Defining an Ideal Teacher Education Program

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March, 1997

Program standards can take many different forms, as the history of the NCATE attests. One reason they take so many forms is that members of a field often disagree among themselves about what constitutes either essential minimums or ideal maximums. Because many standards are intended to guarantee minimum safeguards, they tend to focus on minimum requirements. When they aim higher, they often settle on uninteresting ideas--those on which an entire field can agree.

The problem is further complicated in teacher education because the enterprise itself has always been viewed with skepticism outside the field. The received wisdom among policy makers and the lay public is that teaching is a self-evident practice, learned mainly in the doing. All one needs is subject matter knowledge and experience. Under the received wisdom model of teacher learning, teachers must learn the subject matter they will teach, typically by studying liberal arts in college, and then must develop and refine their techniques, typically through their own experience. In this model of teacher learning, the formal study of teaching--that which is typically provided in teacher-education courses--contributes only a small part, if anything, to teacher learning. This received wisdom often contributes to policies that restrict the proportion of time teachers can spend in the formal study of teaching, relative to the amount they spend either in liberal arts courses or in practicum situations. Consequently, the formal study of teaching may in fact be a relatively small piece of the entire puzzle of teacher learning.

What should occur during this small portion of teacher education is a matter of debate even among teacher educators. Some believe its main contribution resides in helping novices learn classroom management routines, discipline strategies, and other survival skills. Others believe its main contribution is to imbue in novices a moral and ethical stance. Still others believe its main contribution is to enable teachers to adopt a particular stance toward the subject matter. These disagreements over fundamental purpose, combined with the received wisdom that the formal study of teaching plays a minor role in teacher learning anyway, make it difficult for teacher educators to agree on how best to use the limited time available for the formal study of teaching.

My aim in this paper is to propose a set of ideal standards for teacher education. In this paper, I assume that teacher learning consists of four parts: (1) early childhood experiences, which provide images of what schools are, what classrooms are like, and how teachers and students are supposed to behave in these settings; (2) college-level liberal arts programs, which provide further knowledge of subject matter; (3) the ostensible teacher education program, which provides for the formal study of teaching, and (4) teaching experience itself, which provides a
sense for what to expect from students and the kinds of classroom routines that can be used to organize students and student work. I concentrate on only one of these portions—the formal study of teaching. My approach to the formal study of teaching is to derive a set program ideals from two sources: national standards for teaching and research on teacher learning. The former provides the necessary value judgements about what counts as “good teaching,” and the latter provides an empirical basis for envisioning how such teaching might be fostered. I begin by examining the various national standards for teaching and use these to define the kind of teaching that we want teachers to learn. I contrast these portraits with portraits of actual teaching practices, by way of defining the difference that needs to be overcome if we are to contribute to the national standards. I then examine research on teacher learning to see what it can tell us about learning these forms of teaching. Finally, I examine research on teacher education—that is, the formal study of teaching--to see whether there are forms of it that seem more consistent with the ideas that I have derived from the first two parts of the paper.

Part I: Defining Good Teaching and Typical Teaching

Education is a field that is subject to many fads, and what counts as a good idea varies over time and across locations. Right now, most people are persuaded that the key to educational improvement lies in developing a coherent and integrated system for governing education, so that tests, texts, licencing decisions and other rewards and sanctions all are based on the same set of ideas. These ideas have come to be called standards, and they are being developed within each subject area. In mathematics, the National Council of Teachers of Mathematics (NCTM) took the lead by defining both curricular standards and professional teaching standards. In science, there two major statements of standards, one from the American Association for the Advancement of Sciences (AAAS) and one from the National Research Council of the National Academy of Sciences. Language arts and social studies standards are having more difficulty achieving consensus because of the social and therefore political nature of these subjects. I will therefore concentrate more heavily on the teaching standards that have been developed in mathematics and science. However, I do not want to omit the softer subjects altogether, and so will augment these standards with Hillocks’ review of research on effective teaching practices in writing. This large meta-analysis of research on teaching writing provides an opportunity to define teaching standards, at least in writing, to complement those in mathematics and science.

National Content Teaching Standards

The various statements of standards differ in many of their details, but are remarkably similar in their general tenor. For instance, two of the three math and science sources I draw upon put forward a premise that is worded exactly the same: "What students learn is greatly influenced by how they are taught [emphasis added]" (NCTM 1991, NRC 1996. This statement in itself is remarkable, and represents an important shift in thinking about teaching. In the past, educators have assumed that subject matter and pedagogy were unrelated. In fact, the principal tension in teacher education has been how much time should be spent learning the subject (that is, how much time should be spent in the liberal arts curriculum) and how much should be spent learning pedagogy (in courses offered by education departments). Advocates for more attention to
subject matter assume that good teaching depends largely on the teachers' ability to correctly present the content. Advocates for more attention to pedagogy assume that good teaching depends on the ability to keep students orderly and attentive.

So the statement that what students learn depends on how they are taught introduces a remarkable new idea to educational thought: that the method by which one teaches a subject itself conveys important information to students about the subject matter. How a subject is taught tells students whether the subject is interesting or boring, debatable or authoritative, clear or fuzzy, applied or theoretical, relevant or irrelevant, challenging or routine. Thus pedagogy is no longer defined as a set of techniques that enable teachers to maintain order or to entice students to pay attention, but instead as integral to the substantive goals of teaching.

Let's examine the standards for pedagogy that these organizations put forward to see how pedagogy relates to subject matter. Here I concentrate especially on standards for teaching itself—not for planning or evaluation, or for curriculum, but for the act of teaching particular subjects. Here are the statements of teaching standards from the two main science standard-setters.

