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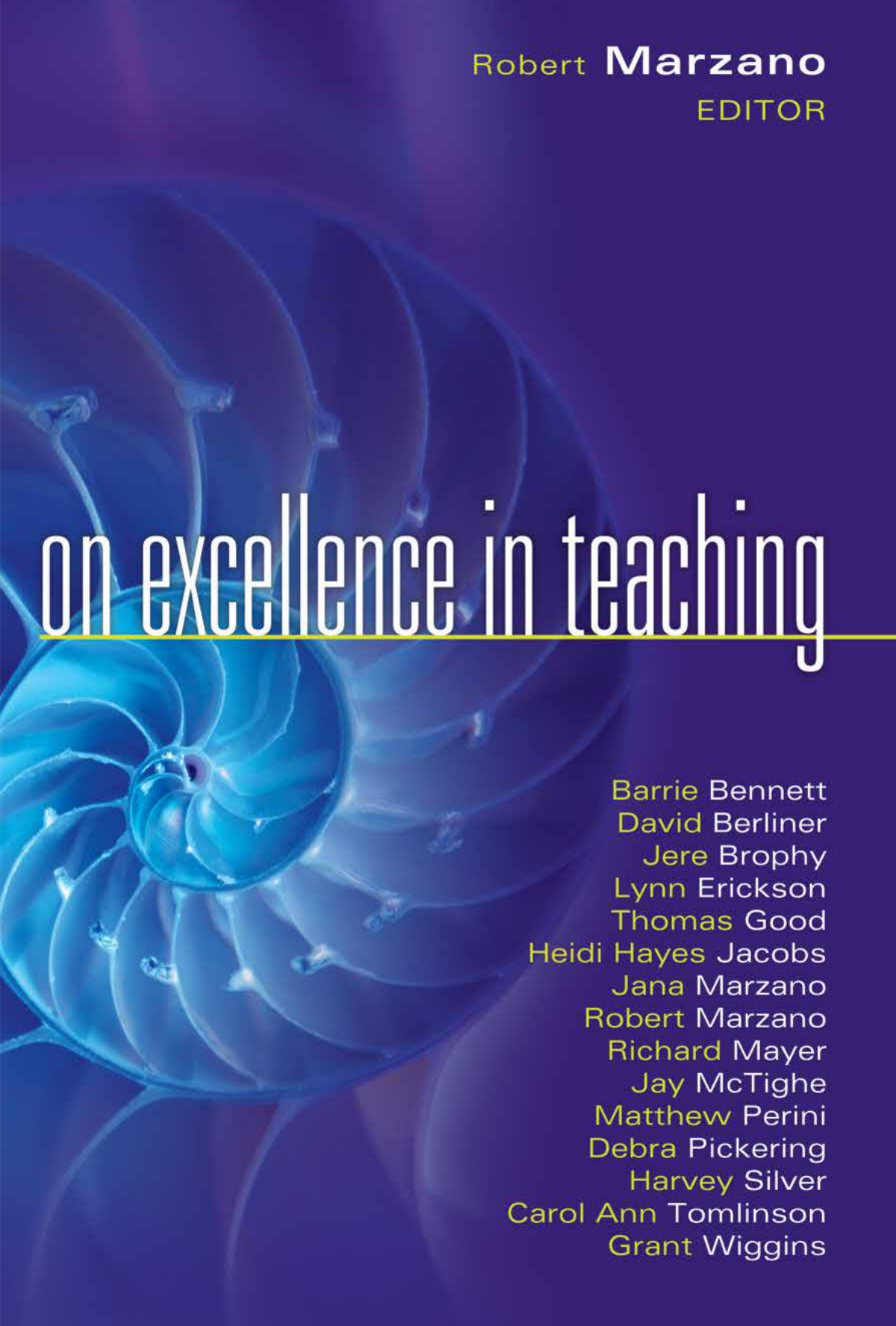

on excellence in teaching

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Chapter 9

Developing Expert Teachers

Robert J. Marzano

Today it is considered common knowledge that a classroom teacher is probably the single most powerful influence on student achievement that is within the control of the educational system. We know that effective teachers enhance student achievement. Impressive findings from a wide variety of researchers attest to this fact. For example, when reporting on their findings of achievement scores across five subject areas (mathematics, reading, language arts, social studies, and science) for sixty thousand students across grades 3 and 5, Wright, Horn, and Sanders (1997) note:

> 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]. (p. 63)

More recently, Nye, Konstantopoulos, and Hedges (2004) have quantified the relationship between teacher effectiveness in a randomized controlled study involving seventy-nine schools in forty-two school districts. Using their findings, one could

make the inferences in table 1 regarding the relationship between teacher competence and student achievement.

Table 1: The Relationship Between Teacher Competence and Student Achievement

Teacher Skill Percentile Rank	Expected Percentile Gain in Achievement for a Student Starting at the 50th Percentile	Predicted Percentile Rank for a Student Starting at the 50th Percentile
50th	0	50th
70th	8	58th
90th	18	68th
98th	27	77th

Table 1 depicts the expected percentile gain in achievement for a student starting at the 50th percentile if that student is taught by teachers of varying degrees of competence. The first row depicts a teacher at the 50th percentile in terms of his pedagogical competence. With this teacher, the student would not gain in her relative standing regarding other students. She would remain at the 50th percentile. She would, of course, increase in her knowledge, but it would be at the same rate as her cohort group. Next, consider the second row. Here the teacher is at the 70th percentile in terms of his pedagogical competence. Now the student is expected to gain 8 percentile points, raising her to the 58th percentile. In the classroom of a teacher at the 90th percentile, a student starting at the 50th percentile would be expected to increase her achievement to the 68th percentile. The inference from table 1 is clear: if the skill of teachers in a building or district could be raised dramatically, student achievement would be expected to increase dramatically.

