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8 THE TEACHER-LEVEL FACTORS

Now we turn our attention to those factors that affect individual students in the classroom—the independent impact that a teacher can have on student achievement. Naturally, an individual teacher is influenced by decisions the school makes (decisions that include a guaranteed and viable curriculum, challenging goals, and feedback). However, the teacher-level factors addressed here are primarily a function of decisions made by individual teachers, including instructional strategies, classroom management, and classroom curriculum design.

Before the mid-1980s, studies of effective schooling tended to look at school-level factors only, that is, the school as having a unitary and consistent impact on student achievement. Good and Brophy (1986) warned of the consequences of this perspective:

> Studies of large samples of schools yield important profiles of more and less successful schools, but these are *group averages* [original emphasis] that may or may not describe how a single effective teacher actually behaves in a particular effective school. Persons who use research to guide practice sometimes expect all teachers' behavior to reflect the group average. Such simplistic thinking is apt to lead the literature to be too broadly and inappropriately applied. (p. 588)

A useful question, then, for anyone wishing to understand those factors that enhance student achievement is this: What influence does an individual teacher have apart from what the school does?

The Effect of Individual Teachers

Although most attempts to answer this question arrive at slightly different quantitative estimates, all researchers agree that the impact of decisions made by individual teachers is far greater than the impact of decisions made at the school level. Reporting on their analysis of achievement scores from

five subject areas (mathematics, reading, language arts, social studies, and science) for some 60,000 students across grades 3 through 5, S. Paul Wright, Sandra Horn, and William Sanders (1997) note

> The results of this study will document that the most important factor affecting student learning is the teacher. In addition, the results show wide variation in effectiveness among teachers. The immediate and clear implication of this finding is that seemingly more can be done to improve education by improving the effectiveness of teachers than by any other single factor. *Effective teachers appear to be effective with students of all achievement levels regardless of the levels of heterogeneity in their classes* [emphasis in original]. If the teacher is ineffective, students under that teacher's tutelage will achieve inadequate progress academically, regardless of how similar or different they are regarding their academic achievement. (p. 63)

This study and others conducted by William Sanders and his colleagues (Sanders & Horn, 1994; Wright, Horn, & Sanders, 1997) rather dramatically illustrate the profound impact an individual teacher can have on student achievement. For example, Kati Haycock (1998) notes that Sanders' results are most revealing in determining the achievement differences between students who spend a year with a highly effective teacher as opposed to a less effective teacher. This difference is depicted in Figure 8.1. On the average, the most effective teachers produced gains of about 53 percentage points in student achievement over one year, whereas the least effective teachers produced achievement gains of about 14 percentage points over one year. To understand these results, consider the fact that researchers estimate that students typically gain about 34 percentile points in achievement during one academic year (see

FIGURE 8.1

Student Achievement Differences Affected by Teachers

Teacher	Student achievement gain in 1 year
Least effective	14 percentage points
Most effective	53 percentage points

Note: Sanders identified "most effective" versus "least effective" teachers by ranking them in terms of gains in student achievement and then organizing that rank order into five categories or quintiles. "Most effective" teachers were defined as those in the highest category (quintile 1); "least effective" teachers were defined as those in the lowest category (quintile 5).
For a technical discussion, see Haycock, 1998.

Adapted from
Sanders, W. L., & Horn, S. P. (1994). The Tennessee value-added assessment system (TVAAS): Mixed-model methodology in educational assessment. *Journal of Personnel Evaluation in Education, 8,* 299–311

Wright, S. P., Horn, S. P., & Sanders, W. L. (1997). Teacher and classroom context effects on student achievement: Implications for teacher evaluation. *Journal of Personnel Evaluation in Education, 11,* 57–67.

Glass, McGaw, & Smith, 1981). That is, a student who scores at the 50th percentile in mathematics in September will score at the 84th percentile on the same test given in May. The findings reported in Figure 8.1 indicate that over a year, students in classes of the most effective teachers will gain much more in achievement than is expected (i.e., 53 percentile points as opposed to 34 percentile points). However, students in the classes of the least effective teachers will gain much less in achievement than is expected (i.e., 14 percentile points as opposed to 34). These findings are even more startling when we consider that some researchers have estimated that students gain about 6 percentage points simply from growing one year older and gleaning new knowledge and information through everyday life (Hattie, 1992; Cahen & Davis, 1977). From this perspective, we might say the least effective teachers add little to students' knowledge over what would be expected from one year of maturation.