**National Research Council, National Science Education Standards (1996)**

Teaching Standard B: Teachers of science guide and facilitate learning. In doing this, teachers

- Focus and support inquiries while interacting with students.
- Orchestrated discourse among students about scientific ideas.
- Challenge students to accept and share responsibility for their own learning.
- Recognize and respond to student diversity and encourage all students to participate fully in science learning.
- Encourage and model the skills of scientific literacy, as well as curiosity, openness to new ideas and data, and skepticism that characterize science. (P 32)

Teaching Standard E: Teachers of science develop communities of science learners that reflect the intellectual rigor of scientific inquiry and the attitudes and social values conducive to science learning. In doing this, teachers--

- Display and demand respect for diverse ideas, skills, and experiences of all students.
- Enable students to have a significant voice in decisions about the content and context for their work and require students to take responsibility for the learning of all members of the community.
- Nurture collaboration among students.
- Structure and facilitate ongoing formal and informal discussions based on a shared understanding of rules of scientific discourse.
- Model and emphasize the skills, attitudes, and values of scientific inquiry (P 46)

**American Association for the Advancement of Science, Science for All Americans (1989):**
[Teaching about science should:]

- Engage students actively [in doing experiments, measuring, etc]
- Concentrate on the collection and use of evidence
- Provide historical perspective
- Insist on clear expression
- Use a team approach
- Do not separate knowledge from finding out
- De-emphasize the memorization of technical vocabulary
- Welcome curiosity
- Reward creativity
- Encourage a spirit of healthy questioning
- Avoid dogmatism
- Promote aesthetic responses

Though there are some differences between these two sets of science teaching standards, there are also some similarities. Both encourage active learning, but AAAS's definition seems to imply that the activity is physical--collecting data, carrying out experiments, etc., whereas the NRC's emphasis is clearly on conversations in the classroom, suggesting that the activity is more intellectual than physical--more "minds-on" than "hands-on". Still, neither set of standards excludes the other; they merely differ in their relative emphasis. Both want students working in teams, both want them raising questions and exploring ideas for themselves, both want students to learn to evaluate ideas using evidence. The pedagogy for science teaching, then, is one that actively engages students in reasoning about scientific phenomena.

Now let's consider the NCTM standards:


Standard 2: The teacher's role in discourse:

The teacher of mathematics should orchestrate discourse by --

- Posing questions and tasks that elicit, engage, and challenge each student's thinking;
- Listening carefully to students' ideas;
- Asking students to clarify and justify their ideas orally and in writing;
- Deciding what to pursue in depth from among the ideas that students bring up during a discussion;
- Deciding when and how to attach mathematical notation and language to students' ideas;
- Monitoring students' participation in discussions and deciding when and how to encourage each student to participate."

(P 35)
Standard 3: Students' role in discourse:
The teacher of mathematics should promote classroom discourse in which students--
- Listen to, respond to, and question the teacher and one another;
- Use a variety of tools to reason, make connections, solve problems, and communicate;
- Initiate problems and questions;
- Make conjectures and present solutions;
- Explore examples and counter examples to investigate a conjecture;
- Try to convince themselves and one another of the validity of particular representations, solutions, conjectures, and answers;
- Rely on mathematical evidence and argument to determine validity.

(P 45)

Like the science standards, the mathematics teaching standards emphasize a classroom in which students are not being told, but instead are being asked. In fact, in both science and mathematics, the tilt goes even further than simply asking students questions, toward encouraging students to ask their own questions.

Now, by way of subject matter contrast, let us consider the kind of teaching that mathematics and science educators want with the kind that Hillocks (1986) found most effective in his review of approaches to teaching students to write. Hillocks defined four main approaches to teaching writing: A presentational approach, which represents what most of us would think of as traditional instruction; a natural-process approach, which is less structured and allows students to write freely on projects of their own choosing and to obtain feedback from peers or the teacher; an environmental approach, which had clear objectives but encouraged more group discussions and activities in the pursuit of those objectives; and an individualized approach, which consists essentially of tutoring. The environmental approach is closest to the teaching approaches that the mathematics and science professions are advocating, in that there is a clear curricular goal, but the content is conceptual rather than factual and students are heavily engaged in reasoning and exploring these concepts. The natural-process approach is more akin to what we might have called an open, or unstructured classroom, in the 1960's.

Hillocks found that the presentational approach had the weakest effect on students' writing--in fact, it was virtually ineffective. The environmental approach was most effective, surpassing both tutoring and the natural process approaches. This finding is important to our work here, for it suggests that there is continuity across at least this liberal-arts subject and the mathematics and sciences subjects. I will refer to these various instructional ideas, across all subject areas, as conceptual approaches to teaching, meaning that the instruction is guided by a set of content goals, rather than being open-ended, but that the content of interest is concepts and strategies rather than facts and procedures, and that the method of teaching involves a lot of student participation in examining, reasoning, evaluating and debating about, these concepts and strategies.
If teachers were to engage in conceptual teaching, they would substantially decrease the predictability of events within their classrooms. When students begin to pose their own questions, raise their own hypotheses in response to their own or others’ questions, and argue the merits of their own or others’ hypotheses using their own understanding of the evidence or of the rules of inference, the range of ideas that may come up in class is unlimited. Moreover, some ideas will be wrong or at least inappropriate to pursue, and some texts will be filled with grammatical errors. Students may make inappropriate analogies, generate questions or hypotheses that are beyond their capabilities to pursue, or generate ideas that, if pursued, will lead them astray, down dead-end alleys or into trivial pursuits. Roth (1989) noted that the questions her students had about biology were not questions she was prepared to answer when she first completed her bachelor’s degree. Students wanted to know such things as whether blood is really blue, what caused hiccups, and how long it takes for oxygen to get from the lungs to the toes.

Clearly, then, teachers need to be able to respond to questions and hypotheses that they might not have anticipated, to provide students with guidance when they get in over their heads, clarify confusions, and to assure that misconceptions aren’t perpetuated. No one expects teachers to move in any direction students want to go, but they do expect teachers to be able to manage classroom discussions of the sort reformers envision. To do that, teachers would need enough knowledge of the subject to recognize which questions are likely to be fruitful and which are likely to be dead-ends. And to do that, in turn, teachers would need a strong sense of direction--of what they hope eventually the class will come to understand.

Typical Teaching

To understand the significance of conceptual teaching, it might be useful to contrast it with the kind of teaching we see most of the time in contemporary American schools. Researchers have studied teaching for some time now, and certain patterns have begun to emerge. Let us, then, review some of these findings.

One important finding from research is that teachers teach most content only for exposure, not for understanding (Porter, 1989). That is, their aim is not to assure that students really understand the concepts they present, but rather only that they have been exposed to them. Moreover, the particular content they teach is largely skills rather than concepts. In mathematics, teachers give ten times the emphasis to skills that they give to concepts or applications. And they are more willing to add more content, even under relatively little external pressure to do so, than they are to remove content (Schwille, et al, 1983).

Content also tends to be fragmented. The recently-released Third International Mathematics and Sciences Study (TIMSS) illustrates this problem. These researchers defined a “characteristic pedagogical flow” for each participating country. The characteristic pedagogical flow in the US consisted of teachers presenting information and directing student activities. The work emphasized procedures, exercises and basic facts, and there was a multiplicity and diversity of
curriculum topics. Individual topics were dealt with briefly and superficially at any given time, and then covered repeatedly across grades, rather than being dealt with once, in depth at a single time in the curriculum (Schmidt, et al, 1996). These findings about US curriculum offerings suggest that contemporary teaching practices stand in sharp contrast to what reformers want to see.

Another finding is that teachers emphasize tasks and routines more than concepts and meaning. Doyle (1986) found, for instance, that teachers presented academic tasks as work assignments with specific completion dates and that teachers stuck to familiar and routine tasks and avoided novel tasks. He argued that conceptual meaning gets lost as a result of these activities. Similarly, McNeil (1985) found that teachers reduced complex ideas into labels and lists, sacrificing depth for breadth. Cultural content, once converted to school content, lost meaning and became artificial, contrived, and subordinated to the controlling purposes of schools.

Both Doyle and McNeil speculate that the reason teachers avoid complex content and novel activities is that such content and activities make classroom management much more difficult (Doyle, 1983; 1986). Complex tasks take longer to do, engender more questions from students, create more confusion and drift (Carter and Doyle, 1987). They and other researchers also note that a central task of teaching is to gain and maintain cooperation from students. To gain student cooperation, teachers often bargain with students and in the process simplify the task requirements (Sedlak et al, 1986). As early as the 1930's, Waller (1932) observed that the dominant principle governing school practices was the authority principle. He noted that domination and subordination were central and essential, and that spontaneity had to be suppressed to maintain this principle.

One further finding which complicates the problem of teacher learning is the literature on the role of childhood experiences in teacher learning. It has now become somewhat of a mantra to say that teachers teach as they were taught. All of us, whether we choose to enter teaching or not, learn about teaching throughout our lives. From kindergarten through twelfth grade, we observe teachers. Those of us who go on to college observe even more teachers, and these teachers are not necessarily any better or different from those we observed when we were younger (Cohen, 1988; McDiarmid, 1990). By the time we receive our bachelor's degree, we have observed teachers for over 3000 days. For those of us who choose to enter teaching, the pervasiveness of this "apprenticeship of observation," both across grade levels and across subject areas, coupled with the sheer volume of time spent observing, yields a deeply entrenched and tacit set of preconceptions about what can and should happen in schools: about the nature of intellectual work and the nature of school subjects, about the teachers' role in facilitating learning, and about the pedagogical implications of student diversity (Haberman, 1985; Lortie, 1975; Nemser, 1983).

So, for instance, if elementary-school teachers present mathematics as a set of procedural rules with no substantive rationale, their students are likely to think that this is what mathematics is and that this is how mathematics should be studied. As adults, they are likely to teach it this way. Similarly, if they studied writing as a set of grammar rules rather than as a way to organize
thoughts and to communicate ideas to others, then this is what they will think writing is and this is how they will think it should be taught and learned. Moreover, these preconceptions are highly likely to be accompanied by an emotional commitment. People who choose teaching as a career not only have ingrained conceptions about what the enterprise is all about, but have chosen teaching as a career precisely because this is what it is all about. They are not committed to the enterprise in the abstract; they are committed to it as they understand it.

Cuban's (1984) history of American teaching examines several hypotheses for why teaching practices seem so resilient and concludes that teachers' preconceptions are a major contributor to this stability. Because of the apprenticeship of observation, we have a system that self-perpetuates across generations. The characteristic pedagogical flow that defines American classrooms is different from what reformers want, but it is the only version of teaching that novice teachers (and experienced teachers, for that matter) may be aware of. Consequently, it is the version of teaching that they aspire to and that they take pride in mastering. Their commitment to traditional teaching practice presents a significant barrier for the task of learning to teach conceptually.

**Part II: Learning to Teach Conceptually**

Teachers' initial conceptions present two challenges to learning to teach conceptually. One is that teachers use these ideas to define their own standards for good teaching (Butt, Raymond, and Yanagishi, 1988, Butt and Raymond, 1989, Kennedy, in press, Lortie, 1975). These early experiences give teachers their ideas about the kind of teachers they want to be. In fact, even when teachers envision themselves as different from their own early teachers, their visions of their own practice are based on an assumption that teaching and learning occur roughly as they always have in schools. Teachers' assumptions about the nature of schools, of classrooms, and of teaching and learning within these contexts, then, are an important contributor to what Hoetker and Ahlbrand (1969) call the *persistence of recitation*.

The second problem is that, since these ideas are formed well before teachers engage in the formal study of teaching, and well before they engage in their own practices and begin to develop and refine their own techniques, they constitute an important backdrop for any examination of teacher learning, whether within formal teacher education programs or in the field. Virtually everything college students and novice teachers encounter and experience is interpreted in light of these early experiences and the conclusions they have drawn from these. It is therefore important to understand the nature of these conceptions and to estimate their malleability. Through this examination, we may eventually arrive at some ideas about the appropriate content and character of teacher education.

In addition, the standards that define conceptual teaching also present problems for teacher learning. First, they make teaching a much more ambiguous enterprise, one that requires many more on-the-spot judgements about what students are actually learning and about what that implies for the teacher's next move. Moreover, student work will be much more unpredictable
and classroom activities more complicated. Such teaching is in direct contradiction with current classroom practice, which trivializes subject matter and emphasizes predictable routines. The second problem presented by conceptual teaching is that teachers have rarely, if ever, witnessed such teaching, so they have no models on which to draw to envision such a practice. Absent appropriate images of what good conceptual teaching should look like and what it should accomplish, they cannot invent such practices on their own.

The Content of Teachers Preconceptions

The significance of teachers’ preconceptions has become increasingly apparent in recent years, and the volume of research on these preconceptions has increased dramatically in the last decade. Variously called values (Gudmundsdottir, 1990), epistemologies (Powell, 1996), conceptions of practice (Freeman, 1993) images of good teaching or bad teaching (Calderhead and Robson, 1991), conceptions of self as teacher (Bullough and Knowles, 1991), and simply beliefs, these ideas have been documented numerous times, with numerous research methods, and in numerous settings. Specific findings are the following:

1. *Preservice teachers enter teacher education programs with images of themselves as teachers.* At the time they enter their teacher education programs, most college students have images of what they will be like as teachers. They envision themselves working with small groups rather than at the board, for instance, or envision themselves as being enthusiastic teachers. These images are often formed in response to their early childhood experiences with teachers, and may be modeled after former teachers or put forward as improvements on their former teachers (Calderhead, 1991; Calderhead and Robson, 1991, Crow, 1987, April; Kagan, 1992; Kennedy, in press).

2. *Preservice teachers are remarkably confident that they will succeed.* Even before they have formally studied teaching, college students are confident that they will be good teachers and that they already possess the most important traits of good teachers. Like debutantes imagining themselves as the bell of the ball, these young people are sure they can enact the images they hold and believe they are already have the personal traits they need--traits such as caring, enthusiasm, dynamism, etc. (Book, Byers and Freeman, 1983; Brookhart and Freeman, 1992; Weinstein, 1989, 1990.)

3. *Teachers care about caring.* Both practicing teachers and students entering preservice teacher education programs generally have altruistic motives for entering teaching and believe that an important contributor to good teaching is that they be caring and nurturing toward their students. They believe it is important to have strong personal relationships with their students and that fostering self-esteem in students is an important--sometimes the most important--goal of teaching (Book, Byers and Freeman, 1983; Brookhart and Freeman, 1992; Bullough and Knowles, 1991; H. J. McLaughlin, 1991; Serew,, Eaker and Forrest, 1994; Weinstein, 1989, 1990).

4. *However, there are contradictions in teachers’ thinking.* Despite their compelling
images and their strong confidence in their teaching potential, preservice teachers ideas are not well thought through and can contain internal contradictions. Contradictions in teachers conceptions usually derive from multiple and conflicting imperatives, such as the imperative to treat all children equally and the imperative to treat each child as an individual. These conflicting ideals create "knots" in teachers’ thinking (Wagner, 1987) which interfere with their ability to think through conflicts reduce their ability to generate satisfactory solutions to the dilemmas they face (Trumball, 1987; Wiggins and Clift, 1995), and often lead to disappointment and disillusionment (Cole and Knowles, 1993). One major tension is between their desire to be caring and their need to control their classes and to teach the curriculum (Bullough and Knowles, 1991; H. J. McLaughlin, 1991).

5. **Teachers’ conceptions influence a wide range of teaching practices.** Several studies have found that teachers' conceptions influence their practices. One approach to this research is to identify teachers who are recognized as different and then examine their conceptions. Agne, et al (1994), for instance, found that teachers who had received awards for "teachers of the year" held more humanistic orientations toward classroom management than comparable teachers who have not been singled out for recognition. Another approach is to solicit information about teachers' conceptions and then observe their teaching practices. For instance, Artiles, et al (1994) found that teachers who attend to different principles for teaching when planning their lessons looked noticeably different on classroom observations. From studies such as these, we know that, for instance, teachers' conceptions about the relative importance of nature and nurture influence their decisions to retain students in grade (Smith and Shepard, 1988) and their expectations of student performance influence their interactions with students so that, for instance, they give less wait-time after asking questions of students from whom they expect little (Good, 1987).

6. **Teachers’ conceptions of subject matter influence the way they teach that subject matter.** Researchers in the subject areas of science, mathematics, literature and reading have examined the relationship between teachers' conceptions of the nature of these subjects and their approaches to teaching these subjects. A consistent relationship between teachers' conceptions and their teaching practices has been found in science (Brickhouse, 1990; Fraser and Tobin, 1991; Powell, 1996) mathematics (Peterson, et al, 1989; Thompson, 1984), literature (Gudmundsdottir, 1990) and reading (Mergendoller and Sacks, 1994). In science, for instance, one teacher may represent scientific theories as truths and another may represent them as tools for learning, depending on what the teachers themselves believe about the nature and role of scientific theories (Brickhouse, 1990), while in literature, teachers make pedagogical decisions and judge student work differently depending on their conceptions about what particular pieces of literature are about. Teachers are more inclined to "deliver" subject matter to students when they believe the subject consists of a fixed body of knowledge, and they are inclined to believe mathematics and sciences are fixed (Stodolsky and Grossman, 1995), in strong contrast to the arguments of the current reform movement.
7. Subject matter and teaching routines are interrelated. I noted earlier that the contemporary reform documents acknowledge a relationship between pedagogy and subject matter by saying that what students learn depends on how they are taught. Several researchers have noted that the routines teachers devise for organizing and managing students and student activities are related to the type of content that is taught. The nature of the relationship, however, is not clear. When Willard Waller first noted that authority was a central issue in teaching, he speculated that tight control was necessary because the curriculum was so boring and unrelated to anything outside of schools. That is, teachers had to adopt highly authoritarian postures in order to make students comply. Other researchers (e.g., Doyle, 1986; McNeil, 1985; Martens, 1992; Tobin, 1987) suggest that boring and trivialized curriculum content is a bi-product of efforts to control students. That is, knowledge becomes trivialized in the act of managing students and orchestrating their work. For these researchers, the need to control comes first, and the trivialized knowledge follows from that. Yet a third interpretation comes from Lortie (1975), who suggests that the ambiguities of classroom life encourage teachers to adopt narrow goals in part because these are easier to achieve and in part because it is easier to measure progress with these goals. That is, progress is easier to see when it is defined as the number of pages covered than when it is defined as how well students understand difficult or complicated ideas. For Lortie, then, the inherent ambiguities of teaching encourage conservatism in teachers and encourage them to cling to tried-and-true practices.

8. Teachers translate educational innovations into practices that are consistent with their conceptions. Several researchers have noted that teachers adapt new materials and activities to match their prior conceptions about teaching, subject matter, and learning. But as was the case with the preceding finding, the reason for these adaptations is not clear. One hypothesis is that teachers are guided by their conceptions about subject matter when they develop and carry out their lessons, so that their adaptations of educational innovations ultimately trivialize the content that is taught through these new devices. Cohen (1990) and Peterson (1990) have shown how well-meaning elementary teachers use materials and activities intended to promote conceptual teaching to teach computation and recitational knowledge of mathematics. Similarly, Applebee (1991) found that it was relatively easy to introduce new techniques into secondary English classrooms, but very difficult to make them work in the way reformers anticipated. Olsen (1988) found similar transformations in science teaching. Another hypothesis is that teachers adapt these innovations because of their need to control students. Applebee (1991), Martens (1992), Duffy and Roehler (1986) and Tobin (1987) all speculated that teachers have difficulty implementing conceptual teaching approaches because these approaches don’t satisfy their needs for maintaining predictable and manageable systems of activities. Their speculations reinforce Carter and Doyle (1987), who suggested that teachers’ interest in gaining cooperation from students motivated them to attend more to products and performance than to the content that is presumably to be learned.
These studies, then, indicate that teachers' conceptions influence their practices in a wide variety of ways and in a variety of subject areas. Moreover, they suggest that practices cannot be changed simply by introducing new materials or new activities, for all teaching materials and activities are necessarily interpreted by teachers in light of their prior conceptions of what teachers and students are supposed to do in classrooms. Taken together, these findings have led reviewers to conclude that teacher conceptions are an important contributor to teaching practice (Brophy, 1991; Kagan, 1992) and an important contributor to the stability of traditional teaching practices (O'Loughlin and Campbell, 1988)--to the persistence of recitation. As a set, teachers' conceptions of their practice differ from the conceptions of reformers and they suggest that, if teacher education programs are to contribute to the reform of teaching, they must find a way to address and to alter these conceptions.

The Malleability of Teachers Preconceptions

Knowing that contemporary practice differs in substantial ways from the kind of conceptual practice reformers seek; knowing that contemporary practice is heavily influenced by teachers' understandings of teaching, learning, and subject matter; and knowing, finally, that many of these ideas are developed during childhood as children observe their teachers and form conceptions of what schooling, teaching and learning are all about, we next need to ask whether such conceptions can be altered.

Teachers, of course, are not the only people with preconceptions. We all have preconceptions about many things, and our practices in all aspects of life are influenced by these conceptions. Psychologists have studied conceptions and their malleability and have derived some general observations about them. Rokeach's (1968) summary of this work argues that our most central conceptions are those that are most connected to other ideas. In addition, conceptions that are connected to our identities, and conceptions that are shared with others, are more central, whereas conceptions that are derived from others are less central, and conceptions having to do with tastes and preferences are least central. In a more recent review, Pajares (1992) adds that conceptions formed early in life are more difficult to alter. Moreover, he notes that conceptions strongly influence behavior and that they strongly influence perceptions of events, so that they are self-reinforcing and self-perpetuating.

These studies do not provide much optimism for changing teaching practices, for teachers conceptions fit many of the criteria for resistance to change: They are formed early in life, they are connected to teachers' identities, and they form highly interconnected systems of ideas--that is, a teachers' conceptions of teaching rest on conceptions about one's role as a teacher, conceptions about what makes one teacher better than another, conceptions about the nature of the subject matter, conceptions about how students learn, and so forth.

Much of the research on teachers' conceptions of teaching support the psychological research on the stability of conceptions. That is, researchers who have followed teacher candidates and novice teachers over time have found that their images often persist throughout their teacher education coursework and throughout their teaching experiences (Aitken and Meldon, 1991; H.

**Contribution of the Formal Study of Teaching to Teacher Learning**

People who call themselves teacher educators usually reside in education departments of colleges and universities. While they offer courses on teaching and learning, they have always recognized that teacher education consists not only of their courses but also of courses offered by the various liberal arts departments and of experiences with veteran teachers. It is now safe to say, in addition, that the process of teacher education begins well before aspiring teachers enter college. A great deal of learning apparently occurs during childhood. Moreover, because the ideas formed during childhood are self-reinforcing—that is, because they serve as filters for interpreting and accepting or rejecting other ideas, they limit the capability of prospective teachers to grasp alternative ideas that might be put forward either during their formal preparation for teaching or during their own experiences teaching.

I draw two important conclusions from these observations. First, learning to teach needs to be defined not as the acquisition of a set of skills or moves, and not as the acquisition of a theory of teaching or learning, but rather as a process of *changing one's conceptions of teaching*. The unusual nature of teacher learning is such that students entering teacher education already "know" a great deal about their chosen field. Moreover, they will use what they already know to interpret any new skills or new theories they acquire during the formal study of teaching. This fact means that the simple acquisition of new skills or theories is not adequate to alter teaching practices. Therefore, *the central task of teacher learning* must be to change these conceptions.

My second conclusion is that the most likely place for such changes in conceptions to occur is when students engage in the formal study of teaching. Even though college students learn a great deal about subject matter from their liberal arts courses, it is unlikely that they would learn anything in these courses that would change their initial conceptions of teaching. The pedagogies practiced in liberal arts courses do not provide better models of teaching (Cohen, 1988), and the content they offer does not explicitly address the act of teaching itself. Therefore, a *central task for the formal study of teaching* must be to change these conceptions. How this might be done is the topic of the next section.

**Part III: Program Standards that Respond to Teaching Standards**

Several things make it difficult to define program standards that respond to national teaching standards. One of these is that national teaching standards themselves have not existed for very long, and consequently we have not had much opportunity to study the relative merits of teaching teachers these standards. Another is that the research on the significance of teachers' conceptions, though not entirely new, has virtually crescendoed in the past decade, to the point where its significance to teacher education has just recently become apparent. Finally, most research on teacher education has assumed that appropriate outcomes consisted of increases in
knowledge or skills, and has not examined the extent to which these new ideas or skills have been re-interpreted in light of prior conceptions of teaching. For all of these reasons, there is a dearth of literature on the relationship between formal teacher education coursework and changes in teachers’ conceptions.

Moreover, there is likely to continue to be a dearth of evidence on the relationship between the content and character of teacher education, on one hand, and teaching practices on the other. One reason such studies don’t exist is that they would require researchers to follow teachers longitudinally for some 6-8 years, from their entry into teacher education programs through the first several years of their teaching. Another reason is that such studies would need to examine multiple and diverse teacher education programs, so that the relative merits of alternative approaches can be discerned. Yet another is that such studies would require strong conceptual frameworks to define relevant dimensions of teacher education for purposes of contrast and at present our knowledge of these is still weak. Still another is that such studies would need to sort out the differential influences of the formal study of teaching, on one side, and the other side, the liberal arts education which teachers are receiving concurrently. And finally, such studies would require a definition of good teaching that could be agreed upon by many people and that could be measured reasonably well. Thus, research on the relationship between the formal study of teaching, on one side, and teaching practices on the other, would require a degree of social consensus that we presently lack, a degree of methodological sophistication that we lack, and a degree of financial backing that we have not been willing to provide, absent the social consensus and necessary methodological sophistication.

The standards I propose below are therefore speculative, but are based as much as possible on available research.

1. Teacher education programs should explicitly work to change candidates’ preconceptions about teaching.

Three aspects of teacher candidates' initial thinking are particularly important to change. One is their strong confidence that they already have what it takes to be a good teacher, and that, therefore, they have little to learn from the formal study of teaching. Different candidates may have different conceptions of themselves as teachers--some envision themselves as nurturing, some as dynamic or enthusiastic-- but regardless of the images they hold, there is a naivete in their thinking, an unspoken assumption that their students will respond to their personal qualities. Unless candidates are persuaded early on that teaching is not as self-evident as they believe, they will not be motivated to attend much to, or to think hard about, the ideas their professors offer. Second, they need to be persuaded that school subjects consist of more than the facts and rules they themselves learned as children. Teachers conceptions of subject matter as fixed, indisputable, and factual, need to be replaced with conceptions that recognize ambiguous concepts and tentativeness, and that acknowledge that even young children are capable of reasoning about and arguing about ideas in each school subject. Unless teachers envision subject matter as conceptual, they cannot teach it conceptually. And third, teacher educators need to address and alter teacher candidates' strong desire to control student behavior, for the desire to
develop management routines that keep students on task and in line is frequently a stumbling block to implementing conceptual approaches to teaching.

Unless teacher education programs work explicitly to alter teachers' conceptions in these ways, they cannot be sure that any content they teach will be understood in the way they intend it to be understood. For instance, candidates may take a course in methods for teaching mathematics that emphasizes problem solving, and may interpret the word "problem" as meaning a computational problem.

This is no simple feat: the evidence outlined above suggests that these conceptions are not very malleable. Moreover, there has been very little research on how such conceptions might be altered. This standard, therefore, does not say exactly how teacher educators can actually alter these preconceptions. But it does suggest that such an effort should be an explicit part of the formal study of teaching.

There are some useful theoretical ideas to draw upon. Some researchers have advocated borrowing from science education the theory of conceptual change that has guided much thinking on science teaching and learning (Posner et al, 1982). The theory of conceptual change suggests four conditions necessary for conceptual change to occur: The learner must be dissatisfied with his or her existing conception; a new conception must be available and understandable, the new conception must be plausible, and the new conception must be fruitful; that is, it must have explanatory power. Pintrich et al (1993) have called this model of conceptual change a "cold" model, in that it does not account for the motivational and affective components of learning. They recommend modifying it with a "hot" model, one that does take account of these aspects of learning.

There are also some suggestions for approaches to changing these conceptions. Some authors have had success (e.g., Florio-Ruane and Lensmire, 1990; Carpenter et al, 1989) by focusing on how students learn subject matter rather than on, say, the nature of the subject matter itself or on the teacher's role in the classroom. This approach capitalizes on teachers' desire to care about their students and does not threaten their assumptions about the subject matter or their authority in the classroom. It allows the entire interrelated system of conceptions to be entered through the back door, so to speak.

Others believe that the key lies in having teachers examine videotapes of teaching episodes and raising questions about what is happening in these episodes. It is possible to imagine that such a pedagogy could create the four necessary conditions of conceptual change, but very little research is available to substantiate this idea.

Finally, still others have suggested that teacher candidates need opportunities to reflect on their own childhood experiences, and that this reflection will somehow create the necessary conditions for conceptual change. While volumes have been written about this idea, very little evidence exists to suggest that reflective exercises contribute to different conceptions of teaching, subject matter, or learning.
The most difficult problem facing this proposed standard, however, is that only a small fraction of contemporary teacher educators define their task as changing teachers' preconceptions. Until this is seen as a legitimate goal for the formal study of teaching, we will not make much progress in determining appropriate ways to do it.

2. **The content of teacher education programs should align with extant subject matter standards.** This means that the formal study of teaching should focus on teaching important ideas in core academic subjects rather than on generic teaching skills such as lesson planning and classroom management.

My second proposed standard reflects the current national trend toward systemic change organized around subject matter standards, in which textbooks, tests, credentialing, and other rewards and sanctions are designed to be internally consistent. Preservice teacher education is an important piece of the system that needs to be aligned with other pieces.

I mentioned earlier the scarcity of research on the actual content of teacher education programs. One study that does address program content, however, is Graber's (1996) examination of a program in physical education. The program defined physical education as a conceptual, rather than an activity-based, subject. It's distinctive and coherent substantive orientation ultimately influenced student's conceptions of the subject of physical education and their conceptions of how that subject should be taught. A study that I recently completed (Kennedy, in press), found similar influences in the subject of writing. I examined changes in teacher's ideas as they participated in eight teacher-education programs, and I contrasted programs which were oriented toward conceptual teaching of subject matter with programs that had traditional orientations. By traditional orientation, I mean that the curriculum includes courses in, say, child psychology or instructional management without regard to how these issues relate to teaching particular academic content. I found that this difference in program content did indeed make a difference in how teachers conceived of the teaching of writing. For instance, when asked at the beginning of their teacher education programs how they would respond to a student text, most candidates corrected all the punctuation and grammar errors they saw in the text. However, when they had completed their programs, these teachers responded differently depending on the orientation of the programs they attended. At the end of their programs, when responding to a student text, teachers who had attended reform-oriented programs were more likely to consider the student's intentions, while those who studied in traditional programs were even more likely to enumerate errors in punctuation and grammar at the end of the programs than they had been at the beginning. There is evidence, then, that the content of teacher education programs makes a difference in teachers' conceptions of the subject matter and in their conceptions of how they should teach that subject matter.

Right now, however, many teacher education programs follow the traditional curriculum. A great deal of the content of teacher education focuses on generic issues such as child psychology or classroom management or teaching techniques without regard for the relationship between technique and subject matter. They do not realize that their emphasis on these techniques often tacitly reinforces a view of subject matter as fixed and factual. Although there usually are
courses on teaching particular subject areas--reading methods, mathematics methods, and so forth, there are also many courses unrelated to subject matter--courses in classroom management, child psychology, the identification of handicapping conditions, and so forth. Moreover, even those courses that address subject-specific methods often provide techniques and gimmicks without regard to their substantive implications.

This bifurcation between teaching technique and school subject matter occurs in part because teacher educators themselves are not well versed in particular subjects. As one remedy, Berliner (1991) has suggested that educational psychologists themselves need to develop expertise in a particular subject area, and to conduct research on teaching within that domain rather than attempting to study teaching without regard to subject matter. Just as he argues for couching all research on teaching in the context of particular subjects, I am suggesting, similarly, that all of the discussions of teaching and learning be couched in the context of particular subjects.

3. The content of teacher education programs should emphasize the relationship between teaching and learning.

This standard is intended to address the complex relationship between subject matter and teaching routines. I mentioned above that there were disagreements about whether teaching routines created trivial subject matter or whether teachers' conceptions of subject matter contributed to the routines they employed. This difficult relationship has led to two very different proposals for how to ease novices into teaching. One proposal is to give teachers a more sophisticated understanding of the content they are teaching, and of how students learn that content. The argument here is that if teachers themselves understand the subject matter differently, they will teach it differently. The other proposal is to respond to novices' immediate survival needs by helping them learn routines for managing both students and student activities. The argument here is that, once teachers have their routines in place, we can then help them think about the subject matter more.

Neither of these approaches acknowledges the tight relationship between teaching routines and what students learn. An exclusive focus on the conceptual nature of school subjects ignores teachers' needs to translate that subject matter into do-able classroom activities and routines. Conversely, an exclusive focus on the development of routines overlooks the subtle ways in which these routines trivialize school subjects. What is needed is opportunities for teachers to examine the relationship between the routines and the activities they organize for students, on one side, and on the other, the kinds of intellectual activities these routines foster. Brown and McIntyre's (1993) study of teachers offers us one approach to this task. They found that teaching routines are aimed at what they call Normal Desired States of pupil activity, and that these “NDSs” constitute the criteria by which teachers judge their practices. For some teachers, a normal desired state might consist of everyone sitting quietly, while for others it might consist of everyone asking questions and arguing. Viewed in this way, the study of the relationship between subject matter and teaching routines and is an elaboration of the standard proposed earlier, of explicitly trying to change teachers' conceptions of subject matter and of what an ideal
classroom looks like, for this relationship is a major piece of teaching that is missing in most naive conceptions of teaching.

4. **Teacher education programs should prepare teachers to be consumers of research.**

This standard may seem like a non-sequitur, but it is not. Research is one of the few places in which teachers can find examinations of the relationship between teaching practices and what students learn. By learning to read and understand research, teachers learn not only more about the relationship between teaching and learning, but also more about how to examine this relationship for themselves. I don't mean by this that teachers should be able to grasp studies using multiple regression or hierarchical linear modeling, but rather that teachers should be able to read and understand studies of teaching practices such as Stevenson and Stigler's (1992) comparison of Asian and American classrooms, Brown and Palincsar's (1984) study of reciprocal teaching, or Scardemalia and Bereiter's (1986) study of the use of prompts in writing instruction. Studies such as these are explicit about the relationship between teaching routines and the kind of intellectual work they demand of students.

5. **Cooperating teachers should practice in ways that are consistent with the national standards for teaching.**

The power of the student teaching experience in learning to teach has been acknowledged for some time, either with praise or with blame. Students frequently cite their student teaching experience as most significant contribution to their learning, and at the same time, faculty frequently disparage student teaching experiences for their conservative influence on novices' practices. Hoy and Woolfolk's (1990) study documents the power of these experiences on teachers, but also shows their down side. They compared changes among students participating in a methods course, a developmental psychology course, and a student teaching experience. They found that only those involved in student teaching changed their attitudes over time, and the change was toward a more custodial view of pupil management.

In fact, most of the research on student teaching is about the negative influences of this portion of teacher education, and much of it attributes these outcomes to the conceptions and practices of cooperating teachers. Goodman (1986), for instance, noted that the teaching his students observed was very procedural and skill-oriented and that the main emphasis was on classroom management. And MacIntyre and Killian (1986) noted that most of the conversations between novices and cooperating teachers were about issues such as unions and merit pay, and that only a very small fraction involved feedback to the novice on her teaching. Tabachnik et al (1979-80) examined the work that student teachers did in schools and found that their activities were frequently limited to relatively mechanical tasks such as teaching short-term skills, testing, or managing recitations. Zeichner and Liston (1987) suggest that the historically-dominant conception of student teaching as an apprenticeship--that is, a time to observe and emulate--makes it difficult to establish alternative forms of student teaching.
Despite these studies of the negative influences of student teaching, the few studies that indicate real changes in students' conceptions of teaching occur in programs in which the practicum played a central role. In all of these cases, however, the cooperating teachers' practices were consistent with the program's conceptions of good teaching (Cochran-Smith, 1991; Graber, 1996; Kennedy, in press).

Like most of the standards I have proposed here, the problem with this one is that few extant teacher-education programs have found a way to create strong connections between the formal study of teaching and the student teaching experience. Teacher education is not a priority in schools, so that teachers have little incentive to engage in teacher education. In addition, many programs of teacher education are so large that hundreds of placements are needed each year, more than can reasonably be obtained with any serious measure of quality control. Finally, the kind of conceptual teaching needed—the kind advocated in the reform standards—is rare (If it were commonplace, reformers would feel no need to reform!). Consequently, it is extremely difficult for teacher education programs to find or develop a sufficient cadre of cooperating teachers to serve their practicum needs.

6. Cooperating teachers should receive training in mentoring.

Some of the studies I cited above, having to do with the character of student teaching experiences, suggest that cooperating teachers are not providing novices with useful feedback on their teaching. This should not be surprising, in that teachers' own knowledge is often tacit and in that many have never been given guidance on how to supervise novice teachers. But there are two important reasons to demand that cooperating teachers become more explicit in their mentoring role. Both derive from research in cognitive psychology.

One of these is the notion of cognitive apprenticeship (Collins, Brown and Holum 1992). These authors argue that thought processes can be taught through apprenticeship just as skills can, provided that these thought processes are made visible to novices. That is, in an apprenticeship, novices first observe the expert and then try to emulate the expert's behavior as the expert observes and coaches. For cognitive apprenticeship to work in teacher learning, mentor teachers would need to make their own thinking explicit so that it can be observed by novices. The second idea from cognitive psychology is situated cognition, a term that refers to our use of concrete situations to learn the meaning of various concepts (Brown, Collins and Duguid 1989). Situated cognition enables us to recognize everything from a beanbag to a barstool as a chair, even though we would be hard-put to develop a formal definition of a chair that covered all of this territory.

Applying these ideas to student teaching suggests that novices need mentors who can reason aloud and discuss their reasoning with novices and who can illustrate teaching routines that control student activities without sacrificing intellectual content.

Some Closing Caveats
These six standards might better be called program ideals than program standards, for two reasons. First, they are unlikely to be met by many—perhaps any—programs of teacher education at this time. Second, many of them are put forward with a lack of specific details about how they can or should be accomplished. Still, to the extent possible, I have tried to derive these from prevailing standards for good teaching and from extant research on teacher learning and on the influences of teacher education on teacher learning. In fact, there are several other possible program ideals that I have not proposed because of lack of evidence. Some authors, for instance, have noted that teacher education curricula often consist of an agglomeration of unrelated courses and suggest that they would be more influential of their various courses were conceptually consistent and followed logically from one another. This idea is consistent with my first proposed standard, that programs at least have a conceptual orientation, and that their orientation should match the national teaching standards. However, in absence of any clear evidence about how program particulars are organized, I have not included coordinated content as a standard here. Similarly, some authors have argued that students should move through their teacher education programs in cohorts, taking this planned sequence of courses together. Cohorts enable students to form their first collegial relationships, can facilitate the emotional adjustments that necessarily accompany conceptual change when deeply-held conceptions are at stake, and can facilitate the social construction of new conceptions of teaching (Graber, 1996; Kennedy and Barnes, 1994). Again, while this idea has appeal, there is very little evidence at this point to argue either for or against the formation of cohorts in teacher education programs.

An important question not addressed by this paper is whether any teacher education program in this country could ever attain these ideals. The fact teachers learn so much from their childhood experiences means we have a self-perpetuating system in which mediocre teaching practice begets mediocre teaching practice. Whether, even with more resources and better technology, it would be possible to break this cycle is a serious question. Moreover, teacher educators and educational policy makers are part of this self-perpetuating system. Many of them hold the same conceptions of teaching that novice teachers hold, and hence see no reason to generate the needed resources and technologies to try to break the cycle. Right now, for instance, even though professional development is high on the rhetorical pages about improving teacher education, funding for professional development, and for research on professional development, has not changed.

For all of these reasons, then, it is important to consider these proposed program standards as ideals to strive for more than as standards to judge by.
References


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Roth, K. J. (March, 1989) *Subject matter knowledge for teaching science: Or, How long does it take oxygen to get to the cells?* Paper presented at the annual meeting of the American Educational Research Association, San Francisco.


Attachment: Possible Indicators

The indicators are not very refined, and are offered here more by way of clarifying what I mean by the standards I have proposed than as indicators that could be adopted tomorrow.

1. Teacher educators should explicitly work to change candidates’ preconceptions about teaching.

--evidence that early courses in TE programs require students to re-visit their own experiences in schools and the assumptions they have made about subject matter, learning subject matter, and teaching subject matter.

--evidence that early courses in TE programs place candidates in positions that raise questions about their innate ability to teach and shake their self confidence.

--evidence that TE programs emphasize the difference between facts and concepts in school subjects and emphasize the importance of students reasoning about concepts.

--evidence that TE graduates adopt conceptual goals for teaching school subjects

2. The content of teacher education programs should align with extant standards for teaching school subjects. This means that the formal study of teaching should focus on important ideas in core academic subjects rather than on generic teaching skills such as lesson planning and classroom management.

--evidence that TE courses include opportunities for candidates to evaluate student products for evidence of what students understand and do not understand about important ideas in each school subject.

--evidence that TE programs include opportunities for candidates to evaluate popular elementary textbooks for their attention to important concepts and for the kind of intellectual work they demand of students.

--evidence that TE graduates justify their lesson plans and their approaches to teaching according to the concepts they want students to learn, and that these concepts are included in national subject matter standards.

3. The content of teacher education programs should emphasize the relationship between teaching and learning.
--evidence that TE courses include analyses of real teaching episodes that attend to not only to the teachers' moves but also to the intellectual activity that students are engaged in, and to how the teachers' behaviors encourage this kind of intellectual activity.

--evidence that TE programs alert candidates to the types of misconceptions students frequently develop in mathematics and science, to the teaching techniques that promote misconceptions and to teaching techniques that can be used to monitor and prevent them.

--evidence that TE graduates are aware of teaching practices such as reciprocal teaching, cognitive apprenticeships, and the writing process, which are defined according to what students learn rather than according only to how teachers behave.

4. Teacher education programs should prepare teachers to be consumers of research.

--evidence that original pieces of research are included in students' reading assignments

5. Cooperating teachers should practice in ways that are consistent with national standards for teaching.

--evidence that the TE program has a set of standards for cooperating teachers.

--evidence that these standards are consistent with national standards for teaching subject matter

--evidence that TE programs monitor the teaching practices of cooperating teachers.

6. Cooperating teachers should receive training in mentoring.

--evidence that the TE program has provided seminars or inservice programs for cooperating teachers that define their roles and responsibilities
Endnotes

1. This article was originally prepared for the National Council for Accreditation of Teacher education. While I appreciate NCATE’s support for the development of this piece, no official endorsement by NCATE should be inferred.