CREATING POWERFUL THINKING IN TEACHERS AND STUDENTS

DIVERSE PERSPECTIVES

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CHAPTER NINE

IMPLICATIONS OF COGNITIVE SCIENCE FOR TEACHER EDUCATION

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The literature on teacher education is replete with evidence that teachers have either not learned the things that teacher educators wanted them to learn or that they learned new ideas while in college but then abandoned those ideas when they began practicing on their own. The hypothesized reasons for these apparent failures of teacher education are numerous: programs are underfunded, too brief, too fragmented, too theoretical, or too practical. The problem addressed in this paper, therefore, is not what should be taught to prospective teachers but rather how it should be taught.

All professional educators face two interrelated problems: the need to define professional expertise and the need to promote it in their students. In the case of teacher education in particular, the field has always suffered from competing views of what a teacher is, what a teacher needs to know, and how teachers can learn the things they need to know. But recent literature in these areas differs from earlier literature in that much more of it is empirically based than was true in the past. The field of teacher education is moving from visionary rhetoric toward grounded argument.

This paper combines literature on the nature of expertise that is uniquely needed for teaching with the broader literature on learning and on expertise more generally, in an effort to illustrate their implications for the formation of teacher education programs. The paper has four main sections. In the first, we offer a tentative definition of teaching expertise. In the second, we examine some of the reasons why this kind of expertise is particularly difficult to foster. In the third, we describe a series of challenges to teacher education that follows from the findings of these two bodies of literature. Finally, in the fourth, we describe a teacher education program currently being developed at Michigan State that is designed to respond to these challenges.

**EXPERTISE IN TEACHING**

In nearly all professions, ideas about the nature of professional expertise have evolved in similar ways. In the days when expertise was transmitted through apprenticeships, there was an assumption that expertise consisted largely of a set of techniques. As professions became more sophisticated, and their formal preparation moved from the master craftsman to the university, expertise came to be defined as a body of knowledge—general principles that should guide practice. Aspiring physicians, teachers, or engineers gained this body of knowledge in the university and were expected later on to apply their knowledge in practical situations. More recently, as researchers have begun to examine professionals at work, the definitions of professional expertise have become both more complex and more subtle. We now recognize that professional expertise consists of far more than a body of skills or a body of facts and far more than the simple sum of these. Moreover, the relationship between knowledge and skill—or between idea and action—is more complicated than earlier models of acquisition and application had supposed. Expert practitioners are engaged in a continual process of reinventing their practices—of using their experiences both to devise their practices and to revise their theories of practice. Moreover, contemporary views of professional expertise are more cognizant of the important role of judgment in interpreting situations before action is taken.

Professional expertise is a combination of several things, not all of which are knowledge per se, and the way in which these several aspects of expertise interact is not at all clear. Before discussing the way in which professional expertise is organized or drawn on in practice, let us first review some of the things that have been nominated as part of it. For want of a better term, let us call these aspects of expertise personal resources.

One resource, of course, is declarative knowledge—the body of facts, principles, theories, or concepts that, when taken together, form the professional curriculum in a given field. Virtually everyone agrees that professionals within a field hold some body of knowledge that is uniquely relevant to their practice. This body may include basic disciplinary knowledge (anatomy or physiology in the case of medicine, political science in
the case of law) or knowledge formed specifically for the profession, such as a set of rules for how to handle certain ethical situations. While members of every profession agree that there is a body of knowledge all members should share, each profession has experienced serious arguments among its members about what should be included in that body of knowledge. Teaching is no exception: It has been plagued not only by difficulties in defining its professional knowledge base but with problems of defining the relative importance of professional knowledge (the part that is usually taught by the education department) versus subject matter knowledge (the part usually taught by disciplinary departments) (e.g., McDiarmid, Ball, & Anderson, 1989). The most recent example of an effort to define the knowledge base for teaching is the Knowledge Base for Beginning Teachers by the American Association of Colleges of Teacher Education (Reynolds, 1989).

A second important personal resource, also recognized as important in virtually every profession, is a set of skills: the procedures and techniques one uses in practice. These may include such diverse skills as stitching wounds, calculating stress on a girder, or subduing a violent patient. Teachers, like members of other professions, are presumed to be able to do certain things—explain fractions, recognize handicapping conditions, assess student understanding of what has been taught. In fact, in one period of its history, teacher education attempted to define teaching expertise exclusively through lists of such discrete skills and then to organize teacher education programs around these skills (e.g., Orlosky, 1980).

Though there may have been a time when these two personal resources—knowledge and skills—were thought to encompass all of professional expertise, numerous other resources have since been recognized as important. For instance, many observers want to see evidence of certain beliefs, values, or commitments in professional practitioners. In the case of teaching, the evidence for the importance of beliefs is growing, and there now are several examples in which teachers’ beliefs have been shown to significantly influence both their own classroom practices and what students learn in those classes (e.g. Peterson, Fennema, Carpenter, & Loef, 1989; Anderson, Raphael Engel & Stevens, 1991).