But just how does a school or district go about achieving such a feat? How does a school or district ensure that highly skilled teachers are in their classrooms? Certainly one step toward this

goal is to recruit and retain effective teachers. Marzano and Waters (2009) underscore the importance of this approach. As a result of their review of research on district leadership, they recommend that districts and schools provide the necessary incentives to recruit and retain high-quality teachers. This, of course, is in keeping with the U.S. Department of Education (2002) mandate that all schools provide highly qualified teachers as part of the No Child Left Behind Act (NCLB). It is also consistent with many of the recommendations made by Darling-Hammond (2009) based on her extensive reviews of the research on district and school effectiveness. Finally, it is consistent with the mandate for the new role of federal policy in education spelled out in the report *Democracy at Risk: The Need for a New Federal Policy in Education* (The Forum for Education and Democracy, 2008).

While recruiting and retaining high-quality teachers is certainly a strategy every district and school should employ, there is another equally (if not more) important strategy for ensuring high-quality teachers in classrooms: actively developing expert teachers. That is, in addition to recruiting and retaining expert teachers, districts and schools should provide direct experiences that develop expertise. Fortunately, there is research providing guidance to this end. (For reviews, see Ericsson & Charness, 1994; and Ericsson, Krampe, & Tesch-Romer, 1993).

Some type of metric, of course, is required to operationally define expertise. Ericsson and Charness (1994) explain that *expertise* is traditionally defined as performance that is two standard deviations above the mean in a specific domain. Performance that is two standard deviations above the mean would put a teacher at the 98th percentile in terms of pedagogical skill. As we see in table 1, this is associated with an increase of 27 percentile points for students at the 50th percentile. Simply stated, students in the classrooms of expert teachers learn well beyond expected rates.

Relatively speaking, it was not that long ago that expertise was considered something that could not be developed. To illustrate, as a result of his historical analysis of perceptions of expertise, Murray (1989) concluded that it was generally believed that talent was considered "a gift from the gods." About this notion, Ericsson and Charness (1994) note:

> One important reason for this bias in attribution . . . is linked to immediate legitimization of various activities associated with the gifts. If the gods have bestowed a child with a special gift in a given art form, who would dare to oppose its development, and who would not facilitate its expression so everyone could enjoy its wonderful creations. This argument may appear strange today, but before the French Revolution the privileged status of kings and nobility and birthright of their children were primarily based on such claims. (p. 726)

Talent bestowed by the gods, then, was considered the prime determiner of expertise. Over time, the fallacies in this perspective emerged. Ericsson and Charness explain that "it is curious how little empirical evidence supports the talent view of expert and exceptional performance" (p. 730). They note that over the centuries, the talent hypothesis was inevitably challenged once it became evident that individuals could "dramatically increase their performance through education and training if they had the necessary drive and motivation" (p. 727).

Akin to the talent hypothesis is the intelligence hypothesis: highly intelligent people have the capacity to learn more, quicker. Over time, this trajectory leads to expertise. Again, Ericsson et al. (1993) note that this hypothesis has little backing: "The relationship of IQ to exceptional performance is rather weak in many domains" (p. 364).

If expertise is not a function of talent or intelligence, then what are its determiners? The research points to two critical factors: a well-articulated knowledge base and deliberate practice.

A Well-Articulated Knowledge Base

A well-articulated knowledge base is a prerequisite for developing expertise in any systematic way within any domain. Ericsson et al. (1993) note that the knowledge base has increased and is continuing to increase in a variety of domains. This has resulted in an increased ability to develop experts in many fields:

> As the level of performance in the domain increased in skill and complexity, methods to explicitly instruct and train individuals were developed. In all major domains there has been a steady accumulation of knowledge about the best methods to attain a high level of performance and the associated practice activities leading to this performance. (p. 368)

As is the case with most fields of study, education has experienced exponential growth in its knowledge base, particularly regarding effective pedagogy. There have been many attempts to codify this knowledge base (see Hattie, 1992; Hattie, Biggs, & Purdie, 1996; and Wang, Haertel, & Walberg, 1993). While these efforts have succeeded in listing the various strategies and activities that occur in effectively run classrooms, they have not attempted to articulate the context in which specific strategies should be used. Ericsson and Smith (1991) identify this as a necessary characteristic of expert performance—not only knowing the "moves" to be made in a given domain, but also knowing the "right move" for a specific situation. One challenge, then, in organizing the knowledge base on teaching to make it a viable tool for developing expertise is to classify it in a way that identifies the context or situations in which to employ specific strategies.

