




Preparing Teachers for a Changing World

*What Teachers Should Learn
and Be Able to Do*

Sponsored by the National Academy of Education

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CHAPTER TEN

How Teachers Learn and Develop

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How teachers learn and develop as professionals is a question that has compelled teacher educators and researchers for many years. How do teachers learn to draw upon and use their understanding of subject matter, learning, development, culture, language, pedagogy, and assessment in addressing concrete problems of practice? How do they learn to balance the individual needs of diverse learners with the demands of the curriculum and the goals of the larger group? How do they learn to become members of a professional community that works together to improve student learning? How can teacher educators help prospective teachers learn to address the multiple challenges of classroom and school life?

This chapter reviews classic and contemporary theory and research on teacher learning and development. Our discussion is divided into four major sections. In the first, we return to a theme mentioned in Chapter One and discussed in more detail in Chapter Two: namely, the theme of adaptive expertise that supports lifelong learning (Hatano and Inagaki, 1986). Clearly, the knowledge, skills, and attitudes needed for optimal teaching are not something that can be fully developed in preservice education programs. Instead, teacher education candidates need to be equipped for lifelong learning. This is especially true in societies like ours where expectations regarding academic standards and equitable education are constantly being refined as our world changes. Rethinking what is most important to teach is one example: Do we need to teach a wider range of foreign languages and more about international relations as the

world gets smaller? Do we need to teach the calculation of square roots in an age of calculators? Rethinking how to teach and assess is another example. Can spreadsheets become a powerful tool for helping students understand the power of algebra? Can distance-learning technologies enhance global understanding? What strategies are most effective for teaching new English language learners in mathematics, in reading, and in other subject areas?

To successfully prepare effective teachers, teacher education should lay a foundation for lifelong learning. However, the concept of lifelong learning must become something more than a cliché. Given the relatively short period available for preparing teachers and the fact that not everything can be taught, decisions must be made about what content and strategies are most likely to prepare new entrants to be able to learn from their own practice, as well as the insights of other teachers and researchers.

In this chapter we explore theory and research relevant to the goal of helping teachers become professionals who are adaptive experts. We pay particular attention to three widely documented problems in learning to teach. First, learning to teach requires that new teachers come to think about (and understand) teaching in ways quite different from what they have learned from their own experience as students. Lortie (1975) called this the problem of “the apprenticeship of observation” to refer to the learning that takes place by virtue of being a student for twelve or more years in traditional classroom settings. These experiences have a major effect on preconceptions about teaching and learning that new teachers bring to the task of becoming professionals.

Second, helping teachers learn to teach more effectively requires them not only to develop the ability to “think like a teacher” but also to put what they know into action—what Mary Kennedy (1999) has termed “the problem of enactment.” They need not only to understand but also to *do* a wide variety of things, many of them simultaneously. Meeting this challenge requires much more than simply having students memorize facts and procedures or even discuss ideas. As Simon (1980) notes, there is a major difference between “knowing that” and “knowing why and how.”

A third issue in teacher preparation involves “the problem of complexity.” Teachers typically work with many students at once and have to juggle multiple academic and social goals requiring trade-offs from moment to moment and day to day (Jackson, 1974). Although some aspects of teaching can be made somewhat routine, what teachers do will still be influenced by changing student needs and unexpected classroom events. And many other decisions in teaching cannot be routinized because they are contingent upon student responses and the particular objectives sought at a given moment. Helping prospective teachers learn to think systematically about this complexity is extremely important. They need to develop metacognitive habits of mind that can guide decisions and reflection on practice in support of continual improvement.

Some approaches to learning to teach do not adequately respond to these problems. For example, telling teachers in general ways about strategies that might be used in the classroom, without examples and models, does not typically lead to deep understanding or enactment. Developing routines can be helpful and can free up teachers' attention for other aspects of their work; however, offering only routines does not help teachers develop the diagnostic and instructional skills for dealing with students who require different approaches or additional supports if they are to learn successfully.

The third section of this chapter examines research on the development of teaching expertise and its implications for instruction. We discuss evidence that suggests that teachers' development is influenced by the nature of the preparation they received initially, and we show how changes in some teacher education programs seem to influence what teachers are able to do early in their careers. The final section provides a framework for considering the knowledge, skills, and dispositions needed for effective teaching, and for helping teachers learn throughout their lives.

TEACHERS AS ADAPTIVE EXPERTS

Carter (1990) notes that "how one frames the learning-to-teach question depends a great deal on how one conceives of what needs to be learned and how that learning might take place" (p. 307). This is consistent with Wiggins and McTighe's arguments (1998) that the design of effective learning opportunities needs to begin with a clear idea of what we want people to know and be able to do. It is also consistent with the problem-solving literature that suggests that the ways people initially frame problems has major effects on their solution strategies because different framings open up different "problem spaces" for people to explore (see, for example, Bransford and Stein, 1993; Newell and Simon, 1972).

As discussed in Chapter Two, the development of "adaptive expertise" provides an appropriate gold standard for becoming a professional. Figure 2.1 illustrates the hypothesis that there are two dimensions of expertise: efficiency and innovation (Schwartz and others, in press). In teaching, these dimensions might reflect a teacher's ability to efficiently and effectively use a specific classroom technique—such as reciprocal teaching conducted in small groups for reading—on the one hand, and her ability to develop a set of new strategies for a recently enrolled new English language learner for whom the existing routines are not enabling success. An important feature of adaptive experts lies in their abilities to balance these two dimensions.

Expertise along the *efficiency* dimension involves greater abilities to perform particular tasks without having to devote too many attentional resources to achieve them (see, for example, LaBerge and Samuels, 1974; Atkinson and

Schiffrin, 1968). Expert teachers are able to perform a variety of activities without having to stop and think about how to do them. Examples include how to manage a classroom while students are working in groups, how to give directions and hand out materials while keeping everyone's attention, how to predict the range of answers that students may give to a particular question about a concept in math, history, science, and so forth. Expert teachers are also able to notice patterns of classroom activity that, to the novice, often seem like disorganized chaos. (See "A Study of Teacher Expertise.")

A Study of Teacher Expertise

Expert and novice teachers notice very different things when viewing videotapes of classroom lessons. For example, when examining the same segment of videotape, experts are able to see patterns of activity and quickly draw inferences about what is happening in the classroom, whereas novices see activity that is confusing and not patterned. Here is one example:

EXPERT 6: On the left monitor, the students' note taking indicates that they have seen sheets like this and have had presentations like this before. It's fairly efficient at this point because they're used to the format they are using.

EXPERT 7: I don't understand why the students can't be finding out this information on their own rather than listening to someone tell them because if you watch the faces of most of them, they start out for about the first 2 or 3 minutes sort of paying attention to what's going on and then just drift off.

EXPERT 2: I haven't heard a bell, but the students are already at their desks and seem to be doing purposeful activity, and this is about the time that I decide they must be an accelerated group because they came into the room and started something rather than just sitting down and socializing.

NOVICE 1: I can't tell what they are doing. They're getting ready for class, but I can't tell what they're doing.

NOVICE 3: She's trying to communicate with them here about something, but I sure couldn't tell what it was.

ANOTHER NOVICE: It's a lot to watch.

Adapted from Sabers, D., Cushing, K. S., Berliner, D. C. (1991). Differences among teachers in a task characterized by simultaneity, multidimensionality, and immediacy. *American Educational Journal*, 28(1), 63-88.

Lifelong learning along the *innovation* dimension typically involves moving beyond existing routines and often requires people to rethink key ideas, practices, and even values in order to change what they are doing. These kinds of activities can be highly emotionally charged, and the capacity to consider change without feeling threatened is an important ability. Land's (see Nierenberg, 1982) tongue-in-cheek definition of innovation as "the sudden cessation of stupidity" can be helpful for maintaining a sense of humor in the midst of the need for fundamental change.

The processes of efficiency and innovation are assumed to be complementary at a global level, although they can sometimes appear to be antagonistic at a local level. They are complementary when appropriate levels of efficiency make room for innovation. For example, assume that a student in a classroom generates an answer to a math word problem that is novel for a particular teacher. If the teacher is able efficiently to predict and understand the range of other answers given by students in the class, it becomes possible to think creatively about the novel answer and figure how and why the student might have generated it. With experience and instruction, problem situations change from being novel, nonroutine problems to routine problems (that is, problems that have been solved before or are very similar to ones solved before). However, if the entire range of answers generated by students seems novel to the teacher, he or she will be overwhelmed and unable to cope. Hence learning about common conceptions and misconceptions about specific topics in one's field supports teacher problem solving by allowing teachers to be more efficient in their planning and more effective in their responses to students. (See Chapters Two and Six, for example.)

An example of a teacher's attempt to deal with what to her was a student's novel response to a mathematics problem is illustrated in "The Capacity to Innovate: Dealing with a Puzzling Answer."