Even after including knowledge, skills and values in a definition of professional expertise, other personal resources have been recognized as important. Every profession, for instance, expects its practitioners to subscribe to an ethical code—not merely to espouse a set of principles, but to be aware of ethical issues associated with different features of practice and to recognize instances where ethical issues may come into play. In the case of teachers, for instance, we hope that they would be aware of the subtle ways in which they may differentially treat different students and, thereby, further reinforce differences among them (e.g., Rist, 1970). Equally invisible but important to professional expertise is the professional persona one adopts; each profession subscribes to one or more ideals of what a member of the profession should be like as a person. The professional persona could be defined as a particular set of skills, but it is actually more than that: It includes an attitude toward one’s work and a belief about one’s role that is expressed through one’s behavior. Adopting a professional code requires conscious thought and judgment and may entail some alteration of one’s self-concept as well. A persona is particularly important in teaching, because teachers’ work entails a lot of social interaction. A teacher may adopt the persona of a counselor, a strict taskmaster, a friend, or an intellectual, for instance. The choice may have significant implications for students.

Still another important personal resource that contributes to professional expertise is a set of dispositions to pursue certain kinds of practices over other kinds of practices. In the case of teaching, numerous writers have suggested that teachers need to be more reflective about their work—to be motivated to improve their practices, to study and be critical of their own behaviors and strategies, and to continue to seek improvements. Zeichner, for instance, has argued that it is important for teachers to define their criteria for good teaching in a way that includes not merely technical accomplishment of curriculum goals
but, in addition, the extent to which the classroom processes meet a variety of social and moral criteria as well (Kennedy, 1989).

Most professions also expect their practitioners to have a sense of purpose in their work—to see their task as more than merely filling up a 40-hour work week. In the case of teachers, we would hope that teachers see their purpose not merely as one of maintaining order or silence in the classroom but also of trying to help students gain deeper and more substantial understanding of subject matter.

Finally, professional expertise requires an ability to reason about practice: to interpret and assess particular situations, to monitor and adjust one's own actions, to formulate and test hypotheses, to weigh the relative importance of general principles and unique circumstances, to draw on a variety of ideas from one's field, and to justify one's decisions with arguments grounded both in principles of practice and in the specific circumstances of practice (e.g. Schon, 1983; Kennedy, 1987).

While each of these personal resources is individually important to professional expertise, each is also important as it interacts with others, for it is the package of all these resources, forged into a way of thinking, seeing, and responding to the world, that constitutes professional expertise. Together, these resources provide experts with a mode of operation, or MO, that provides them with goals, strategies, knowledge, skills, reasoning, beliefs, ethical guidelines, and even a persona with which to function.

Carl Bereiter (1990) calls these packages modules, and he ascribes certain properties to modules. For instance, Bereiter says that the various personal resources that comprise modules are compatible and that they support and reinforce one another. That is, the persona one adopts is compatible with the beliefs, knowledge, and purposes one subscribes to, and the reasoning strategies one uses are compatible with one's disposition, values, and ethical code, for instance.

In addition, Bereiter argues that a given individual may hold more than one module that is relevant to a particular kind of activity. To illustrate this point, Bereiter argues that students in school may have two completely different learning modules: a schoolwork module and an independent-learning module. Both modules enable the student to learn. Both include the full set of personal resources: propositional knowledge, skills, beliefs, a sense of purpose, ways of reasoning, dispositions, and so forth. But these resources take on a different character in each module. That is, depending on which module, or mode of operation, is in use, the student has different goals, draws on different knowledge and skills, subscribes to different values and beliefs, and enacts a different persona and different problem-solving strategies. Applying this notion to teaching, we might imagine that teachers, too, could hold multiple modes of operation for teaching, each consistent with a particular view of teaching, and each of which is called upon in different circumstances. Teachers may envision one mode of operation in their idealized image of themselves as teachers, but actually practice another MO in their daily practice as teachers. They may use different MOs when teaching mathematics versus language arts, when teaching in first-grade versus third-grade classrooms, or when teaching gifted students as opposed to difficult-to-teach students. To the extent multiple MOs exist, teachers may adopt different goals and different personas in different settings, reason differently in different settings, and draw on different knowledge and different skills to carry out their tasks.

Bereiter's analysis is useful for understanding both the variety of resources that contribute to expertise and for understanding how it is that we may see different behavior patterns, justified with different arguments, in the same person on different occasions. But the notion that these modes of operation contain so many different kinds of resources also poses problems for the development of professional expertise. Professional educators know how to influence only two of these resources: knowledge and skills. In addition, these various resources do not add up to expertise unless they are woven together into coherent modes of operation, yet professional educators traditionally impart each resource separately, as if each had nothing to do with the others. Physicians, for
instance, study anatomy separately from neurology, and they study these bodies of knowledge separately from clinical skills. Finally, if individuals can sustain different and even conflicting modes of operation, how can professional educators assure that their students, even if they have developed the MOs they need, will in fact call upon these MOs on the right occasions. In the section below, we address these problems with regard to fostering expertise specifically in teaching.

WHY EXPERTISE IN TEACHING IS HARD TO FOSTER

The development of expertise in teaching presents its own special dilemmas. One of these, for instance, derives from the fact that virtually every teacher or teacher candidate enters this professional field with a package of ideas about teaching already formed. Because prospective teachers have observed teachers for some 13 to 17 years, while they themselves were students, they approach their own teaching with highly elaborated ideas about what the practice consists of, what its goals are, what strategies they would use to accomplish their goals, what their own teaching persona is, and so forth. In fact, not only do teacher candidates already have knowledge, skills, and beliefs about teaching, but most ordinary adults hold similar teaching MOs, based on their observations of their own teachers. We can, then, refer to these as naïve teaching MOs. They are visions of teaching—imagined roles played by the individual, along with scripts for students to play as well.