Drawing on a considerable amount of design theory (see Berliner, 1986; Doyle, 1986; Good, Grouws, & Ebmeier, 1983; Leinhardt & Greeno, 1986; and Stodolsky, 1983), Leinhardt (1990)

proposes the *lesson segment* as a way of classifying the myriad strategies and behaviors (moves) employed by expert teachers:

> This research-based information points to the fact that lessons are constructed with multiple parts, or lesson segments, each of which has important characteristics. Each segment contains different roles for teachers and students. Each segment has multiple goals, which can be more or less successfully met by a variety of actions. Further, these segments are supported by fluid, well-rehearsed routines. (pp. 21–22)

Following Leinhardt's lead, this chapter organizes what is known about instructional strategies into lesson segments using the framework described in *The Art and Science of Teaching* (Marzano, 2007). That framework identifies nine types of segments that might occur in classrooms:

1. Communicating learning goals, tracking student progress, and celebrating success
2. Establishing or maintaining rules and procedures
3. Introducing new content (critical input lessons)
4. Knowledge practicing and deepening lessons
5. Hypothesis generating and testing lessons (knowledge-application lessons)
6. Increasing student engagement
7. Recognizing and acknowledging adherence and lack of adherence to classroom rules and procedures
8. Establishing and maintaining effective relationships with students
9. Communicating high expectations for every student

These nine segments are organized into three categories: segments involving routine events, segments involving academic content, and segments involving issues that must be addressed

as they occur. The relationships between these categories are depicted in figure 1.

In figure 1, the first two of the nine lesson segments are organized into the "routine events" category. The next three segments all involve academic content. The last four segments involve issues that must be addressed as they occur. The following sections present the research supporting each segment along with a brief description of how the behaviors associated with the segment might manifest in the classroom along with a list of specific behaviors for each segment.

Segments Involving Routine Events

Every day in every classroom, teachers and students will exhibit certain routine behaviors regardless of the content being taught or the age of the students. As shown in figure 1,

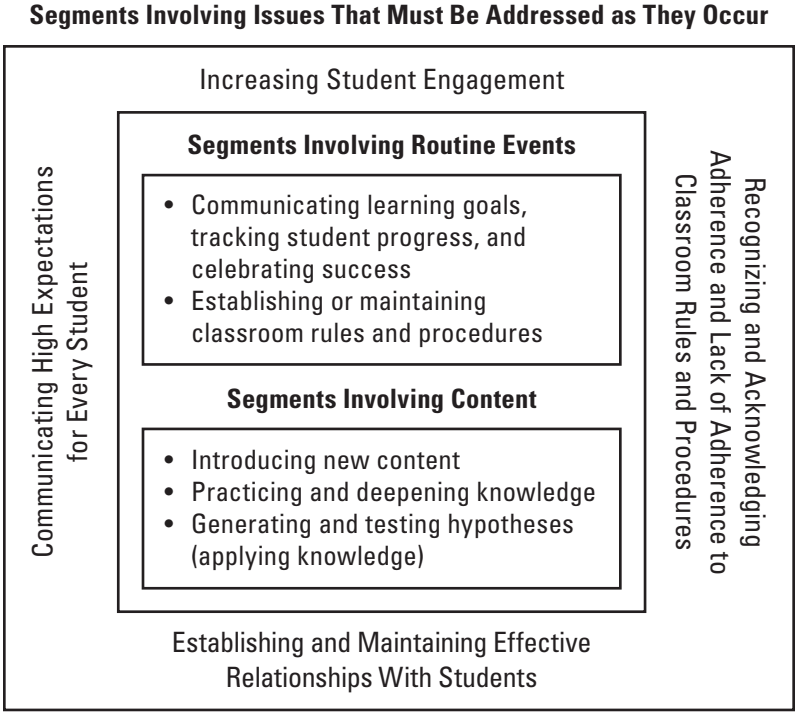

Figure 1: Categories of lesson segments.

two segments are classified as routine events: (1) communicating learning goals, tracking student progress, and celebrating success; and (2) establishing or maintaining classroom rules and procedures.

Communicating learning goals, tracking student progress, and celebrating success. Each of the nine segments identified in *The Art and Science of Teaching* (Marzano, 2007) are themselves an amalgamation of a number of instructional strategies and behaviors. The segment involving communicating learning goals, tracking student progress, and celebrating success is supported by research on the effects of goal setting (Lipsey & Wilson, 1993; Walberg, 1999; Wise & Okey, 1983), feedback (Bangert-Drowns, Kulik, Kulik, & Morgan, 1991; Haas, 2005; Hattie & Timperley, 2007; Kumar, 1991), reinforcing effort (Hattie et al., 1996; Kumar, 1991; Schunk & Cox, 1986), use of praise (Bloom, 1976; Wilkinson, 1981), and use of rewards (Deci, Ryan, & Koestner, 2001).

Specific behaviors associated with this segment include the following (Marzano, 2008):

- The teacher reminds students about learning goals or introduces new learning goals.
- The teacher provides formative feedback to students (through quizzes, tests, informal forms of assessment) relative to their individual progress on learning goals.
- The teacher provides students with some form of recognition for their progress on learning goals.

To illustrate how these behaviors might interact, consider a middle school science teacher who daily reminds students of the learning goals for the unit. In addition, using formative assessments, the teacher helps students track their progress regarding the learning goals for the unit. This is done routinely if not daily. Finally, as a matter of course, the teacher provides opportunities for students to celebrate their knowledge gain as well as their achievement status at any given moment.

Establishing or maintaining classroom rules and procedures. Another segment that is classified as a type of routine behavior involves establishing or maintaining classroom rules and procedures. This segment draws from the research on establishing rules and procedures early on in the school year and addressing those rules and procedures in a logical and systematic fashion throughout the school year (Anderson, Evertson, & Emmer, 1980; Brophy & Evertson, 1976; Eisenhart, 1977; Emmer, Evertson, & Anderson, 1980; Good & Brophy, 2003; Moskowitz & Hayman, 1976).