The Capacity to Innovate: Dealing with a Puzzling Answer

A second-grade teacher asked students to solve $3 + 3$. One boy, whom we'll call Jimmy, excitedly answered that the answer was 8. After asking him to rethink and still hearing the same answer, the teacher held up three fingers on each hand and asked Jimmy to count them. This time he got the answer "6." "Great," said the teacher, "so what is $3 + 3$?" Jimmy again said "8," leaving the teacher perplexed.

Eventually it was discovered that Jimmy was highly visual and considered "8" to be the answer because a 3 and a reversed 3 made 8 visually. Initially it took considerable time for the teacher to understand the reasons for Jimmy's answer (which was far preferable than simply saying "you are wrong" and not helping him understand why).

Once the teacher understands Jimmy's reasoning, it should become much easier (more efficient) for her to diagnose similar answers from others who might also have a proclivity to think visually about these kinds of problems. Adding this information to the teachers' repertoire of familiar (routine) problems helps her become more likely to handle new sets of novel (nonroutine) teaching problems that may occur subsequently.

Efficiencies and innovation are antagonistic when one blocks the other. For example, a well-learned routine for teaching fractions, genetics, or other subject matters may turn out to limit a teacher's ability to help students develop a deep understanding of the subject matter if the teacher does not have a flexible command

of alternative explanations (for example, see National Research Council [in press]). Under these conditions, attempts to "unlearn" the efficient set of routines and learn new approaches can be difficult and emotionally painful. Indeed, during the process of learning new strategies, teachers may initially become less efficient than previously, as they let go of techniques that have been comfortable and well practiced for them. In these instances, it is important to help people understand that "letting go" of previously learned ideas and routines or incorporating new information into their practice—choosing what to abandon and what to keep or modify—is a big part of what it means to be a lifelong learner and an adaptive expert. For an adaptive expert, discovering the need to change is perceived not as a failure but, instead, as a success and an inevitable, continuous aspect of effective teaching (see, for example, Cognition and Technology Group at Vanderbilt, 1997; Wineburg, 1998).

TEACHING STRATEGIES AND EFFICIENCY VERSUS INNOVATION

Teaching strategies vary according to the degree to which they emphasize the innovation versus efficiency dimensions. For example, some educators advocate teaching strategies that are highly scripted (see Sawyer, 2004). The goal is to reduce variability in implementation and produce outcomes that are better than what could be expected from a significant subset of teachers if they were left to their own devices. The effort to develop more routinized approaches to teaching is a response to at least two factors: (1) the perception of low levels of teaching skill on the part of practitioners, and (2) an attempt to create more standardization in students' experiences across classrooms and schools.

Other educators argue that effective teaching needs to be highly interactive and should vary depending on the needs of each learner. For example, Gay (personal communication, March 12, 2004) suggests that effective teaching is sensitive to students' needs and backgrounds and should be viewed as a creative act. Ball and Cohen (1999) also emphasize the role of innovation in teaching, "[Our] perspective views teachers' capacity not as a fixed storehouse of facts and ideas but as a source and creator of knowledge and skills needed for instruction" (p. 6). For these educators, effective teaching ranks particularly high on the innovation dimension, but always with a base of efficiency for reasons noted earlier. For this reason, for example, Sawyer (2004) sees the alternative to "scripted teaching" as "disciplined improvisation," with as much emphasis on the disciplined or structured elements of instruction as on the improvisation.

In each of these accounts of teaching there is implicit acknowledgment that being appropriately innovative requires the development of automatized schemas and routines that provide enough background efficiency to keep teachers from becoming overwhelmed and losing sight of important goals. Although highly scripted approaches have been criticized as not allowing enough room

to meet the needs of individual students who learn in different ways, thoughtfully considered curriculum materials, assessment tools, and classroom routines that are based on solid learning theory and well-grounded teaching strategies help teachers develop useful efficiencies in some areas of their teaching that then set the stage for additional innovation and adaptation.

However, if teachers have simply learned automatized routines “by rote” (for example, in a strictly scripted manner) they will not be prepared to be the kinds of adaptive experts who will solve problems that arise while continuing to meet the needs of students and improving over time (see, for example, Cognition and Technology Group at Vanderbilt, 2000; Judd, 1908). Although some have argued that teachers should begin with scripts for teaching with the goal of having them become more innovative over time, this could result in teachers learning a nonresponsive practice in which they do not know how to, nor expect to, individualize to meet students’ needs. They may also lack a theoretical foundation and tools for reflection that would allow them to change course when what they are doing is not working well.

It is important to note that even the most scripted approach to teaching requires some room for innovation—for example, pausing one’s teaching routines to accommodate an unexpected issue in the classroom. And as noted earlier, “disciplined improvisation” is far from simply being freewheeling—it involves innovation within a set of general constraints (for example, to ensure that relevant standards are met) and structured analysis of the innovation process to continue to evaluate and adapt the strategies that are used. Adaptive experts attempt to be particularly aware of the larger social contexts within which they operate. This helps them adapt in ways that are novel *and* appropriate: it helps them innovate within constraints. (See “Innovation Within Constraints.”)

Innovation Within Constraints

The importance of “innovation within constraints” surfaced at a meeting at University of Washington in Seattle where teacher educators met with school professionals to identify potential gaps in the teacher education program. The school professionals identified one potential gap that was particularly important; namely, that University students are often taught “ideal” curriculum and teaching practices for teaching specific subject areas, including reading, mathematics, science, history, and so forth. To help students understand differences between strong and weaker approaches, students are often introduced to contrasting cases of curricula—some of which are very good and some that are far from ideal.

The school professionals were quite supportive of the goal of helping students develop deep understandings of stronger versus weaker approaches to teaching particular concepts and strategies, and they agreed that the use of contrasting cases was quite valuable. However, the school professionals added that new teachers often enter schools where particular curriculum content and practices are mandated by the

district. What if the curricula that are mandated fall in the “less than ideal” range according to the students’ training? Should the new students quit their job, fight to change the system, simply comply and forget their previous training? These are dilemmas that many new teachers will face.

Once this issue was identified, teacher educators at the Seattle meeting realized the need to reframe their instruction and focus on the goal of helping students think about the challenges of “teaching effectively in an imperfect world.” There are always constraints on people’s activities. For teachers, there are usually ways to learn to teach creatively within these constraints. Indeed, being creative means being novel and appropriate (see, for example, Bransford and Stein, 1993). So constraints must always be acknowledged and taken into account.

In schools, “appropriate” is defined by both professional and community standards and by the needs of particular students. Prospective teachers must learn to understand the reasons for various constraints in their particular school and its community, and they must learn to find ways to teach effectively within them. Over time, teachers also need to understand how to work with others in the school and community and to become leaders who can collaborate to change system constraints when they seem clearly less than ideal. Helping prospective teachers see themselves as potential innovators and change agents who operate within systems that are much larger than their classrooms means that issues of organizations and leadership are important issues for prospective teachers to explore (see, for example, Fullan, 1993b; Hargreaves and others, 1994; Knapp and Turnbull, 1990).

An especially important aspect of adaptive expertise involves the ability to learn from others. This is not overly difficult when what is learned simply makes a teacher’s existing teaching routines more efficient and elaborated. As noted earlier, however, lifelong learning often involves the kinds of changes (innovation) that require giving up old routines and transforming prior beliefs and practices. This is much easier said than done. A major part of the vision for future teachers must involve efforts to help them see that being a professional involves not simply “knowing the answers” but also having the skills and will to work with others in evaluating their own performances and searching for new answers when needed, both at the classroom level and the school level. Helping teachers learn to work in teams where they learn from one another is therefore extremely important. For example, watching a videotape of one’s teaching with peers or inviting a colleague into the classroom to gain feedback is very helpful but can also be intimidating. When teachers have learned to develop their teaching in these collaborative contexts, they welcome rather than avoid such feedback. The propensity to seek rather than avoid feedback is important along a number of dimensions. For example, it is important when a school team asks how well students are doing in different classrooms and areas of the curriculum and considers how school curriculum, professional development, or organizational structures might need to change. While seeking feedback can be challenging, teachers who have experienced working in teams to consider such

questions will see this as part of the professional role and an important, ongoing activity rather than as a threat to what they have previously been doing. True adaptive expertise for a teaching professional involves a deep appreciation of the value of actively seeking feedback from many sources in order to make the best decisions for children and to continue to learn throughout one's life.

SOME LEARNING PRINCIPLES FOR FACILITATING TEACHER DEVELOPMENT

Helping prospective teachers become adaptive experts who are able to engage in effective lifelong learning is not something that can be accomplished by simply telling them the information we have discussed in this volume. In this section we discuss research and theory relevant to key learning principles involved in helping people learn to teach and to improve their practices throughout their lives.