These naïve MOs can impede learning to teach in several ways. For instance, because student observers never see their teachers thinking, they may not realize that thought is an important part of the work. Their images of teaching, then, assume that teaching strategies comes naturally, that they are automatic responses to situations. In the Teacher Education and Learning to Teach (TELT) study, a multisite study of changes in teacher candidates' beliefs about teaching, we found many instances of this assumption. When asking teachers and teacher candidates to describe how they would handle certain teaching situations (Kennedy, 1991), we often found them saying that they did not know what they would do but that when the time came, they would know what to do. For instance, one problem we pose is this:

Students often make remarks such as, “This is boring. Why do we have to do this?” If a student in your class made such a remark when you were working on organization in writing, how would you react and why?

“Lori’s” response indicates the view that the appropriate response will come naturally from the situation:

It is easy to sit here and say I would, uh, very casually try to impress him that it is boring stuff that leads to better stuff. I don’t know, I don’t know how I would react to that. . . . When I get into the classroom I would know.

Similarly, Grace’s response illustrates this view when she says:

If the teacher takes a little bit of extra time maybe before they do the lesson or whatever you can always come up with some valid reason to relate to them, to the students, always. And I know I would have done that to begin with. I don’t know exactly how I would have done it.

The teaching MOs that teacher candidates bring with them may also include beliefs about their role as a teacher and about their relationship with students. Some teachers who responded to this question, for instance, perceived the question not as one of justifying the content to be learned but, instead, of defending their authority against a hostile student. For them, the student’s question challenged their persona as an expert. Jade’s response indicates such a view when she says:
I'm one to say, "OK, fine, don't do this, sit there and don't do anything. Do nothing. You can't talk, you can't move. Just sit there and watch everybody else write. We'll see which one is more boring."

To the extent that candidates bring this belief to college with them, as part of their teaching MOs, they will not expect to learn anything of value in their teacher education courses and, consequently, are likely not to learn anything of value.

A second way in which naive teaching MOs might interfere with learning occurs when teacher candidates hold beliefs about the nature of school subjects or the purposes for learning school subjects that differ remarkably from those held by members of the academic disciplines. The "tool" subjects of reading, arithmetic, and writing are prime candidates for such disparities; even though most higher educators envision school subjects as intellectually engaging enterprises, most teacher candidates were taught these subjects as lists of discrete skills. Thus, they are now likely to perceive "writing" as a collection of correct procedures for spelling and punctuating sentences, while contemporaries in this field would argue that writing should be taught as an iterative process of developing ideas and communicating them to real audiences (Hillocks, 1990). Similarly, they may perceive "arithmetic" as a collection of addition and subtraction facts to be memorized and recited on worksheets (Ball, 1988b, 1990), whereas contemporaries in this field would argue that students need to learn to reason about numbers and to connect mathematical ideas to a variety of concrete and everyday situations (NCTM, 1988).

Finally, the teaching MOs that teacher candidates have devised assume that learning occurs in all children as it did for themselves. Since they enjoyed school, they expect that all children enjoy school. Since they learned by passively listening and by filling out repetitive worksheets, they expect all students to learn through these processes. Yet cognitive research, much of which is described elsewhere in this book, suggests that students learn by actively thinking about ideas and constructing their own knowledge of the material.

These teaching MOs derive from what Lortie (1975) called the "apprenticeship of observation": the lengthy period of time during which teachers observed other teachers from the perspective of student. Moreover, consistent with Bereiter's argument, the many ideas and values that contribute to these MOs are internally consistent and mutually reinforcing. If subject matter consists of discrete facts and skills, then the teacher's task is to assure that students acquire as many of these as possible, and the most efficient way to do this is to force-feed these bits of knowledge to students and to use examinations and worksheets to assure that students get it all.

Standing in sharp contrast to this naive teaching MO is one held by many contemporary researchers and teacher educators. In their teaching MO, the goal of teaching is to enable students to reason about school subjects and to use school subjects for their own purposes. Subject matter does not consist of lists of facts and skills to be memorized but, instead, of ideas that need to be weighed and analyzed. A student question about why the class has to learn this material is interpreted not as a challenge to the teacher's authority but as a signal that something is amiss and needs to be investigated. Teaching strategies consist more of methods of engaging students in reasoning than of allocating work sheets for students to fill out.

One inescapable conclusion from the contrast between these two modes of operation is that if contemporary research about how students learn is to have any impact on teaching practice, then teachers' MOs must be changed. The task of professional education, at least for the teaching profession, is one of getting novices to give up the MO they arrive with in favor of another one. This cannot happen merely by giving teachers new knowledge about academic subjects, or about how students learn those subjects or by giving novices different pedagogies. These alternative teaching MOs also require different goals, different values and dispositions, different ethical codes, and different personas. Moreover, because all of these personal resources must be consistent with one another, we are not likely to succeed if
we try to change them one at a time, for each alternative resource can be rejected if it is not consistent with the remaining resources in the novice’s existing MO. That is, teacher candidates are likely to reject a teaching strategy that entails group discussions about problem-solving strategies if they believe subject matter consists of discrete facts and skills that need to be memorized through repetition. The challenge for teacher educators, then, is to find a way to change the whole MO rather than to change the individual resources one at a time.

THE CHALLENGE TO TEACHER EDUCATORS

If we define teacher education as a systematic effort to replace candidates’ naive teaching MOs with new teaching MOs, then teacher educators face six major challenges. Next, we examine each of these challenges.