If the effect of attending the class of one of the least effective teachers for a year is not debilitating enough, the cumulative effect can be devastating. To illustrate, consider Figure 8.2, which is again based on data from the work of Sanders and his colleagues (as reported by Haycock, 1998).

Figure 8.2 shows a 54-percentile point discrepancy in achievement gains between students with least effective teachers versus those with most effective teachers—29 percentage points versus 83 percentage points respectively over three years. Commenting on this discrepancy, Haycock (1998) notes

> Differences of this magnitude—50 percentile points—are stunning. As all of us know only too well, they can represent the differences between a "remedial" label and placement in the "accelerated" or even "gifted" track. And the difference between entry into a selective college and a lifetime at McDonald's. (p. 4)

Sanders and his colleagues gathered their data from elementary students in Tennessee, yet they are not the only ones to find these differences in achievement. Haycock (1998) reports similar findings from studies conducted in Dallas and Boston.

I have taken a slightly different approach and come to the same conclusions. The studies conducted in Tennessee, Dallas, and Boston were based on data acquired from students over time; I started my calculations with the assumption gathered from my review of research—that schooling accounts for about 20 percent of the variance in student achievement (see the discussion in

FIGURE 8.2

Cumulative Effects Over Three Years Between Students with Least Effective Versus Most Effective Teachers

Most effective teacher	83 percentile point gain
Least effective teacher	29 percentile point gain

Chapter 1). However, in my synthesis of the research, I also found that about 67 percent of this effect is due to the effect of individual teachers. That is, about 13 percent of the variance in student achievement in a given subject area is due to what the teacher does and about 7 percent is due to what the school does (Bosker, 1992; Luyten, 1994; Madaus et al., 1979; Marzano, 2000a; Stringfield & Teddlie, 1989). The implications of my analysis are reported in Figure 8.3. For a detailed discussion of how Figure 8.3 was derived, see Technical Note 6, pp. 191–192.

The six scenarios in Figure 8.3 show effects on student achievement of various combinations of school and teacher effectiveness under the assumption that the student enters school achieving at the 50th percentile. If a student begins at the 50th percentile in mathematics, for example, and attends an average school and has an average teacher, her achievement will still be at the 50th percentile at the end of about two years (as depicted in the first scenario in Figure 8.3). Now let's consider the second scenario where this student attends a school that is one of the least effective and has a teacher that is classified as one of the least effective. After two years the student has dropped from the 50th percentile to the 3rd percentile. In the third scenario, the student is in a school classified as one of the most effective but has a teacher classified as one of the least effective. Although she enters the class at the 50th percentile, she leaves it two years later at the 37th percentile. In the fourth scenario, the student is in a school that is considered one of the least effective, but she is with a teacher classified as one of the most effective. The student now leaves the class at the 63rd percentile—13 percentile points higher than she entered. The fifth scenario is the most optimistic of all. The student is not only in a school classified as one of the most effective but is with a teacher classified as one of the most effective. She enters the class at the 50th percentile but leaves at the 96th percentile. In the sixth scenario, the student is in a school that is one of the most effective and is with a teacher considered average. After two years the student has risen from the 50th percentile to the 78th percentile.

FIGURE 8.3

Effects on Student Achievement of School and Teacher Effectiveness with Student Entering School at the 50th Percentile

School and Teacher Scenario	Achievement Percentile After Two Years
Average School and Average Teacher	50th
Least Effective School and Least Effective Teacher	3rd
Most Effective School and Least Effective Teacher	37th
Least Effective School and Most Effective Teacher	63rd
Most Effective School and Most Effective Teacher	96th
Most Effective School and Average Teacher	78th

See Technical Note 6, pp. 191–192, to determine how average, least effective, and most effective schools and teachers were defined.

Adapted from Marzano, R. J. (2000a). A new era of school reform: Going where the research takes us. Aurora, CO: Mid-continent Research for Education and Learning (ERIC Document Reproduction Service No. ED 454255)

Regardless of the research basis, it is clear that effective teachers have a profound influence on student achievement and ineffective teachers do not. In fact, ineffective teachers might actually impede the learning of their students. What then are the characteristics of an effective teacher?