We organize our discussion around three major principles of learning that have been summarized in several reports from the National Academy of Sciences (National Research Council, in press; National Research Council, 2000). These three principles complement the *How People Learn* framework that we discussed in Chapters One and Two (see Figure 1.5). We use these principles to organize this discussion because they help readers align issues of teacher learning with other organizing principles for learning that are based on a strong body of research about how children and adults learn and acquire competence. The three principles are:

1. Prospective teachers come to the classroom with preconceptions about how the world, and teaching, works. These preconceptions, developed in their "apprenticeship of observation," condition what they learn. If their initial understanding is not engaged, they may fail to grasp the new concepts and information, or they may learn them for purposes of a test but revert to their preconceptions outside the classroom.
2. To develop competence in an area of inquiry that allows them to "enact" what they know, teachers must (i) have a deep foundation of factual and theoretical knowledge, (ii) understand facts and ideas in the context of a conceptual framework, and (iii) organize knowledge in ways that facilitate retrieval and action.
3. A "metacognitive" approach to instruction can help teachers learn to take control of their own learning by providing tools for analysis of events and situations that enable them to understand and handle the complexities of life in classrooms.

The Importance of Addressing Student Preconceptions

In Chapter Two we discussed Lionni's (1970) *Fish is Fish* story as an illustration of the constructive nature of knowing. Just as the Fish had preconceptions that affected what it learned from the Frog, prospective teachers have preconceptions that affect what they learn from teacher educators and in-classroom experiences. These preconceptions come from years and years of observing people who taught them and using this information to draw inferences about what good teaching looks like and what makes it work.

The sociologist Dan Lortie (1975) used the term *apprenticeship of observation* to refer to the processes by which prospective teachers develop conceptions of teaching based on their own experiences as students. The good news of these apprenticeships is that students have had a great deal of experience in classrooms, and many draw inspiration from outstanding teachers who taught them. The bad news is that these apprenticeships can result in serious misconceptions about teaching. As Lortie (1975) notes: "Students do not receive invitations to watch the teacher's performance through the wings; they are not privy to the teacher's private intentions and personal reflections on classroom events. Students rarely participate in selecting goals, making preparations or postmortem analysis. Thus they are not pressed to place the teacher's actions in a pedagogically oriented framework" (p. 62).

The difficulty of inducing a deep understanding of actions through observation alone is illustrated in "Learning Through Observation and Induction."

Learning Through Observation and Induction

Amy had learned to cook delicious ham dinners by watching her grandmother. For the grandmother's 85th birthday, Amy cooked a ham "just like grandmother used to make" and the grandmother stood by proudly to watch.

One of the secrets that Amy had observed was that her Grandmother always cut off a rather large piece of the end of the ham before cooking it. Amy had explained to her children that this allowed the juices to simmer in a very special way. As the Grandmother watched her granddaughter slice off the end of the ham, she asked, "Why did you cut off the end of the ham, Amy?" Amy replied, "Because you always did it, Grandmother, and your hams were always the best." The Grandmother smiled and explained, "I did it to fit the ham into my oven—it was much smaller than yours!"

(Author unknown)

Lortie (1975) concludes that students' long apprenticeship of observing teaching often leads to a number of misconceptions. One is the widespread idea that teaching is easy. Rather like the audience members watching the orchestra conductor we referred to at the beginning of Chapter One, students observe the superficial trappings of teaching, but not the underlying knowledge, skills, planning, and decision making. Part of the problem is that the limited vantage point of the student does not result in the acquisition of professional knowledge; that is,

knowledge that allows the selection and implementation of different strategies that will support learning for different purposes and different students. Instead it produces a tendency to imitate the most easily observed aspects of teaching. Munby, Russell, and Martin (2001) add that even when observing good teaching or experiencing it for oneself, one cannot easily glean a deep understanding of the complexity of the work: "Good teaching tends to reinforce the view that teaching is effortless because the knowledge and experience supporting it are invisible to those taught. Good teaching looks like the ordering and deployment of skills, so learning to teach looks like acquiring the skills" (p. 887).

Kennedy points out additional preconceptions that can make learning difficult for novice teachers. For example, many of the concepts and ideas discussed in preparation courses are ideas that already seem familiar to the students—concepts such as group learning, assessment, and diversity. Preservice teachers often already have clear beliefs associated with these concepts and therefore tend to assimilate what is being taught to their preexisting schemas. This can make it very difficult to develop deeper, more nuanced understandings of these concepts. For example, effective collaboration requires the use of tasks or problems that actually require diverse perspectives, the allocation of time for making sufficient progress, scaffolding of critical skills, and so forth (see, for example, Brown and Campione, 1996). Prospective teachers may have experienced groupwork yet have been totally unaware of the degree to which the tasks they were assigned or the procedures they followed actually supported collaboration. They may therefore think they understand collaborative learning when in fact they do not. Whether they had poor experiences in unguided, poorly planned groupwork or good experiences with well-designed collaborative tasks, they may not know what elements caused the experience to be more or less productive.

As noted earlier, novice teachers often use the same language as teacher educators but signify different things with their language than do teacher educators. One method for overcoming this overassimilation problem is to use carefully calibrated sets of contrasting cases, grounded in practice as well as theory, that help people progressively differentiate their understanding rather than simply assimilate new information to preexisting ideas (see, for example, Schwartz and Bransford, 1998). In Chapter Eleven we discuss the use of written and videotaped cases to illustrate teaching and learning concepts in ways that make more vivid the consequences associated with different kinds of practices.

In an extensive review of research on teacher change, Richardson and Placier (2001) have documented the beliefs about teaching that preservice teachers tend to bring to their classrooms. Many beliefs consist of unexamined assumptions that need to be made explicit and explored. These views tend to focus on affective qualities of teachers (for example, caring), teaching styles, and individual children, with little appreciation of the role of social contexts, subject matter, or pedagogical knowledge (Paine, 1990; Sugrue, 1996). As Paine (1990) notes

from a study of five teacher education programs, novices typically bring "an enthusiastic appreciation of personality factors and an underdeveloped sense of the role of content and context" (p. 20). Richardson and Placier (2001) note that many preconceptions in teacher education are hard to change and require interventions that are time-consuming and difficult. But if these preconceptions are not addressed, prospective teachers may retain problematic beliefs throughout their programs.

One important preconception that many candidates hold about *learning* is that it is the simple and rather mechanistic "transfer of information" from texts and teachers to students who acquire it through listening, reading, and memorization (Feiman-Nemser and Buchmann, 1989; Richardson, 1996). We noted in Chapter Two that constructivist theories play a major role in modern theories of learning and teaching, and that they are theories of knowing—not theories of pedagogy (teaching). A great deal of research establishes that individuals process and understand new information (correctly or incorrectly) in light of their experiences and prior knowledge and beliefs, and that they will often fail to remember, understand, or apply ideas that have no connections to their experience and no context for acquiring meaning. Although constructivist theorists acknowledge that there are indeed "times for telling" (Schwartz and Bransford, 1998), these theories help explain why attempts to "directly transmit" new information often fail and offer alternatives that have been found to foster learning much more successfully (see, for example, Schwartz and others, in press). Preconceptions that teaching is only about "transmission" can make it difficult for teacher educators who seek to prepare teachers to teach in ways that are more compatible with what we now know about how people learn. These more successful methods are often fundamentally different from how the student teachers were taught, and, sometimes, from how the teacher educators themselves learned as students (Borko and Mayfield, 1995).

Studies suggest that there is a wide distribution of preconceptions about teaching that are held by novices. In a review of the literature, Wideen, Mayer-Smith, and Moon (1998) concluded that prospective teachers are not an undifferentiated group and instead, hold a variety of images of and understandings about teaching and learning. These entering beliefs are more nuanced—and extend across a wider range of possibilities—than many people had imagined. These findings suggest that teacher educators will have different work to do with different candidates and warn against a "one size fits all" approach.

Many short-term interventions have shown little capacity to change preconceptions (Wideen and others, 1998). In contrast, longer-term approaches that explicitly seek to elicit and work with novice teachers' initial beliefs and concerns have shown some success. For example, in a three-year longitudinal study, Gunstone and colleagues (1993) found that teachers' beliefs and understanding about the teaching and learning of science changed significantly as they

completed a one-year preservice program that explicitly drew upon and addressed their experiences, concerns, and needs. The program consciously provided new information and experiences relevant to those evolving concerns. Similar findings in other teaching fields have also been reported (see, for example, Fosnot, 1996; Graber, 1996). All of these studies involved cases where teacher educators used their students' "apprenticeship of observation" as a springboard from which to begin the process of conceptual and behavioral change.

The Importance of Learning for Understanding and Enactment

The preceding discussion focused on the importance of taking account of prospective teachers' preconceptions about the nature of teaching. A second challenge of learning to teach is what Mary Kennedy (1999) has termed the *problem of enactment*. If it is difficult to help preservice teachers learn to "think like a teacher," it is even more complicated to help them learn to put their intentions into action. Teachers must learn to weigh difficult dilemmas and to make and implement decisions on the fly; to put their plans into action effectively as well as to alter plans for unforeseen circumstances while they are in the midst of teaching; to respond to children and to represent well the material they are teaching. This challenge relates to the second *How People Learn* principle discussed by the National Research Council (in press), one that focuses on ways to help novices develop the kinds of organized understanding and skills that support effective action. This principle can be described as follows: "To develop competence in an area of inquiry, students must: (a) have a deep foundation of factual knowledge, (b) understand facts and ideas in the context of a conceptual framework, and (c) organize knowledge in ways that facilitate retrieval and action" (National Research Council, in press).