The first challenge is finding time to foster this kind of change. Candidates need time to rethink their prior assumptions, to reconceptualize the task of teaching, and to reconstruct their whole packages of teaching. By the word time, we do not necessarily mean more course credits but rather an arrangement of course credits that is extended over time so that candidates have ample opportunities to reconsider their naive ideas. Conventional teacher education programs often happen within only a one-and-one-half-year time span, from the beginning of the junior year through the middle of the senior year. Students are presumed to be ready to enter student teaching at the end of their senior year, with all of their new professional knowledge in place and ready to use.

The second challenge facing teacher educators is how to address candidates’ naive assumptions. The literature offers two promising but competing ideas for how to do this. On one hand is the notion that new ideas need to be tied in some way to existing ideas so that they can be understood and rendered meaningful to the learner (e.g., essays in Resnick, 1989). On the other hand is the notion that the prior ideas must be challenged and shown to be wanting before learners will be willing to abandon them. The literature on conceptual change (e.g., Posner, Strike, Hewson, & Gertzog, 1982) suggests this approach. Both of these bodies of literature, however, address mainly changes in conceptual understanding, not changes in whole modes of operation.

The third challenge facing teacher educators comes from the fact that the personal resources that contribute to professional expertise are interrelated and mutually supportive. The combinations of knowledge, skills, beliefs, persona, and so forth, that comprise the teaching modes of operations are bundled together and have to be learned as systems of thought and ways of being and behaving. Altering one or two resources without influencing the rest may not yield the kind of change that is desired. Any given teaching act entails, at a minimum, a consideration of both the subject matter and the students, and these two considerations alone bring in not only teachers’ knowledge about each of these but also their assumptions about how learning occurs in general, their notion of what is most important for students to learn, their sense of persona, and their ability to reason about all of these together (Kennedy, 1991). Yet, although the literature on learning and problem solving offers several clues about enhancing individual resources, it offers very little about changing whole systems of thought.

The fourth challenge facing teacher educators is that of situating important ideas in practical contexts that give them meaning. That is, teacher educators must do more than simply change the frame of reference that teachers use when they approach their work. They must also situate knowledge about teaching and learning and situate strategies for handling teaching dilemmas. For, as Brown, Collins, and Duguid (1989) have argued, even simple, presumably stipulative, concepts do not take on the rich and varied meanings practitioners need unless they are learned in the situations to which they apply. Concepts take on increasingly elaborate meanings as they are
encountered in more and diverse situations. Professional expertise cannot be meaningfully attained apart from practice. Bear in mind that all the ideas in candidates' naive MOs are situated, for they were all devised in the context of real classrooms. If new ideas are not situated, the old ideas, those that are part of the naive MO, will remain operative when teachers finally reenter classrooms.

The fifth challenge is that teacher educators must find ways to guide novices in their early practical experiences so that they learn to invoke their new MOs rather than falling back on their naive MOs. That teachers can rarely make this transition to practice is apparent in a substantial body of literature on student teaching and first-year teaching practices. Teachers, like practitioners in law and several other professions, often complain that they learned nothing relevant from their professional education but, instead, learned to teach from their own experiences (Smylie, 1989). Yet, what they learn from their own practice often reinforces their naive MOs, because they haven't become sufficiently facile with their new MOs to use them to interpret their experiences. This is one of the reasons teachers so often learn bad practices rather than good ones from experience (Feiman-Nemser & Buchmann, 1983). Strategies must be devised for assuring that candidates are not overwhelmed by the details and that important concepts are infused into their ruminations about their work. Assuring that practical situations reinforce a new teaching MO, rather than reinforcing the naive teaching MO, is no simple task (Kennedy, 1992).

The sixth challenge for those who want to alter candidates' teaching modes of operation is that teachers can hold strong emotional commitments to their naive MOs. These MOs are, after all, part of their character, part of their identities. They include personas, professional values, dispositions, and ethical codes that are at least as important, perhaps more important, than knowledge and skills. If teacher educators try to alter these personal resources, they are tampering with the very identities of their students and may also be undermining the very reasons why these candidates chose to enter the profession in the first place. It should be no surprise that candidates will resist such efforts. Moreover, teaching is, by its very nature, an anxiety-provoking activity, because it is a public performance, because it involves interpersonal relations with children, and because these children will be making their own interpersonal demands on the teacher. The nature of this performance is such as to engender self-consciousness, fear, and a concomitant resistance to new ideas.

Thus, research on cognition, particularly as it applies to teachers as learners, suggests that the task of creating new modes of operation for teachers presents six important challenges for teacher educators:

- how to extend the learning process over a longer period of time;
- how to confront the naive modes of operation that teacher candidates bring with them;
- how to develop new modes of operation rather than simply adding individual personal resources;
- how to situate new ideas in practical contexts;
- how to guide novice practitioners so that they don't fall back on their naive MOs;
- how to manage candidates' emotional resistance to new modes of operation.

In the next section, we describe a teacher education program under development at Michigan State University that is trying to respond to these six challenges.

**AN ILLUSTRATIVE EFFORT TO IMPROVE TEACHER EDUCATION**

Faculty at Michigan State University are currently trying to develop a new program that builds on this emerging body of cognitive research, as
well as on successful features of our earlier programs (e.g., Roth, Rossen, & Lanier, 1988), and on our research on teacher education and teacher learning (Ball, 1988a; McDermid, 1990; Wilson & Wineburg, 1988). The ideas we present in this chapter still represent gleams in our collective eyes more than a finished program, but they also represent our best predictions about the conditions that will enable candidates to develop new modes of operation—MOs that are more consistent with literature on student learning and more consistent with education reform agendas. Next, we describe the ways in which the program responds to the six challenges just discussed.

