In the 1980s new methods and findings from cognitive psychology began to influence research on teaching. The emerging literature on commonalities in expertise across different fields seemed pertinent to educational researchers because it appeared to describe characteristics of effective teachers. So without much theory to guide them, a few scholars began to explore expertise in teaching and this work produced some well-warranted assertions about expertise in pedagogy (Berliner, 1987; 1994a; 1994b; 2001).

Propositions about the nature of expertise in pedagogy

Among the propositions that have strong support are the following: expert teachers often develop automaticity and routinization for the repetitive operations that are needed to accomplish their goals; expert teachers are more sensitive to the task demands and social situation when solving pedagogical problems; expert teachers are more opportunistic and flexible in their teaching than are novices; expert teachers represent problems in qualitatively different ways than do novices; expert teachers have fast and accurate pattern recognition capabilities, while novices can not always make sense of what they experience; expert teachers perceive meaningful patterns in the domain in which they are experienced; and although expert teachers may begin to solve problems slower, they bring richer and more personal sources of information to bear on the problem they are trying to solve.

One other well-supported proposition about expertise in general that quickly became established in studies of teaching is that: *Expertise is specific to a domain, and to particular contexts in domains, and is developed over hundreds and thousands of hours.* This one proposition is described more thoroughly, next, to illustrate the nature of the warrant that exists for this proposition, but this kind of experimental and theoretical support exists for all the other propositions that have been noted.
In the general literature on expertise expert radiologists were estimated to have looked at 100,000 X-rays while chess experts had spent 10,000-20,000 hours looking at and thinking about chess positions. One golf expert has hit an estimated 4 million golf balls as he strived to master and then maintain his golf ball driving ability. Time and experience play a similar role in the development of pedagogical expertise. The expert teacher, say with seven years experience, has spent a minimum of 7,000 hours in classrooms as a teacher. Furthermore, if the teacher entered the profession through a regular university course of study, an additional 1,000 hours might have been spent as a student teacher and classroom aide. Moreover, those hours would have been preceded by at least 15,000 hours in classrooms as a student, though it is unknown if the experience as a student is of any value in the development of expertise. Certainly experience alone will not make a teacher an expert, but it is likely that almost every expert pedagogue has had extensive classroom experience.

**Time and expertise.** The question is often asked about how long it might take to develop expertise, if one ever develops expertise? In the field of education an approximate answer to this question can be provided.

Teachers’ anecdotes in The United States inform us it takes 3-5 years until they are no longer surprised by what happens to them in their schools and classrooms. A lack of surprise in one’s work environment may be thought of as the achievement of competence in one’s work. In Australia, Turner (1995) found that non-exemplary experienced teachers claimed it took them 2.5 years to learn to teach. Exemplary experienced teachers thought it took them almost twice that long, 4.5 years. Turner noted that learning to teach is primarily about learning to codify knowledge in order to draw on it again. And for those that become exemplary, learning to teach is probably also about complexifying rather than simplifying the world in which they work. The exemplary teachers in Turner’s study developed a far more complex view of their working worlds than did the non-exemplary teachers. Their more complex view assisted them in responding to the many challenges, demands, disappointments, and achievements encountered in their teaching careers.”

Omar Lopez (1995), working in Texas, obtained access to achievement test data from about 6,000 teachers and their more than 100,000 students. He plotted the relationship between scores on the standardized achievement test and years of teaching experience. He discovered that for beginning teachers the scores of their students were higher every year during the first seven years of their teaching. Throughout their first seven years new teachers apparently learn more of the knowledge and skill that is needed to improve the scores of their students. Their students’ scores hit asymptote in about their seventh year of teaching. Scores stayed at that level for about 17 more years before showing a small decline during the last few years of a teacher’s career.

So a reasonable answer to the question of how long it takes to acquire high levels of skill as a teacher might be 5-7 years, if one works hard at it. Competence as a teacher might come about two years earlier, but achieving that level of ability also requires some work.

From inquiries about what makes for expertise in sports come indications about how one’s time for learning can be spent most productively (Ericsson, 1996). For example, ratings of the importance of various influences on the development of expertise in ice-skating were obtained from coaches and expert ice-skaters who compete at the national team level.
Natural ability—talent—was rated 6th of 12 factors in order of importance by the coaches, and 10th by the skaters. Among this group of coaches and athletes the number one quality believed to be necessary for attaining unusually high levels of performance was the desire to be excellent. These data inform us that in some domains of human performance motivation may be more important for achieving success than talent.