A strong body of research indicates that learning experiences that support understanding and effective action are different from those that simply support the ability to remember facts or perform rote sets of skills (see, for example, Donovan and others, in press; Good and Brophy, 1995, pp. 293-318; Resnick, 1987). Furthermore, actions that are supported by understanding are often more effective than those that occur without understanding. An example is provided in *Experience and Understanding*, which continues the story of *Fish is Fish*.

Experience and Understanding

In the first part of Lionni's (1970) *Fish is Fish* story (discussed earlier), we saw the Fish imagining fish-like birds, cows, and people, and we noted that this illustrated the role of preconceptions in constructing new understandings. Lionni's story continues with the Fish beginning to act on the knowledge that it thinks it has learned from the Frog. In particular, the Fish is so excited by the Frog's descriptions that it leaps from the water to experience life on land for itself. Because it can neither breathe nor

maneuver on land, the Fish must be saved by the amphibious Frog. This part of Lionni's story illustrates how knowledge of events affects subsequent actions and decisions. The Fish did not have a real understanding of the differences between life in water and on the land.

Experience played a critical role in helping the Fish understand some key aspects of life on the land. Thankfully, the experience was "supervised" by the Frog, who could avert potentially disastrous consequences. However, experience alone is not enough either. The Fish's misunderstanding would presumably have persisted even if it had seen real birds, cows, and humans, or accurate pictures of them. The National Research Council (in press) argues the following:

Some additional, critical concepts are needed: for example, the concept of adaptation. Species that move through a medium of air rather than through water have a different mobility challenge. And species that are warm blooded, unlike those that are cold blooded, must maintain their body temperature. It will take more explaining of course, but if the fish is to see a bird as something other than a fish with feathers and wings, and a human as something other than an upright fish with clothing, then feathers and clothing must be seen as adaptations that help solve the problem of maintaining body temperature, and the upright posture and wings must be seen as different solutions to the problem of mobility outside water. Conceptual information such as a theory of adaptation represents a kind of knowledge that is unlikely to be induced from everyday experiences. It typically takes generations of inquiry to develop this kind of knowledge, and people usually need some kind of help (e.g. interactions with "knowledgeable others") in order to grasp organizing concepts such as this (e.g. Hanson, 1970).

Source: Reprinted with permission from *How Students Learn: History, Mathematics, and Science in the Classroom*, © 2005 by the National Academy of Sciences, courtesy of the National Academies Press, Washington, D.C.

Our earlier discussion of Lortie's (1975) work on the "apprenticeship of observation" touched on the difficulty of inducing important levels of understanding simply by watching. In the *Fish is Fish* example in *Experience and Understanding*, it is quite plausible that the Fish would not have deeply understood adaptation and mobility even if the Frog had tried to explain these concepts. But after it experienced its own inability to breathe and move when on land, a "time for telling" emerged where new opportunities for learning should now be possible. As we discuss in the following section, the time and the manner of telling, however, have to be carefully considered.

Because Wisdom Can't Be Told. In his 1940 article, "Because Wisdom Can't Be Told," Charles L. Gragg of the Harvard Business School begins with this quotation from Balzac: "So he had grown rich at last, and thought to transmit to his only son all the cut-and-dried experience which he himself had purchased at the price of his lost illusions: a noble last illusion of age" (see Gragg, 1940).

Except for the part about growing rich, many educators find that Balzac's ideas fit their experiences quite well. Educators frequently attempt to prepare people for the future by imparting the wisdom gleaned from their own experiences. Sometimes these efforts are rewarded, but often they are less successful

than people would like them to be and we need to understand why. Examples of this problem are discussed in "Using Knowledge in Action."

Using Knowledge in Action

College students were taught about problem solving from the perspective of the IDEAL model—a model that emphasizes the importance of *Identifying problems, Defining them from at least two perspectives, Exploring strategies for solution, Acting on the basis of strategies, and Looking at the effects* (Bransford and Stein, 1993). Students were able to learn the material; for example, they could explain the purposes and steps of the IDEAL model and provide examples of how to use it to solve problems assigned in class. Nevertheless, students often failed to use the model spontaneously, when not asked to do so. For example, unless explicitly prompted to do so, students often failed to apply the model to their attempts to formulate their own topic for a paper related to discussions of problem identification and definition. They could think about the model, but they tended not to "think in terms of the model" (Bransford, Nitsch, and Franks, 1977) or "think with" the model (Broudy, 1977). The model had not become what some call a *conceptual tool* (Bransford and Stein, 1993).

Bereiter and Scardamalia (1989) provide an additional illustration of failure to spontaneously use important information. They note that a teacher of educational psychology gave her students a long, difficult article and told the students they had ten minutes to learn as much as they could about it. Almost without exception, the students began with the first sentence of the article and read as far as they could until the time was up. Later, when discussing the strategies, the students acknowledged that they knew better than simply to begin reading. They had all had classes that taught them to skim for main ideas, consult section headings, and so forth. But they did not spontaneously use these strategies when it would have helped.

The problem of knowing something but failing to have it guide one's actions is ubiquitous. Many years ago, Alfred Whitehead (1929) warned about the dangers of inert knowledge. This involves knowledge that is available to people in the sense that they can talk about it when explicitly asked to do so (for example, when asked to explain the IDEAL model, or explain strategies for reading research articles). However, the knowledge is inert in the sense that it does not guide one's thinking and actions in new settings. Whitehead made the provocative claim, demonstrated by research several decades later, that traditional educational practices tend to produce knowledge that remains inert (see also Bereiter and Scardamalia, 1989; Brown, Campione, and Day, 1981; Gick and Holyoak, 1980).

Gragg's (1940) "Wisdom Can't be Told" article discusses problems with Harvard Business School graduates in the 1930s. Employers said that the Harvard graduates had acquired an impressive array of knowledge and skills, but they were not "prepared for action" (for example, they could not make useful decisions in business settings). Barrows (1985) noted similar problems with respect to medical education. Michael, a language therapist, provides a particularly interesting story about this problem. She served for several years as a clinical supervisor of college students who were beginning a practicum in language

therapy for language-delayed children. The students had all passed the required college course on theories of language and their implications for therapy, but there was almost no evidence that the students ever attempted to use this knowledge in the clinical therapy sessions. Michael concluded that the college course must have been very poorly taught.

Michael was later asked to teach that college course herself. She did what she thought was a highly competent job and was pleased with the general performance of the students on her tests. A year later, she encountered a number of students again in the clinical practicum on language therapy. Much to her surprise and dismay, these students also showed little evidence of applying what they had learned in their language course. Many could remember facts when explicitly asked about them, but they did not automatically draw on that knowledge to help them solve problems in the clinic.

Because she had taught the practicum, Michael was reluctant to conclude that her college students performed poorly because of poor instruction. Instead she was motivated to explore problems with traditional approaches to instruction and to study ways to overcome them. Her Ph.D. thesis successfully explored new teaching methods that were designed to improve the degree to which her students were prepared for action when they moved from the classroom to the clinical lab (Michael, Klee, Bransford, and Warren, 1993).

To better prepare people for action, a number of professional schools (law schools, medical schools, and business schools, for example) use a variety of approaches called "case-based" and "problem-based" instruction. (See Williams [1992] for an excellent review and analysis of this general approach.) The essence of the approach is to organize instruction around actual situations that students are likely to encounter later in their careers or perhaps have already encountered. In business, for example, a case might focus on a company that is in trouble and needs to be restructured. In medicine, a case might involve a patient with certain symptoms that need to be diagnosed. In Michael's work on language therapy (discussed earlier), faculty anchored their instruction around videos of language experts who were working with children, and students analyzed these examples from different theoretical perspectives (for example, behavioral, linguistic, social/linguistic).

In all these examples, students work on cases over some fixed period, set learning goals for acquiring new information that is needed to solve the problem, and eventually discuss their ideas with classmates and with the professor. Ideally, students move from simple cases to more complex ones. In the process, they acquire relevant knowledge while learning to analyze problems, set learning goals, and present and discuss their ideas. Overall, these kinds of experiences appear to help students think and act more professionally when dealing with everyday problems relevant to their disciplines (see, for example, Hmelo-Silver, 2004; Michael and others, 1993). These approaches to instruction

represent attempts to avoid Whitehead's lament that many traditional forms of instruction tend to produce knowledge and skills that tend to remain inert once students leave the classroom and enter the world. Research like this underlies a number of the pedagogies for teacher education that we describe in Chapter Eleven.