**EXTENDING TIME FOR LEARNING**

We have argued that if teacher education is to enable candidates to “unlearn” their prior teaching MOs as well as learn a new one, the program will have to be extended over a longer period of time than are most contemporary teacher education programs. We address the problem of time in three ways. First, students who anticipate enrolling in teacher education can enroll in two required *preadmission* courses that explore learning, learner diversity, and schools. Our hope is that in these courses we can heighten students’ awareness of the assumptions they bring with them and raise questions about teaching and learning that they will continue to ponder over time, using their experiences in other university courses as material for considering these questions. Second, once they enroll in the program, the program itself spans a three-year period extending from the junior year through a fifth year. During the first two of these three years, both elementary and secondary teacher candidates are engaged in professional studies while concomitantly pursuing their subject matter preparation. That is, the actual course credits they take within the *teacher education curriculum* through the fourth year are not increased. Third, the program is a five-year program. Upon completion of the baccalaureate degree, students will enter a full-time, year-long internship in schools that is accompanied by graduate-level coursework. The intent of this design is to provide students with more time to rethink ideas and to change their MOs without having to take significantly more education courses.

**CONFRONTING NAIVE MODES OF OPERATION**

Getting teacher education students to become students of education is not easy. The MOs that candidates bring with them are naively optimistic about their own potential as teachers and often are self-serving. They tend to believe, for instance, that the characteristics of an ideal teacher are the characteristics they already have and that they will not have the difficulties other novice teachers have (Pajares, 1992). These beliefs make them impatient with teacher education courses that raise questions about the goals of education or about why teachers might do what they do. If they expect anything from their teacher education courses, it is a bag of clever tricks that can help them solve occasional logistical problems in their classrooms.

These naive beliefs add to the challenge of teacher education, for teacher educators cannot simply work on the MOs they think teachers need; they have to attend to the assumptions and MOs that candidates bring with them. One task, for instance, is to get candidates to suspend their eagerness to acquire the behaviors that will make them *look* like teachers long enough to help them learn how to *think* like teachers. A critical part of their new MOs, after all, consists of strategic reasoning. Candidates need to learn how to weigh the relative merits of alternative actions in practical situations.

One way to get students to begin thinking strategically about teaching is to ask them to analyze videotaped instances of atypical teaching. Bird (1991) has presented such examples to candidates and asked them to assume that the actions make sense to the teacher and to figure out why it makes sense to that person rather than judging whether the teacher did the “right” thing or not. By granting the most forgiving interpretation to the episode, students are forced to take alternative
points of view in their attempts to understand the dynamics of the situation. Bird argues that by beginning with the actions of real teachers in real situations and then extending the conversation to focus on the “whys” of those actions, teacher educators might be able to overcome some of the candidates’ resistance to serious examination of teaching practices.

Bird (1992) also proposes starting with questions that students have when they come into the program. For example, the most pressing question for students might be “how should teachers manage classrooms?” Faculty might prefer to delay consideration of this important question until a theoretical foundation has been laid for thinking about it. But by addressing the students’ questions first, teacher educators might be able to assure students that the content of the course is actually going to be helpful to them as future teachers. And if students are persuaded, they, in turn, might open themselves up to deeper consideration of the issues of teaching and learning, which is our primary agenda. Bird has found that it does not take long for the conversation to turn from what teachers should do to broader issues of teaching, learning, and subject matter.

Based on our faculty’s experience with a course designed in this way, we now plan to precede our new program with two courses that will be offered prior to admission into the formal teacher education program. The goal of these courses will be to challenge students’ naive beliefs about teaching, learning, learners, and schools. The first of these courses, Reflections on Learning, will introduce students to some of the central questions in education: What is learning? Who is capable of learning what? Where and how does learning happen? What can teachers do to enable learning? The declarative knowledge in this course will be similar to that often taught in educational psychology courses, but the pedagogy will be designed to try to engage many personal resources other than knowledge per se. We hope to get students to use their own experience as learners as the context for considering both the learning experiences of others and a variety of theories of learning and development as well. Not only would such a course encourage students to reconsider some of their naive assumptions, it might also help them apply new insights to their current university experiences. If we can accomplish this latter goal, we also contribute to our goal of extending the learning process over a longer period of time without necessarily increasing the number of course credits students take in education.

The second preeducation course, Human Diversity, Power, and Opportunity in Schools, engages students in similar ways around another critical issue about which they hold many naive beliefs: the nature and consequences of student diversity. Again, in this course, we hope to help students recognize their own deeply embedded attitudes and assumptions about different learner characteristics. Course content will include ways in which teacher attitudes and assumptions might exacerbate student differences and curtail student opportunities to learn. We hope the course will influence the dispositions, ethical codes, and commitments of future teachers as well as their knowledge and beliefs about diverse learners.

DEVELOPING NEW MODES OF OPERATION

We argued above that teacher education programs must find ways of altering integrated systems of thought and action rather than working separately on individual personal resources such as knowledge or skills. One way to do this, of course, is to provide role models for students by becoming the kind of teachers we hope they will become. It is no small matter to teach as we want our students to teach—by questioning, probing, encouraging students to speculate about possibilities, without squelching ideas with which we disagree.