Specific behaviors associated with this segment include the following (Marzano, 2008):

- The teacher has clear routines and procedures that contribute to the effective functioning of the class.
- The teacher has organized the classroom for effective learning with appropriate traffic patterns and bulletin boards that display student work.

To illustrate the interplay of these behaviors in the classroom, consider an elementary language arts teacher who takes time at the beginning of the school year to establish clear rules and procedures regarding appropriate behavior in the classroom. Additionally, as a matter of routine, the teacher systematically reviews these rules and procedures, making changes as necessary. Finally, the teacher helps establish routine and order by organizing classroom materials, displays, and traffic patterns in a manner that facilitates learning.

Segments Involving Content

There are three types of content segments: (1) segments that involve the introduction of new content, (2) segments that involve reviewing content or practicing content, and (3) segments that involve applying content. Each of these typically manifest as a distinct lesson, although more than one type of content segment may be addressed in a single class period—especially when classes are extended due to block scheduling.

Introducing new content. Some lessons are devoted to the introduction of new content. Marzano (2007) refers to these lessons as critical input lessons—students are being introduced to new content that is critical to their ability to attain learning goals. The behaviors important to these types of lessons draw from the research on presentation formats that enhance retention of new knowledge (Nuthall, 1999), previewing new content (Ausubel, 1968; Mayer, 1989, 2003; West & Fensham, 1976), organizing new knowledge for efficient processing (Linden et al., 2003; Rosenshine, 2002), summarizing new information (Anderson & Hidi, 1988/1989; Hidi & Anderson, 1987), representing new knowledge in multiple ways (Alvermann & Boothby, 1986; Aubusson, Foswill, Barr, & Perkovic, 1997; Druyan, 1997; Newton, 1995; Sadoski & Paivio, 2001; Welch, 1997), teacher questioning (Pressley et al., 1992; Reder, 1980; Redfield & Rousseau, 1981), and student self-reflection (Cross, 1998).

Specific behaviors associated with introducing new content include the following (Marzano, 2008):

- The teacher engages students in activities that help them preview the new content (such as overt linkages, preview questions, brief teacher summary, skimming, teacher-prepared notes, and asking, "What do you think you know?").
- When appropriate, the teacher presents new content in ways that involve a variety of mediums (such as lecture, demonstration, and video).
- When appropriate, the teacher augments new content with narratives and anecdotes.
- The teacher presents new content in small, digestible "chunks."
- After each chunk, students are asked to process the new content by generating brief summaries and making predictions, or the teacher uses some formal type of

group-interaction technique (such as reciprocal teaching, jigsaw, or concept attainment).

- After presenting new content, teachers ask students to elaborate on the content by addressing inferential questions and defending their answers.
- After presenting new content, teachers ask students to record and represent their understanding of the new content (such as by summarizing their understanding, creating graphic representations of the new content, generating notes on the new content, or drawing pictures representing the new content).
- When appropriate, the teacher engages students in the use of dramatic enactments or mnemonic devices to help them remember and better understand the new content.
- At the end of the lesson (or segment), the teacher asks students to reflect on their understanding and their learning process (for example, "What are you clear about?" "What are you unclear about?").
- The teacher uses grouping effectively to help students process the new content (for example, students are organized in small groups as they process new content).

To illustrate the interaction of these behaviors, consider a high school mathematics teacher who designs a lesson to introduce new information about the concept of function. The teacher begins by briefly previewing the concept. She asks students what they think they know about functions. As students volunteer answers, she records their responses on the whiteboard. Next, she shows a video that describes and illustrates defining characteristics of various types of functions. Prior to showing the video, the teacher has organized students into groups of three to facilitate interaction about the information in the video. She plays about two minutes and then stops. She then asks one student in each group of three to summarize what they have seen so far. The other two students

in each group pose questions that are either answered in the triad or posed to the teacher. Next, the teacher plays another two minutes of the video and repeats the same process by having one student in each triad summarize the content. When the video is completed, the teacher asks some inferential questions of the entire class to provide a different perspective on the content. Next, each triad is asked to develop a summary of the content in the video along with a graphic or pictographic representation of the content. The lesson ends with students reflecting on their understanding of the content as presented in the lesson. They do so by answering the following question in their academic notebooks: What am I still confused about?

Practicing and deepening knowledge. Once the teacher has introduced the knowledge, one or more lessons are typically devoted to helping students practice a new skill or deepen their understanding of information. The behaviors important to these types of lessons draw from the research on practice (Kumar, 1991; Ross, 1988), revising and analyzing errors (Halpern, 1984; Hillocks, 1986; Rovee-Collier, 1995), examining similarities and differences (Halpern, Hansen, & Reifer, 1990; McDaniel & Donnelly, 1996), and homework (Cooper, Robinson, & Patall, 2006). When considering lessons that involve practicing and deepening knowledge, it is important to keep in mind the distinction between declarative and procedural knowledge. *Procedural knowledge* includes skills, strategies, and processes. *Declarative knowledge* includes details, sequences of information, generalizations, and principles.

Specific behaviors associated with segments devoted to practicing and deepening knowledge include the following (Marzano, 2008):

- The teacher engages students in a brief review of the content.
- The teacher asks students to review and revise notes they have taken on the new content.

- Teachers use grouping in ways that help students deepen their understanding (for declarative knowledge) or move toward fluency (for procedural knowledge).
- When appropriate, the teacher assigns homework that helps students deepen their understanding (for declarative knowledge) or move toward fluency (for procedural knowledge).