Challenges of Enactment in Teacher Education. The issues teachers face regarding enactment are similar to those encountered in other professional fields, but there are differences as well. The preconceptions about educational ideas carried into teacher education by prospective teachers may be stronger than those of other novice professionals because of the long apprenticeship of observation in elementary and secondary schools. In addition, even when novice teachers have developed solid ideas about teaching, putting them into action is extremely challenging, as teachers do many more things at once, with many more clients assembled at one time, than do most other professionals. Developing an authoritative classroom presence, good radar for watching and interpreting what many different students are doing and feeling at each moment, and skills for explaining, questioning, discussing, giving feedback, constructing tasks, facilitating work, and managing the classroom—all at once—is not simple.

A number of scholars have specifically explored the challenges involved in preparing *teachers* for effective action. Schön (1983), for example, suggests that there are some kinds of professions—he includes teaching as a prime example—in which much of the information needed to make effective teaching decisions *emerges in the context of the practice*. For example, information about what ideas students have developed about a topic, how they are understanding or misunderstanding the material being taught, and how different students learn best emerges in the actual work of teaching—and guides future planning and instruction. How different strategies work with this or that *group* of students, as well as individuals, also emerges in the course of enacting plans, and cannot be fully known ahead of time in the abstract.

Some describe learning for understanding and enactment as learning to “apply” knowledge to practice. However, our earlier discussions of adaptive expertise suggest that effective actions involve *more* than the ability to simply apply previously acquired routines and schemas. The efficiency dimension (see Figure 2.1) highlights the importance of acquiring and using well-learned schemas and routines that set the stage for effective action without commanding too much attention. However, the innovation dimension involves “disciplined improvisation” (Sawyer, 2003) where new ideas and actions often emerge in the context of ongoing interactions. As discussed earlier, the upshot of this analysis is that “application” and “innovation” are tightly intertwined and need to be learned together, in the context of a schema that provides a means for reflection and further learning.

If the information needed to teach well emerges during the practice itself, then learning how to think and act professionally is unusually difficult at the start of a teaching career, and many ways of preparing prospective teachers will not be sufficient to guide their actions. For example, if a teacher preparation program emphasizes “book learning” rather than opportunities to practice and reflect in supervised classrooms, students’ actual postgraduation teaching experiences would be expected to have more effect on their subsequent teaching than their book-based classroom experiences. And indeed, data show that, for good or for ill, teachers’ initial classroom experiences, especially in the first one or two years, are consistently a predictor of teacher effectiveness (Rowan, Correnti, and Miller, 2002). Evidence also shows that these initial classroom experiences are much different for candidates who have had strong preservice preparation and those who have not (see, for example, Darling-Hammond, Chung, and Frelow, 2002).

One inference from these studies of learning is that teacher educators need to make sure that candidates have opportunities to practice and reflect on teaching *while enrolled in their preparation programs*. During both the preservice period and initial years in the field, new teachers need support in interpreting their experiences and expanding their repertoire, so that they can continue to learn how to become effective rather than infer the wrong lessons from their early attempts at teaching. Findings from several studies suggest that how teacher education is conducted can make a difference in teachers’ abilities to enact what they are learning. These studies have found that, when a well-supervised student teaching experience precedes or is conducted jointly with coursework, students appear more able to connect theoretical learning to practice, become more comfortable with the process of learning to teach, and are more able to enact what they are learning in practice (Chin and Russell, 1995; Darling-Hammond and Macdonald, 2000; Koppich, 2000; Snyder, 2000; Sumara and Luce-Kapler, 1996; Whitford, Ruscoe, and Fickel, 2000). Other studies suggest that when teachers learn content-specific strategies and tools that they are able to try immediately and continue to refine with a group of colleagues in a learning community, they are more able to enact new practices effectively (Cohen and Hill, 2000; Lieberman and Wood, 2003).

Metacognition and the Problem of Complexity

A third challenge in learning to teach is that teaching is an incredibly complex and demanding task (Lampert, 2001; McDonald, 1992). Effective teachers become increasingly aware of the complexities involved in teaching and learn how to think systematically about them so that they can better assess their own performances. As McDonald explains, “Real teaching happens within a wild triangle of relations—among teacher, students, subject—and the points of this triangle shift continuously. What shall I teach amid all that I should teach? How can I grasp it myself so that my grasping might enable theirs? What are they thinking and feeling—toward me, toward each other, toward the thing I am

trying to teach? How near should I come, how far off should I stay? How much clutch, how much gas?" (1992, p. 1).

A principle of learning that is extremely important for helping teachers become adaptive experts who can manage complexity involves the concept of metacognition—or the ability to think about one's own thinking. John Flavell (1979) described two aspects of metacognition: *metacognitive knowledge*—that is, understanding one's own thinking and developing strategies for planning, analyzing, and gaining more knowledge—and *metacognitive regulation*—that is, being able to define learning goals and monitoring one's progress in achieving them (see also National Research Council, 2000). A continuation of the *Fish is Fish* story provides more information about the nature and role of metacognition in learning (see *Developing Metacognition in the Cause of Learning*).

Developing Metacognition in the Cause of Learning

Hero though he is for saving the Fish's life, the Frog in our story gets poor marks as a teacher. But the burden of learning does not fall on the teacher alone. Even the best instructional efforts can be successful only if the student can make use of the opportunity to learn. Helping students become effective learners is relevant to the third key principle: a metacognitive, or self-monitoring, approach can help students develop the ability to take control of their own learning by defining learning goals and monitoring their progress in achieving them.

Our Fish accepted the information about life on land rather passively. Had it been analyzing and monitoring its understanding, it might have noted that putting on a hat and jacket would be rather uncomfortable for a fish, and would slow its swimming in the worst way. Had the Fish been more engaged in figuring out what the Frog meant, it might have asked why humans would make themselves uncomfortable and compromise their mobility. A good answer to the Fish's questions might have set the stage for learning about differences between humans and fish, and ultimately the notion of adaptation.

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There is a strong research literature demonstrating that efforts to help students become more active monitors of their own learning facilitate their performances (see, for example, Brown, Bransford, Ferrera, and Campione, 1983; National Research Council, in press). Data showing the benefits of metacognitive reflection range from work with children to adults. Metacognition is an especially important component of adaptive expertise (National Research Council, 2000). People with high levels of metacognitive awareness have developed habits of mind that prompt them to continually self-assess their performances and modify their assumptions and actions as needed. People who are less metacognitive rely on external feedback from others to tell them what to do and how to change.

Effective teachers particularly need to be metacognitive about their work. The more they learn about teaching and learning the more accurately they can reflect

on what they are doing well and on what needs to be improved. For example, beginning teachers frequently focus on their teaching practices rather than on what their students are learning. They need to be able to figure out what they do and do not yet understand about how their students are performing and what to do about it. They also need to be able to ask themselves and others questions to guide their learning and decision making. These include questions about the spheres of decision making that matter in interpreting what is going on in the classroom—for example, the aspects of learners' experiences, content representations, and social contexts that are in play in a given situation. And they need to be able to analyze acts of teaching as well as reactions and interactions that occur, so that they can reflect on these outcomes and adapt what they do.

In describing the complexity of teaching, Lampert outlines some of the many factors a teacher must consider and some of the areas in which metacognitive deliberations are critical to her ability to make sound decisions:

One reason teaching is a complex practice is that many of the problems a teacher must address to get students to learn occur simultaneously, not one after another. Because of this simultaneity, several different problems must be addressed in a single action. And a teacher's actions are not taken independently; there are interactions with students, individually and as a group. A teacher acts in different social arrangements in the same time frame. A teacher also acts in different time frames and at different levels of ideas with individuals, groups and the class to make each lesson coherent, to link one lesson to another, and to cover a curriculum over the course of a year. Problems exist across social, temporal, and intellectual domains, and often the actions that need to be taken to solve problems are different in different domains.

When I am teaching fifth-grade mathematics, for example, I teach a mathematical idea or procedure to a student while also teaching that student to be civil to classmates and to me, to complete the tasks assigned, and to think of himself and herself and everyone else in the class as capable of learning, no matter what their gender, race or parents' income. As I work to get students to learn something like "improper fractions," I know I will also need to be teaching them the meaning of division, how division relates to other operations, and the nature of our number system. While I take action to get some particular content to be studied by a particular student in a particular moment, I simultaneously have to do the work of engaging all of the students in my class in the lesson as a whole, even as I am paying different kinds of attention to groups of students with diverse characteristics. And I need to act in a way that preserves my potential to keep acting productively day after day, throughout the year. [Lampert, M. (2001). *Teaching problems and the problems of teaching*. New Haven: Yale University Press.]