Another approach to this problem is to assure that students have numerous opportunities to make connections among the various ideas they learn of in their courses. The more connections are made, the more likely students are to integrate these ideas into the kind of coherent systems of
thought that are needed to form a new mode of operation. Courses such as those described above are intended to help candidates build new systems of thought about all aspects of teaching—subject matter, learners, learning, context, community, and pedagogy. We hope candidates will also begin to tie these new ideas to nascent observation skills as they analyze videotaped and written cases of teaching and learning. And, through journals, class discussion, conferences with both faculty and practicing teachers, and modeling, we hope to develop habits of strategic reasoning.

In addition to altering the strategies we use in individual courses, we hope to design the course sequence to help novices make connections among the numerous ideas they are learning. We are abandoning the traditional teacher education curriculum, which is organized by content areas, such as educational psychology, reading methods, math methods, classroom management, and so forth. Instead, we are trying to develop a spiraling curriculum that is structured around central questions and problems of practice. While the program will still provide roughly the same knowledge base as before (after all, the faculty have not changed and these are the content areas our faculty value), the goal is to rearrange that content so that it can better help candidates connect ideas to one another and to practical teaching situations.

Connecting the Various Educational Foundations

Although the university recognizes courses as the building blocks of degree programs, we are trying to change the function of courses from one of parceling knowledge into discrete pieces and transmitting them chunk by chunk into one of weaving ideas together to address larger issues. We do this by creating larger credit blocks that allow for the integration of content around six major questions. Two of these questions have been mentioned above: What do students learn in school? and What should and could students learn in school? The other questions are: Who are the diverse students who come to school? What is worth knowing and learning in school? How does one teach that which is worth knowing? and What does it mean to be a professional who is capable of teaching worthwhile knowledge?

The use of these questions to organize course content enables traditional domains of knowledge to be connected to each other and to the goals of teaching. For example, each question can be considered in light of specific subject matter; such as, what do students typically know about photosynthesis or light, and what should they know? Each question can also be answered by thinking about a particular foundational discipline. What, for instance, does cognitive research suggest about how students' naive conceptions contribute or detract from their learning about photosynthesis or light? Similarly, what do anthropologists' findings about culture have to say about enabling diverse learners to comprehend scientific theories?

The courses allow candidates to revisit these questions over time as they become better informed about teaching practices and more able to invoke different modes of operation for teaching.

Connecting Disciplinary Knowledge and Professional Knowledge

We also want to help candidates see the connections between disciplinary knowledge and teaching school subjects. To that end, we are trying to form collaborations that include arts and sciences faculty, education faculty, and K–12 teachers—three populations of teacher educators that have traditionally operated almost independently of one another. This is not a simple task. On one hand, we want future teachers, especially elementary candidates who are typically denied access to upper division courses, to have the same disciplinary knowledge as other students who major in these subjects. On the other hand, we are concerned about the substance and the pedagogy that may be provided in college and university courses. Students often do not learn much about why a discipline is organized as it is, what kinds of questions are considered important and why,
what the central debates are in the field, or how evidence and argument are used in these debates. Yet it is often these most fundamental questions that arise in K–12 classrooms, so that even elementary teachers often must grapple with these questions (Kennedy, 1990). And the teaching they observe in these courses may do more to reinforce their naïve modes of operation than to stimulate the formation of a new mode of operation for teaching.

Though we are only beginning to understand what the content of a disciplinary major for teachers ought to be, we do have some ideas about how to help teachers transform their own subject matter knowledge into subject matter that is both substantively important and engaging for students. For instance, by focusing candidates’ attention on what their students know and believe about a discipline, we might be able to help candidates see the gaps in their own knowledge. The instructional task for faculty is one of helping candidates construct both their own understanding of the subject matter and their understanding of how to help children understand it. The traditional separation between disciplinary knowledge and pedagogical knowledge is one of the most difficult barriers to overcome in any effort to provide teachers with integrated knowledge that can contribute to a coherent mode of operation for teaching.

Connecting Special Education and Regular Education

Another important aspect of integration involves preparation to work with special needs students in the least restrictive environment. Typically, the preparation of special educators is separate from the preparation of regular classroom teachers, but this practice has not served special needs students well (Pugach & Leake, 1991). Many educators and policymakers have therefore supported a move toward more inclusive teacher education. Yet neither regular classroom teachers nor special educators are accustomed to working together. Moreover, though most of our faculty are committed to integrating these content areas, not all are.

Our current thinking is that we should introduce issues related to special students and to the ways schools respond to them early in the curriculum, and we should revisit these issues later on through the use of cases that illustrate dilemmas associated with mainstreaming. Finally, during the internship year, we hope to enable interns to work with both regular and special educators, so that they continue to see the tensions between different perspectives on learning offered by these professionals.

Connecting Courses and Field Experiences

By the term “field experiences,” we mean not only time in schools, either observing or actually teaching, but also time spent examining videotapes and written cases of teaching. All of these provide opportunities to connect theoretical ideas to practical situations. We hope to include in our field experiences not only classroom observations but also some form of involvement with families and community members. We envision a sequence of field experiences tied to the course work, so that the bulk of the content we teach can be “situated” (Brown, Collins, & Duguid, 1989). These experiences will culminate in a fifth-year internship.