Characteristics of an Effective Teacher

I have concluded that the nearly 3,000,000 teachers in this country (National Center for Educational Statistics, 2002) are probably distributed normally in terms of their effectiveness as defined in terms of their impact on student achievement. Consistent with characteristics of the normal or bell curve, most of the teachers are in the middle of the effectiveness distribution or not too far away from the average. There are a few at the extreme positive end and a few at the extreme negative end. This means that most teachers are a little below or a little above average in terms of their impact on student achievement. I would put teachers at the extreme positive end in the most effective category and teachers at the extreme negative end in the least effective category. A teacher who masters the three factors I have identified would not necessarily be reassigned to the most effective category. Rather, I believe that mastery of the three teacher-level factors will certainly render a teacher at least average (and probably well above average). Yet, teachers who are average in terms of their effectiveness can still have a powerful impact on student achievement as illustrated in the sixth scenario in Figure 8.3.

Specifically, this scenario illustrates that if teachers exhibit average performance and a school is willing to do all that it can to be most effective, then students in that school will demonstrate remarkable gains. Many principals have reported to me that they don't have the freedom or resources to hire the most experienced or most talented teachers. This discussion indicates that such talent and experience are not a prerequisite to effectiveness. If a school is willing to do all that it can at the school level and if all teachers in the school are at least competent in their profession, the school can have a tremendous impact on student achievement.

Teacher-Level Factors: A Comparison Across Researchers

My three teacher-level factors are not the only ways to organize the research on teacher effectiveness. In fact, researchers have identified many variables that correlate with teacher effectiveness. Kathleen Cotton

(1995) has identified more than 150 variables that are components of teacher effectiveness; Barry Fraser and his colleagues (Fraser, Walberg, Welch, & Hattie, 1987) list some 30 variables. These long lists of variables have been organized in a variety of ways. For example, Jere Brophy (1996) uses the following categories:

- instruction,
- classroom management,
- disciplinary interactions, and
- student socialization.

Bert Creemers (1994) uses three categories: curriculum, grouping procedures, and teacher behaviors. Finally, Cotton (1995) uses the following categories to organize the 150 variables she has identified:

- planning,
- setting goals,
- classroom management and organization,
- instruction,
- teacher-student interactions,
- equity, and
- assessment.

As was the case with the school-level factors, my three teacher-level factors are, in most cases, simply a reorganization of the work of other researchers. See Figure 8.4 for a more explicit explanation.

To derive my three factors, I have collapsed two or more categories from another researcher into a single category or placed elements of another researcher's single category into two of my categories. For example, I collapsed three of Cotton's categories into the single category of "classroom management" because Cotton's description of these elements is nearly synonymous with my description of classroom management. For similar reasons, I placed Creemer's category of "teacher behaviors" into my categories "instructional strategies" and "classroom management."

FIGURE 8.4
Comparing Teacher-Level Factors Across Researchers

Marzano (2000a)	Brophy (1996)	Creemers (1994)	Cotton (1995)
Instructional strategies	Instruction	Grouping procedures/teacher behaviors	Planning Setting goals Instruction
Classroom management	Classroom management Disciplinary interventions Student socialization	Teacher behavior	Classroom management and organization Teacher-student interactions Equity
Classroom curriculum design		Curriculum	Assessment

The following three chapters address each of the three teacher-level factors. Chapter 9 explores instructional strategies, Chapter 10 explores classroom management, and Chapter 11 explores classroom curriculum design.

Despite discussing the teacher-level factors in isolation, they are not practiced in isolation. In fact, studies that have attempted to identify the unique or independent effects of instruction versus management versus classroom curricular design have not met with much success (Levy, Wubbels, Brekelmans, & Morganfield, 1997). The act of teaching is a holistic endeavor. Effective teachers employ effective instructional strategies, classroom management techniques, and classroom curricular design in a fluent, seamless fashion. A variety of researchers support this conclusion (Leinhardt & Greens, 1986; Brooks & Hawke, 1985). In his article "In Pursuit of the Expert Pedagogue," David Berliner (1986) likens an expert teacher to a chess master, capable of seeing many things simultaneously and making judgments with seeming ease and fluency.

The interdependence of the three teacher-level factors underscores their difference from the five school-level factors. The school-level factors are ranked in the order of their impact on student achievement, but the teacher-level factors are not. Although there might be research available or in process that allows for this delineation, I have not yet found it.