Lampert's account of the multiple considerations that shape her teaching of mathematics to fifth graders suggests at least four elements for reflecting on the complexity of teaching. First, *teaching is never routine*. Students do not learn at the same pace or in the same ways. Their needs are both diverse and

ever-changing. The “wild triangle” to which McDonald refers is constantly shifting—teachers must constantly cope with changing situations, learning needs, challenges, questions, and dilemmas. Second, *teaching has multiple goals* that often must be addressed simultaneously. As Lampert explains, for instance, at the same time a teacher is teaching content, she is simultaneously teaching social and intellectual development, helping students work in groups, and paying attention to the way she interacts with the child who needs some extra support and the child who needs to be the center of attention. Third, *teaching is done in relationship to very diverse groups of students*. In contrast to the individual problems confronted one at a time by doctors, lawyers, or architects, teachers must find a way to meet the needs of a group of students who are diverse in terms of their learning needs, strengths, backgrounds, areas of challenge, and range of abilities. Finally, *teaching requires multiple kinds of knowledge to be brought together in an integrated way*. For instance, teachers must constantly integrate their knowledge of child development, of subject matter, of group interactions, of students’ different cultures and backgrounds, and of their particular students’ interests, needs, and strengths together in a way that advances the learning of all their students. In sum, helping new teachers learn about and reflect upon the multidimensionality and simultaneity of teaching (Jackson, 1974) is clearly important. And it is also no easy task.

Not only is there great complexity in the classroom, but there is also a complicated set of factors from outside the classroom that influence teachers and students. The way the school is organized shapes the prior experiences—norms, access to knowledge, and supports—students will have had before entering a given teachers’ classroom, as well as their current experiences. Furthermore, the conditions and relationships existing in the community served by the school will influence how children are raised, what resources have been available to them, how alike or different groups served by the school are and what kinds of expectations and values they bring. To be effective over the course of a career, teachers need to understand and manage these factors, and, eventually, to influence them on behalf of the students they serve.

THE PROCESS OF TEACHER DEVELOPMENT

It would be helpful if there were predictable phases of teacher development that could guide teacher educators. As is the case with child development (see Chapter Three), it is important to understand different theories of development and the contributions of each.

Developmental Progressions

A number of stage theories have been advanced to describe teachers’ development (Berliner, 1994; Feiman-Nemser, 1983; Fuller, 1969; Richardson and Placier, 2001; Sprinthall, Reiman, and Theis-Sprinthall, 1996) as well as the course of their careers (Huberman, 1989). For example, drawing upon a review of ten studies of teacher’s concerns, Fuller (1969) proposed that new teachers develop through phases in which they focus initially on themselves and their teaching—for instance, their ability to control the classroom, what their supervisors think about them as teachers—and then eventually on concerns that are related to student learning, such as designing curriculum, finding effective teaching strategies, and assessing student learning. This developmental progression—from early concerns with “self” to a gradual focus upon issues related to students and student learning, and, eventually, conditions of schools and schooling—has been observed in a number of studies.

Descriptions of classroom practice suggest that some teachers eventually develop a strong focus on student welfare and learning that drives their teaching decisions and self-improvement efforts, whereas others stop short of this state, developing techniques of teaching that “work,” in that they get teachers through the day, but that do not result in high levels of learning for students or high levels of teacher concern when learning does not occur. Both the speed and endpoint of this progression appear to be related to teachers’ preparation, as we discuss in the next section.

Other research has focused on the development of teaching knowledge by examining the differences in thinking between expert and novice teachers (Berliner, 1994, 1986; Carter, Cushing, Sabers, Stein, and Berliner, 1988; Lin, 1999). This line of research, described at the beginning of this chapter, has found, for example, that when beginning and experienced teachers are asked to evaluate classroom scenes, novices tend to offer superficial, general observations that do not attend to the intellectual work of the classroom. (See “A Study of Teacher Expertise,” p. 361.) On the other hand, more expert teachers attend to specific aspects of the classroom that are linked directly to the intellectual work of students, to generate more detailed observations and hypotheses about what they see, to qualify their observations and interpretations, to weigh the relative importance of certain kinds of information, and to “take into account the complexity of problems which exist in classrooms” (Carter and others, 1988).

Like experts in other domains, teaching experts quickly recognize patterns in what they observe; see more complexities and bring to bear many sources of knowledge about how to respond to them; are more opportunistic and flexible in their practice than novices, responding to demands of the situation and

the task; and have a broad repertoire of skills they can easily access and implement to achieve their goals (Berliner, 2001). Studies of expertise in fields such as physics (Chi, Feltovitch, and Glasser, 1981; Chi, Glaser, and Rees, 1982), chess (de Groot, 1965; Newell and Simon, 1972; Chase and Simon, 1973), and history (Wineburg, 1991, 1998) suggest similar features in other fields.

Berliner (1994) has proposed that teachers develop expertise through a set of stages—from novice to advanced beginner, competent, proficient, and ultimately to expert. Over time, they progress from learning the basic elements of the task to be performed and accumulating knowledge about learning, teaching, and students to making conscious decisions about what they are going to do, reflecting on what is working based on their experience, and, ultimately, at the expert level (Stage 5), sensing the appropriate responses to be made in any given situation. Teachers appear to develop competence over a period of about five to seven years, and only a small percentage of teachers continue to develop into experts (Berliner, 2001). Some research, described later, suggests that the metacognitive elements that are involved in the development of expertise can be developed in teacher education, enabling more teachers to reach this level of strong competence and to do so earlier than might otherwise be the case (see, for example, Hammerness and others, 2002).

Finally, some researchers have examined the process of development of specific teaching skills. For example, Joyce and Showers (2002) have described how teachers go through an iterative process of learning, experimenting, and reflecting as they develop new skills for use in their classrooms. They have also studied how the developmental process of learning to enact new skills can be supported by skilled coaching in peer support groups that allow teachers to explore, develop, strengthen, and refine teaching skills together. Both the feedback and the collegial nature of the process appear to stimulate reflection and greater skill development. Approaching this kind of process from a developmental perspective strengthens both implementation and student achievement gains.

Stage theories have been useful in describing the trajectory of teachers' development and the nature of teachers' expertise. However, they do not tell us as much about the characteristics of the learning experiences that may help teachers progress in their concerns and acquire expert skills (Berliner, 2001). Furthermore, many stage theories that have guided teacher education decisions have been interpreted as suggesting that teachers' development progressed in a linear fashion, in fairly fixed stages, suggesting teacher development is "invariant, sequential and hierarchical" (Richardson and Placier, 2001). Yet, other frameworks for describing teacher development suggest more complex paths in learning to teach, as well as differences in teachers' concerns and capacities

when they have had different kinds of preparation (see, for example, Grossman, 1992, in response to Kagan, 1992).

Furthermore, many studies describing teacher development in terms of what beginning teachers "can" and "cannot" do were conducted at a time when most teacher education programs were fairly weak interventions. Thus they may underestimate the potential of new teachers to practice in more sophisticated ways, particularly if those new teachers are prepared in programs that can leverage their development productively. Some recent studies designed to examine the kinds of teacher education that support teacher learning suggest that, under the right circumstances, with particular kinds of learning experiences, new teachers can develop a more expert practice even as beginning practitioners (Darling-Hammond, 2000b; Darling-Hammond and Macdonald, 2000; Hammerness and others, 2002; Koppich, 2000; Merseth and Koppich, 2000; Miller and Silvernail, 2000; Snyder, 2000; Whitford and others, 2000; Zeichner, 2000).

These findings parallel recent findings in cognitive development demonstrating that, given well-chosen tasks with appropriate scaffolding and supportive learning environments, children can learn much more than may have been anticipated by earlier biologically based theories of development (Boaler, 1997; Brown and Campione, 1994; Lee, 1995; Palinscar and Brown, 1984; Rogoff, 1990; Vygotsky, 1978). This recent evidence of powerful novice teaching is also particularly important because the studies examined teacher education features that appear to make a substantial difference for preservice teachers' learning and development. These features are discussed more fully in Chapter Eleven.

This research does not suggest that new teachers can immediately develop the kind of expertise that a master teacher develops over years of experience. Such learning about teaching, students, culture, development, and subject matter develops over time. Grossman, Smagorinsky, and Valencia (1999) have distinguished between "appropriating tools" and "mastery," suggesting that "If mastery means the skill to use a tool effectively, then this more fully realized grasp of a concept most likely would take years of practice to achieve" (p. 18). However, this recent research does suggest that new teachers can demonstrate more accomplished practice than previously thought when they experience stronger, more purposeful preparation.

Studies of teacher development have provided evidence for a potential trajectory of teacher development. And although the sequence and timing of particular stages may not be invariant, particularly when new teachers can benefit from especially well-designed teacher education, the descriptions of expertise have helped undergird much of our understanding of what accomplished practice might look like. They provide a basis for characterizing some of the practices we might hope teachers begin to learn and demonstrate as skilled and thoughtful practitioners.

THEORIES OF TEACHER DEVELOPMENT IN COMMUNITIES OF PRACTICE

Current conceptions of learning to teach have also been informed by theories of learning in a community (Au, 2002; Cochran-Smith and Lytle, 1999a; Grossman and others, 1999; Oakes, Franke, Quartz, and Rogers, 2002). A focus upon learning in communities of practice has evolved out of multiple research traditions in the United States and other countries. It can be traced back to scholars such as Kurt Lewin, a social psychologist; to the educational philosophy of John Dewey; and to movements that called for teachers to collaborate and participate in research in their classrooms alongside university researchers, which were in evidence as early as the 1950s (see Zeichner and Noffke, 2001, for a review of these traditions). In addition, this work has been informed by the work of cognitive psychologists who have focused in particular upon the situated and contextualized nature of learning within such communities (see, for example, Bruner, 1996; Cole, 1977; D'Andrade, 1981; Lave and Wenger, 1991; Vygotsky, 1978).

Research on teacher development within learning communities also emphasizes the importance of a particular kind of knowledge development: knowledge that is developed within both teaching contexts and professional contexts. Cochran-Smith and Lytle (1999) outline several approaches to knowledge development, including the development of knowledge *for* practice, knowledge *in* practice, and knowledge *of* practice. The first of these refers to the kinds of knowledge teachers may need to rely upon in developing their practice: knowledge of subject matter content, content pedagogy, theories of learning and development, and research about the effects of various teaching strategies. This kind of knowledge has been the traditional emphasis of teacher education and it has often been thought of as knowledge to be transmitted from scholars to teachers or from experts to novices.

The second perspective emphasizes knowledge in action: what accomplished teachers know as it is expressed in their practice, their reflections, and their narratives. To be sure, some of this knowledge is reflected in the first category, when it has been the subject of formal research on teaching. However, the notion of knowledge *in* practice emphasizes that much of the knowledge of accomplished teachers is practical, highly situated, and acquired through reflection upon experience. Although one teacher's knowledge in practice, when studied by other teachers, can become knowledge for practice, learning from the actions of expert teachers as they make choices and decisions depends upon learning how to "think like a teacher"—how to observe students, reflect upon their needs, evaluate curriculum options, and put plans into action.

Finally, knowledge *of* practice emphasizes the relationship between knowledge and practice and the theoretical aspects of both, assuming that "the knowledge teachers need to teach well emanates from systematic inquiries about teaching, learners and learning, curriculum, schools and schooling. This knowledge is constructed collectively within local and broader communities" (Cochran-Smith and Lytle, 1999a, p. 274). It emphasizes the role of the teacher in constructing knowledge and learning, and growing through that process. And, it suggests the importance of ongoing inquiry by teachers in their own classrooms and into other systematic and practical sources of knowledge for addressing critical problems of practice. In this conception, communities of practice play a central role in developing and transmitting knowledge from practice to research and back again. These notions of knowledge for practice, developed within a professional community of inquiring teachers, inform many of the emerging pedagogies in teacher education that have been found to be associated with implementation of new teaching strategies and improvements in student learning (see, for example, Joyce and Showers, 2002; Cohen and Hill, 2000).

These conceptions of teacher development within professional communities highlight the ways in which the learning of beginning and experienced teachers is similar. As Cochran-Smith and Lytle (1999) explain, "Working together in communities, both new and more experienced teachers pose problems, identify discrepancies between theories and practices, challenge common routines, draw on the work of others for generative frameworks, and attempt to make visible much of that which is taken for granted about teaching and learning" (p. 293). This conception poses an image of the teacher as a member of a professional community and as a lifelong learner, focusing upon collegial, career-long development.

CRITICAL ASPECTS OF IDENTITY DEVELOPMENT IN TEACHERS

In addition to developing knowledge and skills, teachers are developing along many other dimensions. Teachers are developing as professionals (Feiman-Nemser, 2001a); as scholars and practitioners within a subject matter context (Shulman, 1986; Grossman and Stodolsky, 1995); as change agents (Ayers 1995; Darling-Hammond, French, and Garcia-Lopez, 2002); as nurturers and child advocates (Cummins, 1986); and as moral agents (Fullan, 1993b). As teachers develop a vision for what teachers do, what good teaching is, and what they hope to accomplish as a teacher, they begin to forge an identity that will guide them in their work (Hammerness, in press). Developing an identity as a teacher is an important part of securing teachers' commitment to their work and adherence to professional norms of practice.

Preparation programs deliberately and inadvertently reinforce the development of different kinds of teaching identities as they emphasize various aspects of what it means to be a teacher and as they place student teachers in different environments where they will see certain kinds of norms modeled. Though not always explicitly considered, this aspect of preparation is critically important, as the identities teachers develop shape their dispositions, where they place their effort, whether and how they seek out professional development opportunities, and what obligations they see as intrinsic to their role.

Teachers are also developing in their identities as members of racial/ethnic groups and in their views about members of other groups. Research on the development of racial identity suggests that through childhood (as early as three or four years of age) and into adulthood, people move through a variety of stages in making sense of their own racial/ethnic identity and culture and those of others (Katz, 1982; McAllister and Irvine, 2000; Phinney and Rotheram, 1987; Tatum, 1997). This process of racial identity development influences how teachers treat the students they teach as well as how they see their role in confronting social and institutional barriers to equity. This process can be facilitated by teacher education if teacher educators understand how it unfolds and can be supported (Carter and Goodwin, 1994).

Of course, children in the classrooms of teachers also go through these stages. Thus it is equally important to note that teachers play a particularly influential role in the development of children's racial/ethnic identity and their academic self-concepts. As Banks (1988) argues, "Teachers are even more important than the material they use because the ways in which they present material highly influence how they are viewed by students" (p. 88). As teachers bring their own assumptions and beliefs (and even prejudices and biases) to bear upon the materials they use in the classroom, the way they interact with materials or describe them to children can create a lens with which the children themselves view the materials. In this process, teachers can reinforce or counteract racial biases and stereotypes that children bring into school with them, and can display negative or positive attitudes to children of color. Because of teachers' critical role in the identity development of children, teacher educators argue that teachers need to develop consciousness about their own racial identity and consider how they can support positive racial identity development among their students (Carter and Goodwin, 1994).

Furthermore, as Hernández (1989) asserts, teaching is always a cross-cultural encounter no matter what the ethnicity or race of teachers and students, because culture so deeply informs the entire teaching and learning process. Teachers naturally bring their own cultural values, beliefs, and understandings to their work with children, and children always bring their own cultural understandings and ways of knowing to their experiences with teachers, with knowledge and ideas, and with each other.

Of particular challenge is helping preservice teachers from the majority culture develop an understanding of cross-cultural issues and experiences such as discrimination. Surveys suggest that many white teachers have limited awareness of these issues (Sleeter, 2001). Qualitative studies suggest that many have had few cross-cultural experiences, and this lack of experience may lead them to unintentionally or unconsciously accept forms of racial, ethnic, language, or cultural discrimination (McIntyre, 1997; Smith, Moallem, and Sherrill, 1997; Valli, 1995). This limited experience also affects many teachers' understanding of culturally appropriate classroom practices. Many preservice teachers have trouble imagining what multicultural teaching can look like (Goodwin, 1994), in part because of the lack of models of multicultural practices in their own experiences as students and in their placements. Indeed, for these same reasons, preservice teachers of color do not necessarily know more about culturally relevant pedagogical practices than white preservice teachers (Goodwin, 1997b). As we describe in Chapter Seven, preservice programs can provide much-needed opportunities for teacher education students of all backgrounds to develop culturally relevant practices and pedagogical approaches that can serve a diverse range of students (Ladson-Billings, 2001; Sleeter, 2001).

A FRAMEWORK FOR TEACHER LEARNING

In recent years, a number of scholars have offered theoretical frameworks for teacher learning that incorporate much of the research described earlier (Cochran-Smith and Lytle, 1999; Feiman-Nemser, 2001a; Grossman and others, 1999; Shulman and Shulman, 2004). In addition, professional standards for teaching, especially those offered by the Interstate New Teacher Assessment and Support Consortium (INTASC) and the National Board for Professional Teaching Standards (NBPTS), also build upon this research in describing what competent beginners and accomplished teachers need to know and be able to do in order to teach challenging content to diverse students.

We draw from these efforts in offering a framework for teacher learning. As depicted in Figure 10.1, this framework suggests that new teachers learn to teach in a community that enables them to develop a *vision* for their practice; a set of *understandings* about teaching, learning, and children; *dispositions* about how to use this knowledge; *practices* that allow them to act on their intentions and beliefs; and *tools* that support their efforts.

As we argue in Chapter Five, teachers need to have a sense of where they are going and how they are going to get students there. Zumwalt (1989) has called this a sense of "curricular vision." This vision, along with powerful images of good practice (Feiman-Nemser, 2001a; Shulman and Shulman, in press; Zumwalt, 1989) can help new teachers reflect on their work, guide their practice, and direct

their future learning (Hammerness, in press). Feiman-Nemser argues that these images are critical for teacher learning: “Teacher candidates must . . . form visions of what is possible and desirable in teaching to inspire and guide their professional learning and practice. Such visions connect important values and goals to concrete classroom practices. They help teachers construct a normative basis for developing and assessing their teaching and their students’ learning” (2001a, p. 1017). Developing a vision for teaching is the first step toward addressing the apprenticeship of observation and the process of enactment.

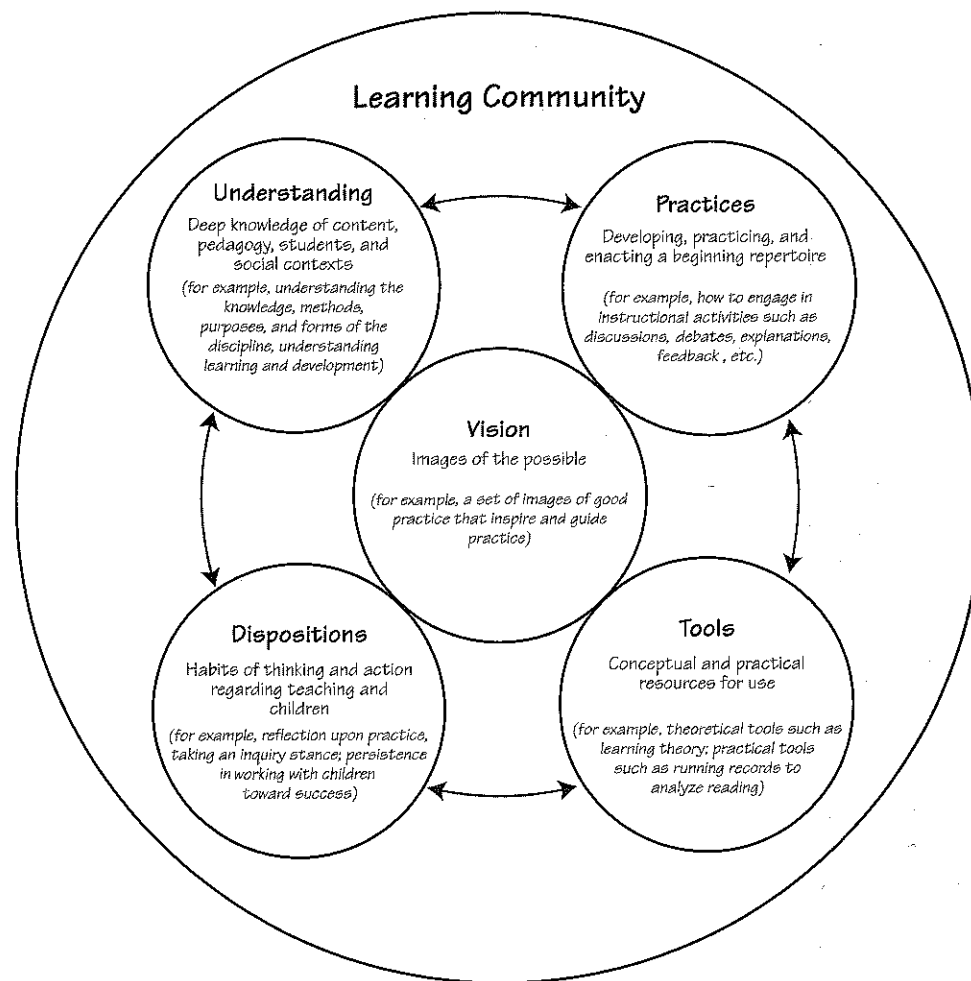


Figure 10.1 Learning to Teach in Community

As we discussed in Chapter Six, scholars agree that teachers need to have a deep knowledge, or *understanding*, of their subject and how to make it accessible to others (Shulman and Shulman, 2004). Making content accessible relies, in turn, on an understanding of students and their prior knowledge and experiences, and an understanding of the learning process. In their definition of disciplinary understanding, Boix-Mansilla and Gardner (1997) argue that deep disciplinary understanding includes understanding the knowledge, the purposes, the methods, and the forms of a subject. This model suggests that teachers need to possess a coherent and rich conceptual map of the discipline (knowledge); an understanding of how knowledge is developed and validated within different social contexts (methods); an understanding of why the subject is important (purposes); and finally, an understanding of how one can communicate knowledge of that subject to others (form). Communicating that knowledge effectively rests upon an understanding of students’ thinking, experiences, development, and learning processes and of how curriculum can be constructed and classrooms managed to allow the learning process to unfold productively.

To put these understandings into practice, teachers also need to develop *tools* (Grossman and others, 1999)—conceptual and practical resources for use in the classroom. Grossman and colleagues make the distinction between conceptual and practical tools, noting that *conceptual tools* can include learning theories, frameworks, and ideas about teaching and learning (concepts such as the zone of proximal development or culturally relevant teaching). They suggest that *practical tools* include particular instructional approaches and strategies, and resources, such as textbooks, assessment tools, and other materials. Such tools help teachers to work smarter and to enact their intentions in practice.

These understandings and tools need to be integrated into a set of *practices*, or what Feiman-Nemser (2001a, p. 1018) has termed a *beginning repertoire* of classroom enactment. These practices can include a variety of instructional activities to promote student learning, such as explaining concepts, holding discussions, designing experiments, developing simulations, planning debates, and organizing writing workshops (Feiman-Nemser, 2001a). Practices also include activities like learning to design and carry out unit plans and daily lessons that build understanding; developing and implementing formative and summative assessments; and offering feedback that is constructive and specific. Feiman-Nemser points out that student teachers should be learning not only the content of these strategies, but “when, where, how and why to use particular approaches.”

In addition to understanding that is connected to tools and practices, teachers need to develop a set of *dispositions*—or habits of thinking and action—about teaching, children, and the role of the teacher. Teaching dispositions include the disposition to reflect and to learn from practice, which Cochran-Smith and Lytle have termed *inquiry as stance* (1999, p. 250). Dispositions toward children include determination and persistence that support the ability to

work with children until they succeed (Haberman, 1996), including the inclination to take responsibility for children's learning and the will to continue to seek new approaches to teaching that will allow greater success with students. Ladson-Billings, for example, has found that the belief that all children can succeed is a particularly important attribute of successful teachers of African American children (1994). Dispositions can also include a personal orientation (Haberman, 1996) characterized by appreciation of the need for good rapport and strong relationships with children, and of valuing, respecting, and caring for children.

This framework also takes into account the understanding that learning to teach occurs within communities (Cochran-Smith and Lytle, 1999). Professional communities include those found in classroom and clinical settings, such as the peers and faculty candidates work with in their coursework and in student teaching. Purposefully constructed professional communities that share norms and practices can be especially powerful influences on learning. In addition, teachers learn to teach in different kinds of local and regional communities that offer different kinds of opportunities for learning and practice. These settings—which can differ by culture, socioeconomic status, language diversity, political and social norms, and many other factors, pose distinctive challenges for teacher preparation. If their candidates are to be successful, teacher preparation programs must take into account the role of community contexts in children's learning and development and must respond to the particular diversity of children, schools, and communities served by their programs (Haberman, 1996).

This model of teacher learning also invites teacher educators to examine whether and how teachers' learning in school settings complements what is learned in university settings and vice versa (Grossman and others, 1999). Visions of good practice may differ in different settings, and different settings may emphasize or demonstrate different tools, practices, and even dispositions. This model helps demonstrate the importance of coherence—or at the very least, helps teacher educators consider the potential conflicts and differences their students may encounter as they learn to teach in different settings.

Finally, this framework helps us to think about how teacher educators can equip teachers in ways that address the three persistent problems of learning to teach that we identified earlier in this chapter. For example, Feiman-Nemser has pointed out that developing vision, or a set of images of the possible, is a critical step in addressing the problem of the apprenticeship of observation: "Unless teacher educators engage prospective students in a critical examination of their entering beliefs in light of compelling alternatives and help them develop powerful images of good teaching and strong professional commitments, these entering beliefs will continue to shape their ideas and practices" (2001a, p. 1017). Similarly, Cochran-Smith and Lytle point out that the disposition to take an inquiry stance can help teachers deal with the complexity of teaching;

they offer illustrations of "colleagues working together, bringing their perspectives to bear on inquiries into the complexities and messiness of teaching and learning" (1999, p. 279).

From this model, we can see that rather than conceptualizing the process of teacher development as moving in lockstep through a series of universal stages (regardless of setting or experiences), teacher educators are now emphasizing the interrelationships between teachers' *learning and development* and the *context* of teachers' learning. In turn, they are beginning to focus upon the particular features of those contexts and experiences that might help teachers develop these capabilities. This perspective parallels the development of learning theory over the past twenty years, as psychologists have moved from behaviorists' quest for a direct relationship between stimulus and response, to cognitive psychologists' exploration of how individual learning unfolds, to the broader focus offered by sociocultural theory on the contexts and conditions that promote learning.

Although some researchers have previously interpreted research on stage theories to imply that beginning teachers cannot profitably focus on student learning or curriculum issues until they have mastered classroom routines (Kagan, 1992), recent research supports Grossman's (1992) argument that new teachers have the potential to make fruitful strides on these matters even as novices, if they have the right kinds of support. In Chapter Eleven, we focus on some of the characteristics of teachers' learning experiences that appear to contribute to the development of teachers' visions, understandings, tools, practices, and dispositions.