The Question of Program Coherence

All of these arguments for promoting connections among new ideas and other personal resources suggest that there must be a great deal of substantive coherence among program components. This is necessary, we suspect, in part because of the need to create teaching modes of operation rather than simply bodies of knowledge, and in part because candidates’ naïve modes of operation are highly resistant to change (Feiman-Nemser & Featherstone, 1992; McDermid, 1992; Bird, 1991; Holt-Reynolds, 1991). The tacit hypothesis behind all of our efforts at drawing connections is that candidates are more likely to build coherent systems of thought and action when their preparation program is also coherent (Barnes, 1987). Long criticized for fragmentation and redundancy, teacher education programs comprised of the usual collection of courses and practicums
experiences are not seen as powerful enough to overcome candidates' naive modes of operation (Bird, 1991; McDiarmid, 1990). A coherent curriculum, on the other hand, might be able to produce a cumulative impact and foster the integration of a wide range of personal resources.

But strong arguments can also be made for not forcing coherence into programs. Procedurally, such a goal entails numerous time-consuming meetings among faculty who are not necessarily like-minded. Intellectually, we face the possibility, as Buchmann and Floden (1990) point out, of indoctrinating students into a "party line" approach to teaching rather than helping them learn to think for themselves. This potential is a serious one, and our faculty are divided on the merits and demerits of curricular coherence. Over the next several years, as these new programs evolve, this issue will be returned to again and again as faculty seeks ways to develop connections across ideas, situations, and other personal resources, while at the same time encouraging candidates to think hard about what they believe about teaching and learning and what is yet unknown about these fundamental questions. We are trying to define program coherence not in terms of a rigid set of student outcomes but as an organized study of a set of teaching problems that can direct both faculty and student energies.

SITUATING IMPORTANT IDEAS IN PRACTICAL CONTEXTS

The fourth challenge facing teacher educators is finding ways to situate the ideas they believe are important, so that students learn to interpret these situations using new, rather than naive, modes of operation. Without situating our messages, candidates are likely to interpret the language we use in terms of their naive modes of operation. A discussion about mathematical problem solving, for instance, can be interpreted as referring to computational problems, when the faculty mean it to refer to problems that require reasoning about mathematical concepts. Or discussions of the writing process are interpreted by candidates as referring to a linear sequence of outlining, developing note cards, and then writing the text. These new concepts will not be correctly understood unless candidates also learn the concrete situations to which they apply.

The need to situate new concepts means that, in addition to changing our curriculum, our pedagogy must also change to accommodate these problems. An important reason for focusing on central questions of teaching is so that students can connect ideas from educational psychology, sociology, and pedagogy to the purposes of teaching, to real classroom situations, and to real classroom decisions. An important reason for exposing students to, and asking them to examine closely, videotaped and written cases of teaching is so that they situate the ideas they are discussing. Instead of the traditional "methods" course that is taught with little or no connection to classroom teaching, we hope to tie issues of method to field experiences that enable candidates to examine what real students know about particular content and how they respond to various representations of new ideas in the discipline. Among the many issues that must be dealt with if we take situated knowledge seriously is that experienced teachers may not be able to articulate their highly situated knowledge so that novices can learn from them (Heaton & Lampert, in press).

GUIDING INTELLECTUAL DEVELOPMENT

Although formal field experiences are universally recognized as an essential component in teacher education, they are also widely recognized for their potential to be more miseducative than educative (Buchmann & Floden, 1990). Most novices enter their first teaching experiences with two different modes of operation. One MO is new, still tentative, fragile, and vague; the other has been developed and elaborated upon since childhood. It is sturdy and is highly situated. Without some forceful assistance in implementing their new modes of operation, candidates are likely to set them aside in favor of their original MOs to get through the difficult early days of teaching.
The internship will be a yearlong, full-time, intensive experience that will include both classroom teaching and systematic study of teaching. On the teaching side, we hope to arrange a variety of experiences that include not only the traditional student-teaching format, with a single intern and a single mentor teacher, but also membership in instructional teams that include experienced classroom teachers and university faculty. Experienced teachers and university faculty will try to emphasize the strategic nature of teaching practice by discussing alternative strategies and by tying these alternatives to theoretical ideas that novices learned about earlier. They will try to model the mode of operation they are trying to foster in novices.

The internship provides an opportunity to develop those personal resources that are hard to influence in a university setting. For instance, it is important not only that students adopt appropriate values and ideals for teaching, but that they also develop the capacity to be the sort of teacher they envision. Thus, prospective teachers must not only want to teach in ways that are productive for student learning, they must also develop the skills to do so (Fullan, 1985). Working with teams can provide a more varied set of opportunities for such development.

One way we hope to encourage better interpretation of field experiences is by providing prospective teachers with experience in a variety of settings and with a range of students. If candidates are to understand students who come from communities different from those the candidates come from, they will need to have field experiences in different kinds of communities (e.g., urban and rural, or urban and suburban). Our current thinking is that we will require experiences in at least two communities and will require candidates to work with a wide range of learners—learners who differ in language, race, gender, and mental and physical abilities. We will ask novices within these settings to cast a critical eye on the way these schools and communities respond to diverse learners. Our hope is that such experiences might further enable candidates to develop alternative modes of operation that are based in a recognition of the potentially negative effect of teacher responses to these learners. Because urban settings offer significantly more difficult contexts for learning, we hope to assure that each teacher candidate can spend a significant portion of time in such a setting.

Since the community surrounding the professional development school provides an important resource for improving student learning, these locations can also offer opportunities for novices to extend their understandings. For example, in one junior high school, Centers for Opportunity have been created so that students can pursue their talents in particular areas. In an elementary school, novices might have a chance to work in Head Start, Smart Start, and other preschool readiness programs. Participation in such an environment would offer novices a model of teaching and student advocacy that is unavailable in typical field experiences, and it would enable them to develop those personal resources that are difficult to address in a university classroom—resources such as the disposition to seek support from others who can meet different aspects of a student’s needs rather than despairing that the problems go beyond their own capacity to respond.