Summary

This chapter introduces the three teacher-level factors: instructional strategies, classroom management, and classroom curriculum design. Although discussed separately, they cannot be isolated in terms of their classroom application or their impact on student achievement. Additionally, the impact of the individual classroom teacher could have a greater impact on student achievement than the five school-level factors.

9 Instructional Strategies

A teacher-level factor that affects student achievement is "instructional strategies." It is perhaps self-evident that more effective teachers use more effective instructional strategies. It is probably also true that effective teachers have more instructional strategies at their disposal.

Since the middle of the 20th century, chess masters have been a subject of fascination for psychologists (deGroot, 1946; Chase & Simon, 1973; Simon, 1980). One general conclusion is that over time they have learned to recognize thousands of possible chess piece arrangements and their associated counter moves. By one estimation, the chess master has acquired 50,000 such chunks of information (see Anderson, 1995). Using David Berliner's analogy (1986), we might reason that the expert teacher has acquired a wide array of instructional strategies along with the knowledge of when these strategies might be the most useful.

What, then, are the instructional strategies that have proven to be effective?

Instructional Strategies That Work

William Bennett, former Secretary of Education, spearheaded one of many attempts to identify instructional strategies that have strong track records of enhancing student achievement. He established the importance of a well-articulated list of research-based strategies in the introduction to his book *What Works: Research About Teaching and Learning* (1986):

> The preparation of this report has been on my mind since the day, a year ago, when I was sworn in as Secretary of Education. In my first statement upon assuming this office, I said, "We must remember that education is not a dismal science. In education research, of course, there is much to find out, but education, despite efforts to make it so, is not essentially mysterious. (p. v)

Bennett quite forcibly makes the point that effective teaching is not as mysterious as some might think. Research can and should provide some clear guidance on the specifics of effective teaching.

Bennett's efforts produced a list of more than 40 research-based practices. Those practices that dealt specifically with classroom instruction included

- use of experiments,
- teacher estimation strategies,
- teacher expectations,
- effort reinforcement,
- classroom time management,
- direct instruction,
- memorization,
- questioning,
- homework, and
- classroom assessment.

Other researchers have produced similar lists. Bert Creemers (1994) identified the following instructional strategies:

- advance organizers,
- evaluation,
- feedback,
- corrective instruction,
- mastery learning,
- ability grouping,
- homework,
- clarity of presentation, and
- questioning.

In his review of the research, John Hattie (1992; also reported in Fraser et al., 1987) provided the list in Figure 9.1.

FIGURE 9.1

Instructional Strategies Identified by John Hattie

Strategy	Number of studies examined	Effect size	Percentile Gain
Individualization	630	0.14	6
Simulation and games	111	0.34	13
Computer-assisted instruction	566	0.31	12
Tutoring	125	0.50	19
Learning hierarchies	25	0.19	8
Mastery learning	104	0.50	19
Homework	110	0.43	17
Instructional media	4421	0.30	12

Source: Hattie, J. A. (1992). Measuring the effects of schooling. *Australian Journal of Education, 36*(1), 5–13.

What separates Hattie's research from that of Bennett and Creemers is that he reports the effect sizes for the various categories of instructional strategies. The effect size reports how many standard deviations the average score in the experimental group (the group that uses the instructional strategy) is above the average score in the control group (the group that did not use the instructional strategy). To illustrate, according to Figure 9.1, tutoring has an average effect size (based on 125 studies examined by Hattie) of .50. Everything else being equal, the typical student who receives tutoring will obtain achievement scores .50 standard deviation higher than the typical student who does not receive tutoring. This translates into a 19 percentile point gain. (See Technical Note 4, pp. 190–191, for a detailed explanation of effect sizes).

My colleagues and I undertook a similar effort (Marzano, 1998a; Marzano, Gaddy, & Dean, 2000; Marzano, Pickering, & Pollock, 2001). The results are reported in Figure 9.2.

FIGURE 9.2

Categories of Instructional Strategies That Affect Student Achievement

Category	Average Effect Size	Percentile Gain	Number of Effect Sizes	Standard Deviation
Identifying similarities and differences	1.61	45	31	0.31
Summarizing and note taking	1.00	34	179	0.50
Reinforcing effort and providing recognition	0.80	29	21	0.35
Homework and practice	0.77	28	134	0.36
Nonlinguistic representations	0.75	27	246	0.40
Cooperative learning	0.73	27	122	0.40
Setting objectives and providing feedback	0.61	23	408	0.28
Generating and testing hypotheses	0.61	23	63	0.79
Questions, cues, and advance organizers	0.59	22	1,251	0.26

Sources:
Marzano, R. J. (1998a). *A theory-based meta-analysis of research on instruction.* Aurora, CO: Mid-continent Research for Education and Learning. (ERIC Document Reproduction No. ED 427 087)

Marzano, R. J., Gaddy, B. B., & Dean, C. (2000). *What works in classroom instruction?* Aurora, CO: Mid-continent Research for Education and Learning.

Marzano, R. J., Pickering, D. J., & Pollock, J. E. (2001). *Classroom instruction that works: Research-based strategies for increasing student achievement.* Alexandria, VA: Association for Supervision and Curriculum Development.

It is important to comment on the relatively large effect sizes reported in Figure 9.2. The average effect sizes look quite large if you contrast these effect sizes with those commonly reported for the school-level factors. To illustrate, reconsider Scheerens and Bosker's (1997) ranking of the school-level factors, as depicted in Figure 2.1 (p. 17) of this book. The top-ranked factor is time, for which Scheerens and Bosker report an effect size of .39. Yet, the *smallest* effect size in Figure 9.2 is 0.59 for "questions, cues, and advance organizers." Why would the smallest effect size for the instructional strategies reported in Figure 9.2 be greater than the largest effect size reported for the school-level factors? It is because the studies from which the effect sizes in Figure 9.2 were computed generally employed assessments specific to the content being taught while a particular instructional strategy was being used. For example, a study might examine the impact of a particular advance organizer on students' understanding of information presented on the cell. The test used to assess students' achievement was specifically on information about the cell. We might call such assessments "curriculum sensitive."

The studies on school-level factors generally employ standardized tests that are more general in nature than such curriculum-sensitive assessments. When general tests are used as opposed to curriculum-sensitive tests, effect sizes by definition will be much smaller. As George Madaus and colleagues (1979) noted: " . . . what we call curriculum-sensitive measures are precisely that. Compared to conventional standardized tests, they are clearly more dependent on the characteristics of schools and what goes on in them" (pp. 223–224).

Since the publication of *Classroom Instruction That Works: Research-Based Strategies for Increasing Student Achievement* (Marzano, Pickering, & Pollock, 2001), the nine categories of instructional strategies listed in Figure 9.2 have been the basis of study and discussion for thousands of teachers. I have found that the categories are more useful if subdivided into specific behaviors. This makes sense since I created the nine categories by combining strategies with similar characteristics. For example, specific instructional behaviors that involve comparison tasks, classification tasks, metaphors, and analogies were all organized under the general heading "identifying similarities and differences." In all, the nine general instructional categories break down into 34 more specific behaviors as shown in Figure 9.3, p. 82.

Lists of instructional strategies like Figure 9.3 provide useful suggestions for classroom teachers but not much guidance on how to plan for effective instruction. A more useful practice is to organize strategies to provide a framework of effective instructional design. Madeline Hunter (1984) designed the most widely used framework, referred to as "lesson design," although others have been proposed (Reigeluth, 1983; Good & Grouws, 1983). The major components of Hunter's framework are depicted in Figure 9.4 (p. 84).

Historically, lesson design carried the unintended implication that all lessons should contain all components of lesson design. This was never Hunter's intent. In fact, she specifically warned against this inference:

> One of the most typical errors in supervision is that assumption that "all good things must be in every lesson." Each element must

FIGURE 9.3

Instructional Categories Divided into Specific Behaviors

General Instructional Category	Specific Behaviors
Identifying similarities and differences	• assigning in-class and homework tasks that involve comparison and classification • assigning in-class and homework tasks that involve metaphors and analogies
Summarizing and note taking	• asking students to generate verbal summaries • asking students to generate written summaries • asking students to take notes • asking students to revise their notes, correcting errors and adding information
Reinforcing effort and providing recognition	• recognizing and celebrating progress toward learning goals throughout a unit • recognizing and reinforcing the importance of effort • recognizing and celebrating progress toward learning goals at the end of a unit
Homework and practice	• providing specific feedback on all assigned homework • assigning homework for the purpose of students practicing skills and procedures that have been the focus of instruction
Nonlinguistic representations	• asking students to generate mental images representing content • asking students to draw pictures or pictographs representing content • asking students to construct graphic organizers representing content • asking students to act out content • asking students to make physical models of content • asking students to make revisions in their mental images, pictures, pictographs, graphic organizers, and physical models
Cooperative learning	• organizing students in cooperative groups when appropriate • organizing students in ability groups when appropriate
Setting objectives and providing feedback	• setting specific learning goals at the beginning of a unit • asking students to set their own learning goals at the beginning of a unit • providing feedback on learning goals throughout the unit • asking students to keep track of their progress on learning goals • providing summative feedback at the end of a unit • asking students to assess themselves at the end of a unit

FIGURE 9.3 (*continued*)

Instructional Categories Divided into Specific Behaviors

General Instructional Category	Specific Behaviors
Generating and testing hypotheses	• engaging students in projects that involve generating and testing hypotheses through problem solving tasks • engaging students in projects that involve generating and testing hypotheses through decision making tasks • engaging students in projects that involve generating and testing hypotheses through investigation tasks • engaging students in projects that involve generating and testing hypotheses through experimental inquiry tasks • engaging students in projects that involve generating and testing hypotheses through systems analysis tasks • engaging students in projects that involve generating and testing hypotheses through invention tasks
Questions, cues, and advance organizers	• prior to presenting new content, asking questions that help students recall what they might already know about the content • prior to presenting new content, providing students with direct links with what they have studied previously • prior to presenting new content, providing ways for students to organize or think about the content

Source: Marzano, R. J., Pickering, D. J., & Pollock, J. E. (2001). *Classroom instruction that works: Research-based strategies for increasing student achievement.* Alexandria, VA: Association for Supervision and Curriculum Development.

> be *thought* about by the teacher and its exclusion is a matter of professional decision making rather than default. . . . As long as that decision is thoughtful and theory based . . . then the teacher is operating as a professional. (p. 176)

In spite of Hunter's warning, her model of lesson design was frequently applied rigidly to hold teachers accountable for the inclusion of all components (Costa, 1984).

To avoid the problem of constraining the flexibility needed for individual lessons, a more robust approach is to organize research-based instructional strategies into a model for unit design. Benjamin Bloom may be the first to validate the "unit" as the basic element of instruction. Bloom (1976) found that during a year of school, students encounter about 150 separate "learning units," each representing about seven hours of schoolwork. Assuming that the school day is divided into five academic courses, students may encounter about 30 learning units within a yearlong course (or about 15 learning units within a semester-long course).

An instructional framework for units, then, represents a viable alternative to lesson design. It guides teachers to the most appropriate use of research-based strategies but does not constrain them as to day-to-day lesson design.

FIGURE 9.4

Elements of Lesson Design

Element	Description
Anticipatory set	A mental set that causes students to focus on what will be learned. It may also give practice in helping students achieve the learning and yield diagnostic data for the teacher. *Example:* "Look at the paragraph on the board. What do you think might be the most important part to remember?"
Objective and purpose	Not only do students *learn* more effectively when they know what they're supposed to be learning and why that learning is important to them, but teachers *teach* more effectively when they have that same information. *Example:* "Frequently people have difficulty in remembering things that are important to them. Sometimes you feel you have studied hard and yet don't remember some of the important parts. Today, we're going to learn ways to identify what's important, and then we'll practice ways we can use to remember important things."
Input	Students must acquire new information about the knowledge, process, or skill they are to achieve. To design the input phase of the lesson so that a successful outcome becomes predictable, the teacher must have analyzed the final objective to identify knowledge and skills that need to be acquired.
Modeling	"Seeing" what is meant is an important adjunct to learning. To avoid stifling creativity, showing several examples of the process or products that students are expected to acquire or produce is helpful.
Checking for understanding	Before students are expected to do something, the teacher should determine that they understand what they are supposed to do and that they have the minimum skills required.
Guided practice	Students practice their new knowledge or skill *under direct teacher supervision*. New learning is like wet cement; it is easily damaged. An error at the beginning of learning can easily "set" so that correcting it later is harder than correcting it immediately.
Independent practice	Independent practice is assigned only after the teacher is reasonably sure that students will not make serious errors. After an initial lesson, students frequently are not ready to practice independently, and the teacher has committed a pedagogical error if unsupervised practice is expected.

Source: Adapted from Hunter, M. (1984). "Knowing, Teaching, and Supervising." In P. Hosford (Ed.), *Using What We Know About Teaching* (pp. 169–192). Alexandria, VA: Association for Supervision and Curriculum Development.

Action Steps

I recommend one action step to successfully implement research-based instructional strategies.

Action Step 1. Provide teachers with an instructional framework for units that employs research-based strategies.

I believe the specific behaviors identified in Figure 9.3 (pp. 82–83) can be organized in a variety of ways to provide teachers with an instructional framework for units. It makes great sense for individual schools to design their own models to allow variations in approach for different types of students and teachers. Indeed, I consistently encourage schools I work with to engage in that very process—constructing their school-specific instructional framework for units. To this end, I have found that schools find the instructional strategies and behaviors presented in Figure 9.3 most useful when they think of general strategies in three categories: (1) those used at regular intervals in a unit; (2) those focusing on input experiences; and (3) those dealing with reviewing, practicing, and applying content.

Regular Unit Intervals

Establish clear goals at the beginning of the unit by identifying clear learning goals and communicating these to students; also by asking students to identify their own learning goals for unit content.

Monitor progress, balance individual work with group work, reinforce effort, and celebrate success throughout the unit by

- having students work individually,
- having students work in cooperative groups,
- having students work in groups based on their knowledge and skill in specific topics,
- giving students periodic feedback on each of the learning goals,
- asking students to keep track of their progress on the learning goals,
- periodically celebrating legitimate progress toward learning goals, and
- pointing out and reinforcing examples of effort.

Assess final goal attainment and celebrate success at the end of the unit by

- providing students with clear evaluations of their progress on each learning goal,
- having students evaluate themselves on each learning goal and comparing their evaluations with the teacher's, and
- recognizing and celebrating the accomplishment of specific goals for specific students.

Input Experiences

Although it is not frequently addressed in the practitioner literature, providing students with input regarding a unit's content is one critical aspect of teaching. John Anderson and colleagues (Anderson, Reder, & Simon, 1995) explain that this is one of the most basic teacher responsibilities. Indeed, Madeline Hunter (1984) included input as a specific component of lesson design (see Figure 9.4, p. 84). Here we consider instructional strategies that can be used to make input effective regardless of the form it takes. These "input-

oriented" strategies are organized into strategies to employ directly before an input activity and those to employ during and after an input activity. "Prime" students for the learning experience before an input activity by

- asking questions to help students identify what they already know about the content,
- providing students with direct links between new content and old content, and
- providing students with ways of organizing the new content or thinking about the new content.

During and after the learning experience, students are engaged in synthesizing the knowledge in both linguistic ways (e.g., summarizing, note taking) and nonlinguistic ways (e.g., pictures, symbols). Help students synthesize new information by

- asking students to take notes on the content,
- asking students to construct verbal and written summaries of the content,
- asking students to represent the content as pictures, pictographs, symbols, graphic representations, physical models, or dramatic enactments, and
- asking students to create mental images for the content.

Reviewing, Practicing, and Applying Content
Enable students to make changes, additions, and corrections to their initial understanding of the content as well as to extend their understanding by

- asking students to revise their notes, correcting errors and adding detail,
- asking students to revise their pictures, pictographs, symbols, graphic representations, and physical models, correcting errors and adding detail,
- asking students to revise their mental images, correcting errors and adding detail,
- assigning homework and in-class activities that require students to practice skills and processes,
- assigning homework and in-class activities that require students to compare content,
- assigning homework and in-class activities that require students to classify content,
- assigning homework and in-class activities that require students to create metaphors with content,
- assigning homework and in-class activities that require students to create analogies with content,
- engaging students in projects that require them to generate and test hypotheses through problem-solving tasks,
- engaging students in projects that require them to generate and test hypotheses through decision-making tasks,
- engaging students in projects that require them to generate and test hypotheses through investigation tasks,
- engaging students in projects that require them to generate and test hypotheses through experimental inquiry tasks,
- engaging students in projects that require them to generate and test hypotheses through systems analysis tasks, and
- engaging students in projects that require them to generate and test hypotheses through invention.

These instructional activities are effective because they help students reanalyze and apply their knowledge.

Summary

The expert teacher has more strategies at her disposal than the ineffective teacher. After presenting lists of instructional strategies, I recommend one action step to successfully implement research-based instructional strategies: to provide teachers with an instructional framework for units that uses research-based strategies.