If the content is information based (declarative):

- The teacher engages students in activities that require them to examine similarities and differences regarding content (such as comparison activities, classification activities, metaphor activities, and analogy activities).
- The teacher engages students in activities that require students to examine their own logic regarding the new content or the logic underlying the presentation of the new content.

If the content is skill or process based (procedural):

- The teacher involves the students in practice activities that are appropriate to their level of development toward fluency.

To illustrate these behaviors, consider two teachers. The first is a primary language arts teacher who has previously presented a strategy for editing a composition to make sure there is a clear beginning, middle, and end (procedural knowledge). This strategy would have been presented earlier in a lesson specifically designed for introducing new knowledge (a critical input lesson). The second teacher is a middle school history teacher who has previously presented students with information about republics as a form of government (declarative knowledge). Both would begin their knowledge practice and deepening lesson with a brief review of the content presented in the earlier introductory lesson. Both might also organize students into small groups to facilitate the processing of information. Because the language

arts teacher is dealing with procedural knowledge, she would engage students in some type of practice activity. For the initial practice activity, she might provide students with a set of sample compositions, none of which have clear beginnings, middles, and ends. Individually or in small groups, students would use these contrived examples to practice the revising strategy by rewriting the compositions to include an effective beginning, middle, and end. Because the middle school teacher is dealing with declarative knowledge, she might have students engage in a comparison activity designed to help students contrast republics with other forms of government. For example, the teacher might ask students to contrast republics with democracies and monarchies. Finally, both teachers would determine if the activities begun in class would be extended as homework.

Generating and testing hypotheses (applying knowledge). Ultimately, knowledge must be applied in some meaningful situation. In the classroom, these situations typically manifest as projects. Marzano (2007) provides evidence that to maximize the instructional effect of these projects, students must generate and test hypotheses. Strategies for these types of lessons that focus on applying knowledge draw on the research from problem-based learning (Gijbels, Dochy, Van den Bossche, & Segers, 2005) and hypothesis generation and testing (Hattie et al., 1996; Ross, 1988).

Specific strategies associated with lessons devoted to applying knowledge include the following (Marzano, 2008):

- The teacher engages students in a brief review of the content.
- The teacher asks students to work individually or in groups on their hypothesis generation and testing tasks.
- The teacher assumes the role of resource provider and facilitator.

To illustrate the interaction of these strategies, consider a physical education teacher who has previously introduced and had students practice a variety of stretching techniques, each with its own unique purpose. To apply this procedural knowledge in tasks, students might carry out three very different types of physical activities—one involving lifting weights, another involving running slowly for an extended distance, and the third involving sprinting short distances. Students would be asked to construct warm-up and cool-down stretching protocols for each of the three types of activities using the techniques they had previously learned. Prior to executing their protocols, students would generate hypotheses regarding the specific effects of their protocols and then examine their findings in light of these hypotheses.

Segments Involving Issues That Must Be Addressed as They Occur

A number of teacher behaviors must be used as specific situations occur. They involve instructional elements that might not be a part of every lesson. However, when they are called for, a teacher must attend to them immediately or the learning environment will quickly erode. As depicted in figure 1 on page 219, there are four segments that fit into this category: (1) increasing student engagement, (2) recognizing and acknowledging adherence and lack of adherence to classroom rules and procedures, (3) establishing and maintaining effective relationships with students, and (4) communicating high expectations for every student.

Increasing student engagement. Segments devoted to increasing student engagement might be called for at any point in time during a lesson. If students are not engaged in the classroom activities, then they have little if any chance of taking advantage of the instruction that is occurring. Consequently, effective teachers continuously scan their classrooms to determine if students are engaged and then act deliberately to reengage students if they

are not. This type of lesson segment draws from the research on the nature of engagement and ways that engagement can be elicited (Connell, Spencer, & Aber, 1994; Connell & Wellborn, 1991; Reeve, 2006).

Specific behaviors associated with segments devoted to increasing student engagement include the following (Marzano, 2008):

- When appropriate, the teacher involves students in academic games that include inconsequential competition.
- When appropriate, the teacher manages response rates through use of wait time, response cards, choral response, or response chaining.
- When appropriate, the teacher engages students in activities that require physical movement.
- The teacher maintains a lively and appropriate pace throughout the lesson.
- When appropriate, the teacher demonstrates intensity and enthusiasm for the content.
- When appropriate, the teacher engages students in friendly controversy.
- When appropriate, the teacher provides opportunities for students to talk about themselves.
- When appropriate, the teacher provides students with unusual information regarding the content.

To illustrate how these behaviors might be used, consider a technology teacher who notices that her students are simply not paying attention to her presentation on ways to determine the accuracy of information on websites. Noting this lack of engagement, the teacher selects from a list of prepared activities designed to reenergize and reengage students. For example, the teacher might ask questions that require students to answer using response cards, thus ensuring that all students are engaged in

responding to each question. Alternatively, the teacher might engage students in a brief physical activity that helps increase their short-term energy, thus increasing engagement.

Recognizing and acknowledging adherence and lack of adherence to classroom rules and procedures. Segments devoted to acknowledging students' adherence to rules and procedures and acknowledging lack of adherence to rules and procedures may be required throughout the course of a lesson or a day. This type of segment draws from the general research on classroom management (Wang, Haertel, & Walberg, 1993) and discipline (Marzano, Marzano, & Pickering, 2003).

Specific behaviors associated with this segment include the following (Marzano, 2008):

- When appropriate, the teacher provides positive consequences for student adherence to rules and procedures (such as simple verbal and nonverbal acknowledgments, tangible recognition, and involving the home).
- When appropriate, the teacher provides negative consequences for lack of adherence to classroom rules and procedures (such as being proactive about possible classroom disruptions, occupying the entire room, noticing potential problems, using a series of graduated actions when rules and procedures have been broken, using direct consequences, using overcorrection, and using home contingency or group contingency).

To illustrate the use of these behaviors, consider a primary teacher who notices that students are not following the procedure for putting away materials after a science lesson. The teacher points this out to students and takes some time to briefly review the procedure. On another occasion, the teacher notices that students have done a particularly good job at following the rule for raising their hands to ask a question. Again, the teacher points this out to students noting how smoothly the class went and thanking students for their efforts.

Establishing and maintaining effective relationships with students. Perhaps a necessary but not sufficient condition for effective instruction is effective teacher/student relationships. If sound relationships exist between teacher and students, classroom activities progress more smoothly than if sound relationships are not in place. Lesson segments that address teacher/student relationships draw on the research regarding the need for a balance between student perceptions that the teacher is in control of the classroom and student perceptions that the teacher is their advocate (Brekelmans, Wubbels, & Creton, 1990; Wubbels, Brekelmans, den Brok, & van Tartwijk, 2006).

Specific behaviors associated with segments devoted to enhancing teacher/student relationships include the following (Marzano, 2008):

- When appropriate, the teacher demonstrates knowledge of students' interests and backgrounds.
- When appropriate, the teacher engages in verbal behaviors that indicate affection for students (for example, compliments, humor, and informal conversations).
- When appropriate, the teacher engages in physical behaviors that indicate affection for students (for example, smiles, appropriate physical proximity, and contact).
- When appropriate, the teacher brings students' interest into the content.
- When appropriate, the teacher demonstrates a demeanor of emotional objectivity and a cool exterior.

To illustrate the use of these behaviors, consider a middle school teacher who notices that while he has behavioral issues well under control, there is little levity in his classroom. Additionally, students seem reluctant to approach him regarding problems they are having with the content. In response, the teacher decides that he must enhance the perception that he is there to help students, not just to keep them under control. He, therefore,

decides to lighten up the classroom atmosphere using humor and good-natured banter with students.

Communicating high expectations for every student. The final type of lesson segment involves communicating high expectations for all students. Directly or indirectly, students pick up messages that they are expected to do well or poorly academically and then behave in accordance with these expectations (Rosenthal & Jacobson, 1968). Behaviors for this type of lesson segment draw from the research on establishing an appropriate affective tone with all students and providing equal opportunities for complex academic interactions (Weinstein, 2002).

Specific behaviors associated with segments devoted to communicating high expectations include the following (Marzano, 2008):

- The teacher provides low-expectancy students with verbal and nonverbal indications that they are valued and respected (for example, makes eye contact, smiles, makes appropriate physical contact, maintains appropriate proximity, and engages in playful dialogue).
- The teacher asks questions of low-expectancy students.
- When low-expectancy students do not answer a question correctly or completely, the teacher stays with them.

To illustrate how these behaviors might manifest, consider a high school AP calculus teacher who realizes that she asks questions almost exclusively of students who readily participate in class and seem to be doing quite well with the content. In contrast, she leaves other students alone not wishing to embarrass them or force them to respond to questions with which they are not comfortable. Realizing that her behavior is communicating high expectations for some students and low expectations for others, she institutes a policy of asking difficult questions of every student in class. At first, this is challenging for some students since it represents a dramatic shift in her previous behavior.

However, over time, students accept the fact that all students are expected to address complex content, and their thinking will be respected even if it has some flaws in it.

Using the Knowledge Base to Identify Areas of Greatest Pedagogical Need

The nine segments organized into three categories depicted in figure 1 (page 219) provide an organizational scheme that allows teachers seeking improvement in their pedagogical expertise to pinpoint their areas of strength and their areas of weakness. For example, upon introspection and feedback from instructional coaches and superiors, a teacher might determine that her area of greatest need pedagogically is routines. Another teacher might identify critical input lessons as an area on which to work. Still a third teacher might identify student engagement as a focus of personal improvement.

Providing Deliberate Practice

In addition to a well-articulated knowledge base, the second factor important to developing expert teachers is providing opportunities for deliberate practice. Where a comprehensive knowledge of pedagogy is important to developing expertise, deliberate practice is the vehicle that transforms knowledge into behavior. It is the *sine qua non* of expertise (Ericsson & Charness, 1994). Deliberate practice has at least three defining characteristics: (1) clear and focused tasks, (2) clear criteria for success, and (3) the motivation to engage in deliberate practice. Due to the resources necessary to implement these three characteristics, the development of expert teachers most probably should be a districtwide initiative. Necessary resources include an identified cadre of expert teachers, time for expert teachers and aspiring teachers to interact about effective teaching, and time for expert teachers and aspiring teachers to observe each other teaching. These resources are more readily available at the district level than at the school level.

Clear and Focused Tasks

One characteristic of deliberate practice is that it involves tasks for the aspiring expert that are consistent with his or her current skill and knowledge levels. Ericcson et al. (1993) explain: "The design of the task should take into account the preexisting knowledge of the learner so that the task can be correctly understood after a brief period of instruction" (p. 367). This implies that specific areas of strength and weakness have been identified for aspiring experts. To this end, Marzano (2008) recommends the use of rubrics like that in figure 2 (pages 234–235).

The rubric in figure 2 provides a scale for evaluating teacher performance in content lessons that involve introducing new knowledge. Rubrics like this one have been designed for each of the segments described in the previous section. The combination of teacher self-ratings, ratings by expert supervisors, and ratings by instructional coaches can be used to establish a baseline profile of a teacher's greatest area of pedagogical need.

After identification of a high-need segment, an aspiring teacher would receive targeted instruction from a recognized expert in the district. To illustrate, an aspiring teacher might be mentored by an expert in the area of routines. Using the knowledge base described previously, the mentor would review the information regarding effective use of routines. This initial interaction would constitute what Ericcson et al. (1993) refer to as "a brief period of instruction." Next, the aspiring teacher would observe the master teacher using specific strategies regarding effective use of routines. The purpose of this is to allow aspiring teachers to observe what Ambady and Rosenthal (1992, 1993) refer to as "thin slices" of behavior that typically characterize expertise. Ambady and Rosenthal explain that expert behavior is often determined by and recognizable within relatively short episodes. Another way of saying this is that expertise occurs in the moment-to-moment adaptations a teacher makes regarding the use of a specific strategy. Consequently, describing teaching

Score 4.0: In addition to Score 3.0 behaviors, uses adaptations that enhance students' learning.

Score 3.5: In addition to Score 3.0 behaviors, has partial success with adaptations that enhance students' learning.

Score 3.0: While engaged in classroom activities that involve students interacting with new knowledge, the teacher makes no major errors or omissions regarding the following behaviors:

- Identifies critical input experiences
- Employs previewing activities that make linkages between new knowledge and what has been previously addressed
- Organizes students into small groups to facilitate the processing of new knowledge
- Breaks input experiences into small chunks appropriate to the students
- When pausing after a small chunk of new knowledge, teacher engages students in description, discussion, and prediction activities that enhance their understanding of the new knowledge
- Engages students in activities that require them to elaborate on the new knowledge
- After the input experience, teacher engages students in activities that require them to write out and represent their conclusions
- Engages students in concluding activities that require them to reflect on their own learning

Score 2.5: No major errors or omissions regarding the simpler behaviors (Score 2.0 performance) and partial success at the more complex behaviors (Score 3.0 performance).

Score 2.0: No major errors or omissions regarding the following simpler behaviors:

- Identifies experiences that provide students with new information, but does not distinguish between critical and noncritical experiences
- Employs previewing activities, but does not highlight linkages between new knowledge and what has been previously addressed
- Organizes students into small groups, but those groups do not enhance the processing of new knowledge
- Breaks input experiences into small chunks, but those chunks are not appropriate to the students' level of readiness
- When pausing after a small chunk of new knowledge, teacher engages students in activities, but those activities do not necessarily enhance students' understanding of new knowledge

Figure 2: Rubric for lessons involving introduction of new knowledge.

• Engages students in activities that are inferential but not focused on elaborating on the content of the input experience • After the input experience, engages students in review activities, but those activities do not require students to write out and represent their conclusions • Engages students in concluding activities, but those activities do not require students to reflect on their own learning The teacher exhibits major errors or omissions regarding the more complex behaviors (Score 3.0 performance).
Score 1.5: Partial success at the simpler behaviors (Score 2.0 performance) but major errors or omissions regarding the more complex behaviors (Score 3.0 performance).
Score 1.0: With help, partial success at some of the simpler behaviors (Score 2.0 performance) and some of the more complex behaviors (Score 3.0 performance).
Score 0.5: With help, partial success at some of the simpler behaviors (Score 2.0 performance) but not the more complex behaviors (Score 3.0 performance).
Score 0.0: Even with help, no success with the Score 2.0 or 3.0 behaviors.

Figure 2: Rubric for lessons involving introduction of new knowledge.

expertise in terms of use or nonuse of specific instructional strategies makes little sense. It is not the case that experts use routines and nonexperts do not. Rather, it is how the expert adapts the use of routines to specific classes and environments that distinguish her from the nonexperts. Only observation of an expert teacher in action can help the aspiring expert discern the thin slices of behavior that characterize expertise.

After an aspiring teacher has a working knowledge of how specific strategies are used by expert teachers, he would practice the identified strategy in his own class. Extrapolating from the research summarized by Ericsson and his colleagues (Ericsson & Charness, 1994; Ericcson et al. 1993), it can be estimated that

about two to four hours of practice per day over an extended period of time is required to master the skills associated with a specific lesson segment. This requirement would fit well into the lives of aspiring teachers who spend more time than this with students each day.

It is important to note that during practice sessions, it is not sufficient for aspiring teachers to simply repeat a strategy they have seen employed by an expert. Rather, feedback from the expert is needed. As Ericcson et al. (1993) explain: "In the absence of feedback, efficient learning is impossible and improvement only minimal even for highly motivated subjects. Hence, mere repetition of an activity will not automatically lead to improvement" (p. 367). This is quite consistent with the findings reported by Hattie and Timperley (2007) from their analysis of twelve meta-analyses incorporating 196 studies and 6,972 effect sizes. The average effect size for providing feedback was .79, which they note is approximately twice the average effect size (.40) associated with most educational innovations.

To provide effective feedback, expert teachers would have to observe aspiring teachers. This might be done in person with expert teachers visiting the classrooms of aspiring teachers. This, of course, would require a great deal of time. A more efficient technique would be for expert teachers to review videos of aspiring teachers practicing a specific strategy. Again, the work on thin slices of behaviors by Ambady and Rosenthal (1992, 1993) is relevant in that expert teachers would not have to observe the video of an entire lesson to provide effective feedback on the use of specific instructional strategies for a specific lesson segment.

Clear Criteria for Success

Deliberate practice must be accompanied by a clear criterion for success. This means that expertise cannot be assumed of an individual simply because he or she exhibits the behaviors associated with expertise. Indeed, an individual can work in a

domain for years and have a great deal of knowledge regarding the domain, but not exhibit superior performance (Camerer & Johnson, 1991). About this, Ericsson and Charness (1994) explain that expertise should be judged by superior performance, not by knowledge of the domain. A logical question is, What should be the criterion for superior performance regarding classroom pedagogy? In answer to this question, it is easy to embrace the position that appropriate use of specific instructional strategies should be the measure of superior performance. This is a tempting but faulty position to take. While the reasoned use of specific instructional strategies is certainly a necessary ingredient of expertise, the ultimate criterion for expert performance in the classroom is student achievement. Anything else misses the point. As an analogy, consider the domain of chess. A chess player might demonstrate knowledge of a wide variety of moves and even knowledge of when those moves are most appropriate; however, if the chess player cannot actually use that knowledge to win chess matches, she cannot be considered an expert. The same logic applies to the classroom teacher. The ultimate criterion for successful teaching must be student learning. Indeed, in their review of teacher evaluation programs, Tucker and Stronge (2005) demonstrated the power of using student knowledge gain as the ultimate criterion for successful teaching.

Marzano (2008) has provided specific recommendations about how teachers might collect data on student knowledge gain. He recommends two types of data: (1) knowledge gain based on a pretest and posttest from students, and (2) perceived level of learning as reported by students. To obtain the first type of data, teachers would select a unit of instruction and administer a pretest and a posttest over the context of the unit. The differences between posttest and pretest scores would constitute a measure of knowledge gain for each student. This is quite similar to the achievement data used in the Oregon Teacher Work Sample Methodology reviewed by Tucker and Stronge (2005). In addition to knowledge gain as measured by pre-post gains, student

self-report perceptions of learning can be collected at the end of each unit by asking students to complete one or more Likert-type items that represent how much they thought they had learned.

Aspiring experts would use knowledge-gain data to determine the effectiveness of their efforts to master the use of instructional strategies within a particular segment selected for improvement. Specifically, the extent to which student knowledge gain increases as indicated by one or both measures would be used as an indicator of the effectiveness of the teacher's performance.

The Motivation to Engage in Deliberate Practice

The final characteristic of deliberate practice is that it is engaged in continuously and wholeheartedly by aspiring teachers. As mentioned previously, two to four hours of focused practice are required per day. Additionally, this level of practice must continue for about a decade—a fact that has been referred to as the "ten-year rule" (Simon & Chase, 1973). Ericcson et al. (1993) demonstrate the ubiquity of the ten-year rule. Regardless of the domain, about ten years of deliberate practice is required to reach expert performance.

Given the importance of the ten-year rule, it is easy to conclude that acquiring expert status in teaching requires a high level of motivation on the part of aspirants. As Ericcson et al. (1993) explain:

> On the basis of several thousand years of education, along with more recent laboratory research on learning and skill acquisition, a number of conditions for optimal learning and improvement of performance have been uncovered. . . . The most cited condition concerns subjects' motivation to attend to the task and exert effort to improve their performance. (p. 367)

It is probably unreasonable to expect all teachers, even the majority of teachers, to seek the lofty status of expert. Indeed,

the natural human condition appears to be to stop development once an acceptable level of performance has been reached. Ericsson and Charness (1994) explain: "Most amateurs and employees spend a very small amount of time on deliberate practice efforts to improve their performance once it has reached an acceptable level" (p. 730).

What, then, would be a reasonable expectation for teachers in a school or district? One reasonable expectation would be that all teachers in a school or district should improve from year to year. Even small increments in teacher expertise over time could translate into substantial gains. To illustrate, assume that teachers in a district were expected to gain 2 percentile points each year in their effectiveness. For those teachers who begin their improvement at the 50th percentile in terms of pedagogical skill, one would expect their students' achievement to increase by 8 percentile points over a ten-year period of time.

Another reasonable expectation is that teachers who aspire to achieve expert status and are willing to put in the necessary work for the requisite period of time (ten years), should receive the support to do so. As outlined earlier, such support would include tutorial and consultative sessions with teachers who have already attained expert status, opportunities to observe expert teachers, and feedback on their use of specific instructional strategies related to specific types of lesson segments.

Support to Become Experts

This chapter addresses the systematic development of expert teachers. Such an initiative is not easy to implement. It requires a redistribution of resources to free up the time for expert teachers to interact with aspiring teachers. It requires willingness on the part of the district to recognize expertise, and it requires willingness on the part of expert teachers to stand and be counted as leaders. While this idea is challenging, it is not new. Using different terminology and different specific recommendations,

Darling-Hammond (2009) cites examples in the United States and other countries of many of the practices outlined in this chapter. Although Darling-Hammond lays out a very comprehensive reform agenda that goes well beyond the scope of this chapter, one of her basic tenets is that school systems should ensure "that all practitioners have the support to become expert" (p. 64). This chapter has attempted to articulate specific steps districts can take to this end.

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