These teaching experiences will be accompanied by two yearlong graduate seminars. One, entitled “Reflection and Inquiry in Teaching Practice,” is being designed to move novices from informal methods of inquiry to more formal strategies for testing ideas in the context of practice. The other, “Professional Role and Community,” is being designed to help novices study the community surrounding the school and to learn to view the school in this larger context.

MANAGING EMOTIONAL RESISTANCE

Just as teaching is both intellectual and practical, it is also highly personal. Teacher candidates enter teacher education with modes of operation that include not only ideas about teaching and learning, but values, ethical codes, personas, dispositions, and other attitudes toward teaching. These MOs not only constitute their personal
resources, but also are an important part of their personal identities. These values and beliefs often define their reasons for choosing teaching as a career in the first place, and challenges to these values can be highly threatening.

Certainly, changes in dispositions and attitudes are more likely to occur in contexts that are supportive and where personal risks are minimized. But it is easier to define than to create the sort of environment we seek. Such environments should foster respect for alternative perspectives, honest exchange of views, openness to critical feedback, willingness to explore feelings as well as ideas, and responsibility for the well-being of others as well as for oneself. We have two strategies for creating such an environment. One is to group students into cohorts, so that they form collegial groups while moving through the program; the other is to create a supportive learning environment for these cohorts.

Cohorts

We plan to organize students into cohorts that stay together throughout the three-year program. We hope that if students proceed through all seminars together and are assigned to the same schools and classrooms, they will develop close relationships with their colleagues so that they have opportunities to vent their feelings and share their confusions as they gradually begin to entertain different ideas about teaching and learning. To promote collegiality among candidates, we will try to place students in groups to carry out focused field assignments. We hope that peer observation and feedback on teaching episodes will become familiar modes for their learning, as will sharing journals and lesson plans. Social occasions are also important opportunities for building trust and personal regard for colleagues. Studying with a group of peers can help candidates develop a persona that integrates their ethical codes, goals, and conceptions of themselves as teachers and as members of the teaching profession.

Cohorts have other advantages as well. Students learn that others depend on them for critical commentary on their thinking and actions. They are, in a very real sense, accountable to each other for the learning and success of all members. The feedback we have received from students who have participated in student cohorts over the past 10 years suggests that they continue to interact with colleagues and are often instigators of cooperative ventures. The habit of seeking feedback and critical discourse, then, can become ingrained to an extent not possible in programs where students take courses according to their own individual schedules.

But there can be a serious downside to cohorts. Unless faculty spend time developing collegial norms of respect, responsibility, and openness to critical feedback and dialogue, cohort members can form cliques that are destructive to personal and professional growth and that reinforce the already strong naive modes of operation. Just having students proceed through a series of courses together is no guarantee that students will overcome the stereotypes and competitive behavior they may have developed as students. Students who perceive themselves to be outstanding students may, in fact, resist cooperative strategies if they perceive that their academic records may suffer because of poor group performance. The ways in which we treat cohorts, then, must be designed to help individuals take responsibility for the learning of other members of the cohort.

A Context That Encourages Self-Examination

We would like to make both university classes and field experiences into environments that develop prospective teachers' dispositions and their capacity to inquire about teaching dilemmas (Wildox et al., 1991). The program is being designed so that a core of faculty will work with a given cohort of students for the entire three-year duration of their program. The idea is that perhaps faculty cohorts can help candidates make connections between disciplinary and pedagogical studies, and between theory and practice. If they know individual students better, faculty may be in a better position to monitor candidates' thinking as well as their own interpretations of the learning situation.
In addition, we want to place candidates in school environments that provide support and encourage risk taking. Professional development schools can provide such environments if teachers in these schools are themselves engaged in self-examination and risk taking. We hope, therefore, to locate interns in professional development schools as much as possible so that novices can observe teachers who are comfortable with different modes of operation and with raising questions about their practice.

**SUMMARY**

Research on learning, and on teacher learning in particular, suggests that the task of teacher education is not merely to give candidates new knowledge about teaching strategies but is, in addition, to help them change their entire way of thinking about teaching: their beliefs about how students learn, about what is important to learn, and about how teachers can facilitate student learning; their knowledge of students, of subject matter, and of teaching; their professional values; their skills, and the persona they adopt as teachers. Given that teacher candidates already hold internally consistent modes of operation that include all of these personal resources, the challenge for teacher educators is to find ways to reveal those MOs to the teacher candidates who possess them, raise questions about their merit, and offer candidates alternative teaching ideas, beliefs, values, and personas with which to develop their roles as teachers.

In an effort to indicate how this view of teacher education and learning to teach might influence the design of teacher education programs, we have described one particular program that is intended to respond to what we now believe about teacher learning and about teacher expertise. The program is still in its formative stages, and no doubt there are other ways in which these findings might be accommodated in teacher education. The most important lesson we draw from this research is that teacher education must respond to new research findings not only by altering the content of its programs, so that candidates learn what researchers have learned, but also by altering their character as well, so that they reflect the learning principles that they espouse to their students.

**FOOTNOTE**

1. We are indebted to numerous faculty at Michigan State University who were involved in developing this new program. The program is still highly formative and will no doubt change in the forthcoming years.

**REFERENCES**


Barnes, H. L. (1987). The conceptual basis for thematic
Implications of Cognitive Science for Teacher Education


Resnick, L. B. (1987). The 1987 presidential address:


