEEM, Cognitively-Oriented

Table 2.2

Follow Through Models

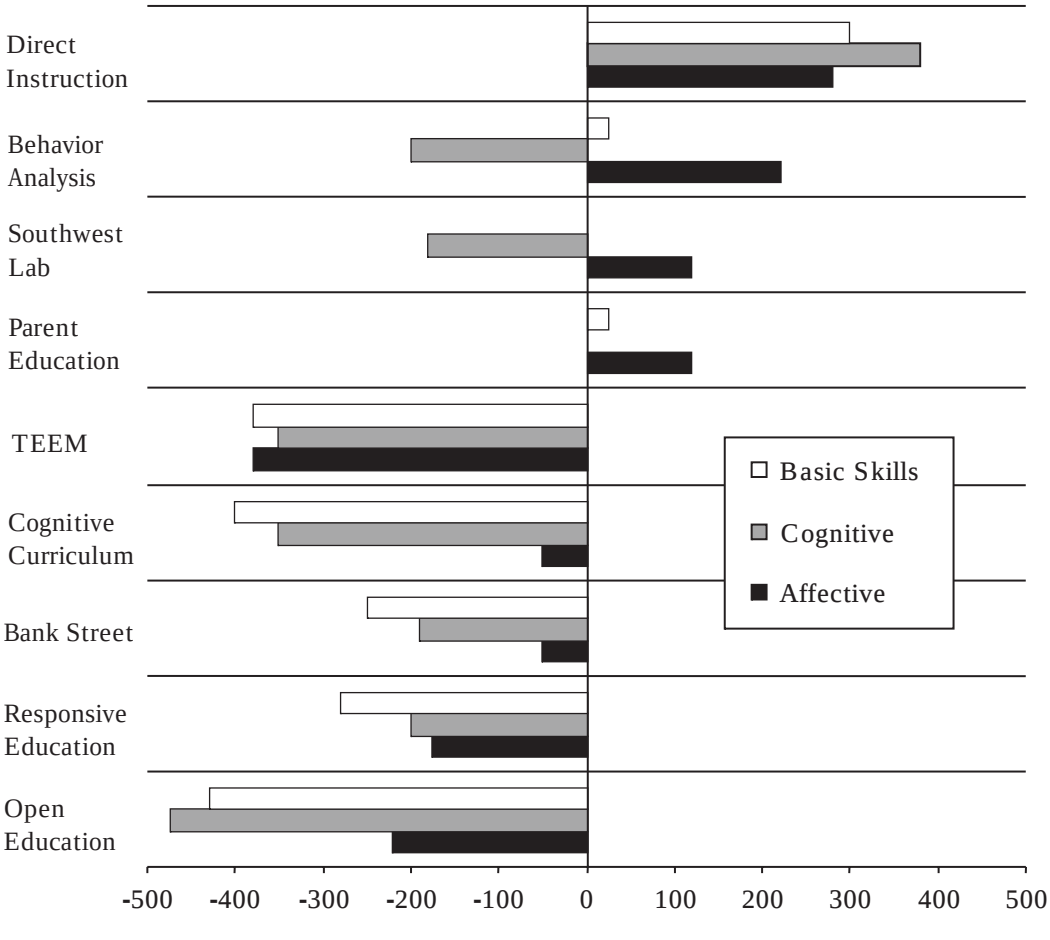
Model	Sponsor	Description
Direct Instruction	University of Oregon College of Education	The curriculum emphasis was reading, arithmetic, and language. Behavioral methods were used in conjunction with sponsor-developed teaching materials. Carefully sequenced lessons specified teacher behaviors (scripted presentation). Instruction took place in small, homogenous groups. Children's progress was assessed frequently.
Behavior Analysis	University of Kansas	Primary objective was mastery of reading, writing, spelling, and math skills. A token economy was implemented and programmed instructional materials were used. Three or four adults staffed classrooms. Children's progress was continuously monitored.
Parent Education	University of Florida	Curriculum objectives varied depending on the assessed needs of individual children. No particular curriculum or teaching strategies were recommended. Focus was on motivating and training parents to serve as teaching aides in the classroom and to visit the parents of children in the class and teach them how to teach their children.
Tucson Early Educational Model (TEEM)	University of Arizona	Emphasis was development of broad intellectual skills and positive attitudes toward school. Language was emphasized as the medium of skill development. Children's interests determined the curriculum.
Cognitively Oriented Curriculum	High Scope Educational Research Foundation	This developmental model was based in part on Piagetian theory. The focus was on developing children's reasoning abilities. Children scheduled their own activities. Teachers were trained to function as catalysts rather than providers of information. Science, math, and reading were emphasized.
Responsive Education	Far West Laboratory	Instruction was self-paced and self-determined. The primary objective was the development of problem solving skills, sensory discrimination, and self-confidence. A basic assumption was that given self-esteem and an appropriate learning environment, acquisition of academic skills would follow.
Bank Street	The Bank Street College of Education	The curriculum objectives of this model included the development of positive self-image, creativity, coping skills, and the use of language to formulate and express ideas. Instructional procedures were not described.
Open Education	Education Development Center	The primary objectives were development of self-respect, imagination, and openness to change. The schedule was flexible with children initiating and terminating activities. The open classroom approach stressed a stimulating environment. The model assumed basic academic skills would be more readily acquired if they were not treated as academic exercises.
The Language Development (Bilingual Education) Approach	Southwest Educational Development Laboratory	This model stressed bilingual language development for Spanish speaking children. Positive emphasis on the child's native language and culture was emphasized. Spanish and English were taught simultaneously; teaching procedures were not specified.

Curriculum). These findings are important because one common misunderstanding is that Direct Instruction promotes only rote learning. In fact, the children in the Direct Instruction model demonstrated higher scores on cognitive–conceptual measures (problem solving and thinking skills) than students in the control group. Without exception, the other models were unable to demonstrate significant positive results on cognitive–conceptual measures.

It is also noteworthy that the Direct Instruction model produced positive results on affective (self-esteem) measures. The children in the Direct Instruction model had higher scores on this set of outcome measures than the control group. It is striking to note that those models that focused on affective development (Bank Street, Responsive Education, Open Education) had negative effects on those measures. This finding means that stu-

Figure 2.13

Follow Through results: Index of significant outcomes for all models. Adapted from Stebbins et al. (1977).



dents who experienced these models demonstrated lower self-esteem than students in the control group. The results of the independent evaluation of Project Follow Through support the conclusion that young children who acquire the skills that enable them to be successful in school feel more positive about themselves and their school experiences.

The second type of analysis provides information about the achievement level of students in each of the models. This comparison uses results from the reading, math, spelling, and language subtests of the Metropolitan Achievement Test. Figure 2.14 shows the results of the major models in these four areas.

To fully appreciate these data, we must understand that, although the national norm is the 50th percentile, disadvantaged students (as a group) typically score in the 20th percentile. Thus, the 20th percentile can be used as a standard for measuring the benefits of receiving instruction according to the various Follow Through models (Becker, 1978). That is, if students who participated in a Follow Through model were expected to be performing at the 20th percentile at the end of third grade without intervention, then an outcome above the 20th percentile would be judged to be an improvement over that prediction. Conversely, if the children who participated in a particular Follow Through model scored below the 20th percentile, we could conclude that their performance was actually worse than it would have been without participation in that Follow Though model.

We see that *only* the Direct Instruction model demonstrated substantial improvement over the 20th percentile on all measures of academic achievement. At the end of third grade, the average of students in the Direct Instruction model was the 41st percentile in reading and the 48th percentile in math. The children in the Direct Instruction model scored, on average, at the 54th percentile in spelling and at the 50th percentile in language.

The purpose of the Follow Through evaluation was to study instructional methods that were intended to reduce the disparity between economically disadvantaged children and their peers. The Direct Instruction model was the sole model that succeeded in raising student performance to a level on a par with national norms by the end of third grade. At the end of third grade, children in the Direct Instruction model were performing at or near the national norm on each measure. These data provide clear evidence of the measurable effectiveness of Direct Instruction. The independent evaluators (Stebbins et al., 1977) summarized the results as follows, "When all Direct Instruction sites are grouped and compared with the Metropolitan Achievement Test norms, students on the average are performing at grade level in Reading, Math, and Spelling" (p. A-168). Stebbins concluded that the Direct Instruction model was generally effective in raising the achievement of Follow Through children to a level comparable with national norms.

Independent Reviews of Research on Direct Instruction

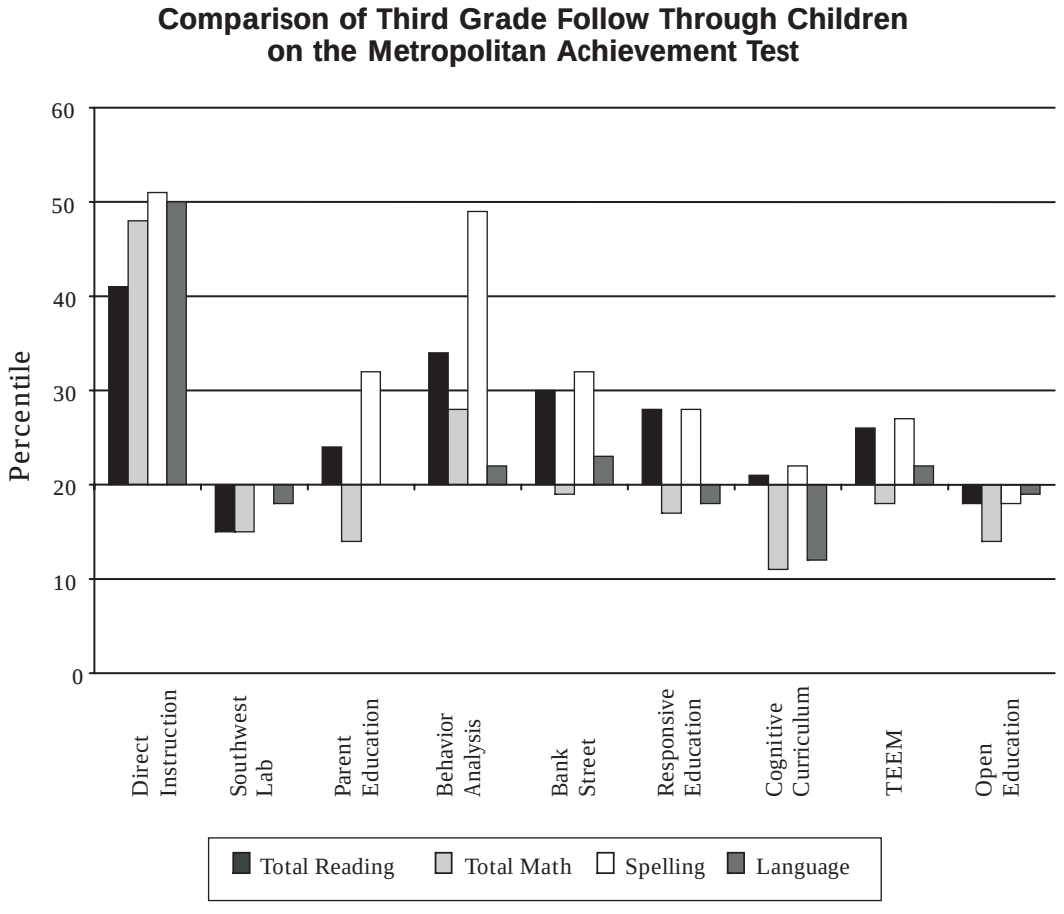
It has been argued (e.g., Allington, 2002) that, because the Follow Through evaluation was completed 30 years ago, the data are no longer relevant. However, the findings of the Follow Through evaluation have not been contradicted by more recent research findings. In fact, recent evaluations have affirmed the findings of Project Follow Through. The American Federation of Teachers (AFT) (1998a) identified Direct Instruction as one of seven promising programs for teaching reading and language arts. The AFT report summarized the research on Direct Instruction saying, "when this program is faithfully implemented, the results are stunning" (p. 17). In a separate report the AFT (1998b) also identified Direct Instruction as one of six school reform programs. In the third report AFT (1999) named Direct Instruction as one of five remedial reading intervention programs that are backed by strong research results.

The American Institutes of Research (AIR) was commissioned to provide an independent review of literature on 24 prominent school-wide reform approaches. After an extensive review of research reports, AIR concluded that Direct Instruction was one of only three approaches that could show strong evidence of positive outcomes on student achievement (Herman et al., 1999).

In a fifth independent review, the Center for Research on the Education of Students Placed at Risk analyzed the research related to 29 of the most widely implemented comprehensive school reform models. This review found that Direct Instruction was one of only three models that could be rated as having the strongest evidence of effectiveness. The review concluded that Direct Instruction had "statistically significant and positive achievement effects based on evidence from studies using comparison groups or from third-party comparison designs" (Borman, Hewes, Overman, & Brown, 2002, p. 29).

Figure 2.14

Follow Through results: Metropolitan Achievement Test scores for all models. Adapted from Stebbins et al. (1977).



Long-Term Follow-Up Research

A small, but widely publicized, research study followed up on graduates from several preschool programs when they were 15 years old (Schweinhart, Weikart, & Larner, 1986). In this study participants were asked to provide a self-report (i.e., complete a questionnaire) about their antisocial acts. The 18 students who had graduated from a Direct Instruction preschool program reported more antisocial acts than those who had completed other kinds of preschools. This single study has been widely cited and, in some circles, the idea that participation in Direct Instruction can have negative effects measured 10 years later has been accepted as a proven fact.

Recently, however, other researchers conducted a similar study with many more participants (at least 77 per group compared to only 18 in the Schweinhart et al. study) and substantially stronger experimental methods (Mills, Cole, Jenkins, & Dale, 2002). This recent research also contacted 15-year-olds and used the same survey as in the earlier study. The authors found no substantial differences between graduates of a Direct Instruction program and graduates of a "child-centered" program. In fact, the very small differences that did exist actually favored the Direct Instruction program. In a careful comparison of the two studies, Mills et al. concluded that the differences found in the Schweinhart study were most likely due to the fact that the Direct Instruction group in that study included a higher ratio of boys than did the other groups, and boys are known to participate in unlawful behavior at a much higher rate than girls.

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