Good coaching was rated as the second most important variable in development of expertise, while practice was rated as the third most important variable. (Starkes, Deakin, Allard, Hodges, & Hayes, 1996). These findings have implications for learning to teach. Desire to achieve excellence is usually not a problem with teachers, since many new teachers see teaching as a calling, a mission of sorts. Imbued with this belief many teachers have a missionary’s desire to do well. But teachers usually get no practice after student teaching, and typically have no coaching or mentoring as they learn their craft. The first few thousand hours of teaching experience might be spent better learning under the direction of a mentor or coach and further improved by having opportunities to practice some performances over and over again, as do gymnasts and ice skaters. It seems likely that the five, seven, or more years needed for motivated teachers to acquire expertise might be shortened or be made richer if some coaching and deliberate practice were to take place. That does not happen in the USA and this failure to provide these kinds of opportunities could restrict what and how much is learned when beginning to teach.

Domain Specific knowledge and expertise. For many experts the domain specific knowledge that is acquired through lengthy experience is contextualized. For example, in one of our research studies, experts, advanced beginners, and novice teachers were asked to teach a 30 minute lesson on probability to a group of high school students (Berliner, Stein, Sabers, Clarridge, Cushing, and Pinnegar, 1988). Teachers were given 30 minutes to plan the lesson. While they taught they were videotaped, and after the lesson, during stimulated recall, they were asked to tell us about their thinking and justify their actions during teaching. Despite the fact that the experts performing this task were judged to be better teachers on a number of dimensions, the task triggered a good deal of anger among them. One of them quit the study, another broke down and cried in the middle of the study, and all were unhappy they participated. They all reported their fears about performing well when we moved them from their own classrooms to the laboratory situation we had created for them to teach in.

Furthermore, we had allocated 30 minutes for planning, enough for advanced beginners and novices to feel comfortable. But the experts claimed they needed more time. One suggested three hours, while another claimed to need three weeks to prepare that material. Our interviews revealed that experts rarely entered their classrooms without having taken the time they need to 1) thoroughly understand the content they will teach and 2) plan one or more activities to teach that content.

The experts also noted that they did not know the students in this situation and that their pedagogical expertise depended, in part, on knowing their students well. Interviews revealed that the experts:

- know the cognitive abilities of the students they teach regularly, thus giving them insight for determining the level at which to teach;
know their regular students personally, so that in their own classrooms they did not need to rely on bureaucratic and formal mechanisms of control while teaching, as they did in the experiment; and

- have a history with the students in their own classrooms and the lack of a shared history hampered them in the experiment. They explained that in their own schools students knew who they were and had certain expectations about what their teaching would be like. These teachers always had students who expected to be well taught and to learn a great deal, even if they were pushed to their intellectual limits.

When facing a group of strangers, as in our teaching laboratory, none of these three aspects of “knowing the students” was present, and the teachers claimed to have suffered from that. In addition, all the experts commented on the problems created by their inability to use routines. Routines have been found to be a basic part of an experts’ performance in many fields. It appeared that by taking these experts out of their classrooms, we had taken away the particular context in which they had learned to excel.

In another study (Bullough and Baughman, 1997), a highly accomplished teacher whose development was followed for many years switched from one school to another. She found herself much less adept as a teacher and her sense of failure at the new school greatly demoralized her. In still another study Stader, Colyer and Berliner (1990) found that when watching video-tapes of instruction, expert teachers could not decide whether students whom they did not know were comprehending lesson materials or not. The experts’ performance at inferring student comprehension from non-verbal cues was no different than that of novices and advanced beginners. But when the experts studied videotapes of students whom they did know, their accuracy in prediction of student comprehension of the lessons went up. Their knowledge of students was specific, depending on things they knew about the child’s personality, typical behavior, and past performance. They did not have this knowledge in a generalizable form.

Schemp, Manross, Tan, & Fincher (1998) studied physical education experts in and out of their area of expertise. They found that the same teacher who was judged to be proficient at teaching fitness activities could be woefully lacking when it came to teaching racket sports. They claimed that even the experts’ passion for teaching was reduced if they had to teach in areas in which they did not believe they had expertise.

So a continuing set of studies in and out of education informs us that expertise is quite often circumscribed. Knowledge, for the most part, is contextually bound. Cognitions are connected to actions and to places; they are situated. Thus expert pedagogues, like experts in many other fields, are likely to excel in their own domain and in particular contexts within that domain.

Exceptions to the rule: While highly contextualized knowledge may be considered the general rule, a few experts seem different. And because of that we have learned to make a distinction between “adaptive expertise” and the more restrictive kind we noted above. Hatano (1990), for example, describes the sushi expert that follows recipes and the one that is more creative, the difference, perhaps, between artisans and virtuosos (Bransford, Brown,
and Cocking, 1999). Patel, Kaufman and Magder (1996) distinguish between specific and generic knowledge among expert physicians. Bertrand, Cellier & Giroux (1994) remarked on the general indexing skills of professional indexers and the specific indexing skills that come from practicing indexing in a specific scientific subject area. My own research team privately talked about our “top experts” and other experts in our research studies. We had no name for these unique individuals, but the label “adaptive expert” would fit the behavior we saw. Bereiter and Scardamalia (1993) make a useful distinction about these differences in expertise using concepts from the psychology of intelligence. They distinguish between crystallized and fluid expertise. Crystallized expertise consists of intact procedures that have been thoroughly learned through experience, brought forth and used in relatively familiar tasks. Fluid expertise consists of abilities that come into play when novel or challenging tasks are confronted by an expert.

Adaptive or fluid experts appear to learn throughout their careers, bringing the expertise they possess to bear on new problems, and finding ways to tie the new situations they encounter to the knowledge base they have. Wineburg (1998) has documented a case of this kind using two professors of history as his subjects. The two expert historians studied and talked aloud about a set of primary documents that were in the area of expertise of only one of these historians. The historian working with documents out of his area at first responded much like novices did when confronted with the same documents. But as this historian worked through the documents, his questions “began to cluster around a set of constructs and relationships that proved crucial to his understanding. Despite early stumbling…adaptive expertise was evident by task’s end, when an interpretive structure that made sense of these issues came into view”. (p. 338).

For the historian working out of his field fluid expertise was needed. Because of these fluid abilities, in the end, the two historians looked much more alike than they did in the beginning.

So research in pedagogy and in other areas informs us that lengthy time commitments are needed to learn domain-specific, contextualized knowledge and that this knowledge provides the basis for expertise in pedagogy. The research also teaches us that expertise is often of a limited kind, but that at least some experts can use the same rich stores of domain specific knowledge as a basis for adaptive and fluid expertise. This latter kind of expertise allows knowledge and skills to be transferred across domains and contexts. Experts, like other humans, are not all alike.

Policy implications. From a brief look at this single proposition, six policy implications for teaching are derived. For one, alternative teacher training programs that require little or no classroom observation and little or no student teaching may be placing novice teachers at great risk of failure in their early years. Furthermore, individuals from such programs may be at risk of not growing suitably as professional educators, making the achievement of competency or expertise more problematic.

A second policy implication is that coaching matters in the acquisition of complex skills such as teaching. Estimates are that mentorship and coaching programs for new teachers reduce teacher dropouts in their first three years by 50%, particularly in schools where the
students are hardest to teach. In addition, mentorship and coaching programs markedly increase the novices’ satisfaction with the teaching profession.

A third implication is that settings to practice lessons might do much to improve skill acquisition by teachers. For example, “lesson study” is practiced in Japan, though not in American or European schools. In lesson study colleagues watch and critique a fellow teachers classroom lesson. This provides teachers in Japan the chance to “polish the stone,” that is, to hone lessons to perfection. (Lewis & Tsuchida, 1998). Lesson study and other forms of deliberate practice and coached performance seem to be beneficial activities in teacher development, but are not now used extensively.

The fourth policy implication is derived from the contextual boundedness of expertise. This implies that a K-12 certificate, a license to teach at any level of schooling, is probably inappropriate. Exemplary performance by a teacher at the 10th grade does not automatically mean that exemplary performance will be seen at the 4th grade if that teacher were to change grades. A fifth policy implication that follows from the contextualization of knowledge is that expert teachers working in the suburbs, or the inner city, may be much less competent should they attempt to switch environments. Finally, because contextualized knowledge is not easily generalized or transferred, we can anticipate that there will be too many false negatives identified in the licensure tests and advanced testing of teachers. Paper and pencil tests or assessment exercises that resemble simulations may identify too many teachers as non-exemplary because those teachers were assessed outside of the context in which they excel. Valid judgments about the degree of expertise a teacher possesses may be obtained only from observing them in their own classrooms, or perhaps by rating video-tapes of their teaching. Both of these assessment strategies, however, are expensive.

Theories for describing the development of expertise

In trying to elaborate and draw out policy implications from one well-warranted proposition about expertise, above, the words expert, novice, competent, advanced beginner and development were used more than once. These seemed appropriate in the contexts in which they were used and probably caused the reader no confusion. This illustrates how difficult it is to discuss the differences between experts and others without a vocabulary that describes some progression in ability. It is natural to think that some kind of stage theory might describe individuals as they move from beginner to highly accomplished in some domain or endeavor.

A theory from cognitive psychology. A modern, cognitive three-stage theory has been provided by Glaser (1996). He describes the development of expertise abstractly, conceiving of emerging expertise as a change in agency over time. The first stage Glaser calls externally supported, involving environmental structuring for the initial acquisition of the skills needed by the novice teacher, musician or athlete. The young performer is influenced by the dedication, interest, and the support of coaches, parents, practitioners in the field, and others who are significant in their lives. Here Glaser gives prominence to the importance of
social learning and communities of practice, representing the influence of Vygotsky on psychology.

Glaser labels the second stage transitional. This stage is characterized by a decrease in the scaffolding used for and by the novice performer. This is accompanied by a concomitant increase in apprenticeship, so that more guided practice can take place. During this period self-monitoring and self-regulation techniques are learned, and high standards for performance begin to be set. Glaser’s concern with apprenticeship at this stage is also compatible with Vygotskian psychology.

The third stage Glaser calls self-regulatory. In this stage the developing expert comes to control his or her own learning environments. The developing experts learn to set their own conditions for deliberate practice, they arrange for the feedback they need, and they choose the level of challenge for their own development.

The three stages focus on changing agency during learning, from supported learning to increasingly self-controlled, self-monitored, and self-reinforced learning. This descriptive theory seems more appropriate to learning in an area where one performs as an individual, as in chess or ice-skating. The theory seems less relevant to other kinds of learning where social constraints on behavior are stronger, as in learning to teach or to be a nurse.

A heuristic model of teacher development. Teacher education in the US universities is charged with recruitment, preservice training, induction into the profession, and professional development. This suggests that we teacher educators are responsible for the development of competence, at the least, among the teachers we graduate. Competence is really the goal we strive for, but development does not stop there. Dreyfus and Dreyfus (1986) provide a heuristic theory for thinking about teacher development that both fit our data and the mission of teacher education. Adapted for a teacher education audience, and with examples from research on teaching, the five-stage theory begins with the novice stage.

The novice stage of development. At this stage the commonplaces of an environment must be discriminated, the elements of the tasks to be performed need to be labeled and learned, and the novice must be given a set of context free rules. In education the commonplaces number four: Someone (usually a teacher) is teaching something (mathematics, reading, some piece of the curriculum) to someone else (usually a student) in some context (usually a public school classroom or school). The practical knowledge associated with these four commonplaces is extensive and comprises most of what novice teachers must learn. The novice teacher is also taught the meaning of terms like higher-order questions, reinforcement, and learning disabled. Novices are taught context free rules such as “give praise for right answers,” “wait three seconds after asking a higher-order question,” and “never personally criticize a student.” At least a limited understanding of the commonplaces and some context free rules are what is needed to begin to teach.

The behavior of the novice is usually rational, relatively inflexible, and tends to conform to whatever rules and procedures they were told to follow. Only minimal skill at the tasks of teaching should be expected of a novice. This is a stage for learning the objective facts and features of situations. It is a stage for the gaining of experience. It is the stage at which real
world experience appears to the learner to be far more important than verbal information, as attested to by generations of student teachers. Student teachers and many first year teachers are ordinarily considered to be novices.

The advanced beginner stage of development. As experience is gained, the novice becomes an advanced beginner. Many second and third year teachers are likely to be in this important developmental stage. This is when experience can become melded with verbal knowledge, where episodic and case knowledge is built up. Without meaningful past episodes and cases to relate the experience of the present to, individuals are unsure of themselves; they do not know what to do or not to do. It is by means of case knowledge that similarities across contexts can be recognized.

In education we often notice novices and advanced beginners having difficulty knowing what to do when a child challenges the teachers authority, or neurotically seeks the teachers attention, or boasts of their “A” on a test. Such incidents in teaching are common but they are understood much better after the second and third time they happen. Case knowledge—learning from each of those types of incidents—seems to be the basis for expertise among clinical personnel such as physicians, auto mechanics and teachers, alike.

Case knowledge is a part of the practical knowledge that teachers must acquire. Practical knowledge starts to build during this second stage of development and is acquired slowly throughout a teacher’s career. It is practical knowledge, not theories or textbooks that is the proximal guide for a good deal of a teachers’ classroom behavior (Van Driel, Beijaard, And Verloop, 2001). Two important features of practical knowledge are that it is action-oriented knowledge and that it is generally acquired without direct help from others. It is what is sometimes called “the wisdom of practice.” Such wisdom is derived from teaching experiences that are both positive and negative. What is important is that the experiences of the advanced beginner—cases, incidents, success and failures—are reflected on and turned into something useful to guide their own teaching practice.

A third feature of teachers’ practical knowledge is that it is person- and context-bound, providing teachers the skills to succeed in their particular teaching contexts. Like expertise in general, teachers’ practical knowledge is situated knowledge. A final feature to recognize in the building of practical knowledge is that it is often implicit or tacit knowledge. Teachers, therefore, are not always able to articulate their practical knowledge. Because of this, experienced teachers appear to have a harder time than other experienced professionals in sharing their knowledge with novices.

The advanced beginner stage is also the time when conditional and strategic knowledge is built up. Practical knowledge eventually informs the advanced beginner about when to ignore or break rules, and when to follow them, as context determines behavior to an ever-increasing degree. For example, a teacher may discover that praise doesn’t always have the desired effect, as when a low ability child interprets it as communicating low expectations. So the general rule about praise must be made conditional or strategic. Teachers might also eventually learn that personal and strong criticism, after a bad performance by a usually good student, can be quite motivating for that student. Thus the rule about never personally criticizing a student can be violated under certain conditions.
While experience is affecting behavior, the advanced beginner may still have no sense of what is important. During these early years novices and advanced beginners learn to label and describe events, follow rules, recognize and classify contexts, but they cannot yet reliably determine what will happen through personal agency. The acceptance of full, personal responsibility for classroom instruction typically occurs only after a teacher believes they have personal agency, willfully and actively choosing what to do. This occurs more frequently in the next stage of development, the stage of competence.

The competent stage of development. Stage 3 is the competent stage, where further experience and motivation to succeed allow most of the advanced beginners to become competent performers in their domain of interest—nursing, piloting a plane, driving a car or teaching. Not all advanced beginners, however, reach this level. Evidence exists that some teachers remain “fixed” at a less than competent level of performance (Borko, 1992; Eisenhart and Jones, 1992). Nevertheless it is believed that many third, fourth and fifth year teachers, as well as more experienced teachers, reach a level of performance that we might consider to be competent.

There are two distinguishing characteristics of the competent performer of a skill. First, they make conscious choices about what they are going to do. They set priorities and decide on plans. They have rational goals and choose sensible means for reaching the ends they have in mind. Secondly, while enacting their skill, they can determine what is and what is not important. From their experience they know what to attend to and what to ignore. This is the stage at which teachers stop making timing errors (intervening in an activity at the wrong time) and they no longer make targeting errors (identifying the wrong student to do a task or as the culprit in a classroom problem). This is also when teachers learn to make sensible curriculum and instruction decisions, such as when to stay with a topic and when to move on, based on particular teaching contexts and particular characteristics of students.

Because they are more personally in control of the events around them, following their own plans, teachers at the competent stage tend to feel more responsibility for what happens. But the competent performer is not yet very fast, fluid or flexible in their behavior. These are characteristics of the final two stages in the development of expertise.

The proficient stage of development. The proficient level is the fourth stage of development. It is estimated that sometime after approximately five years of experience a small number of teachers will move beyond competence, moving into the proficient stage of development. This is the stage at which intuition or know-how becomes prominent. Nothing mysterious is meant by these terms. Consider learning to dance. At some point in the learning process individuals no longer count their steps while keeping time to the music. They simply develop a more “intuitive” sense of dancing. Teachers are no different.

Furthermore, out of the wealth of experience the proficient individual has accumulated comes a holistic way of viewing the situations they encounter. They recognize similarities among events that the novice fails to see. That is the residue of experience. The proficient teacher may notice, without conscious effort, that today’s mathematics lesson is bogging down for the same reason that last week’s spelling lesson “bombed.” At some higher level of
pattern recognition, the similarities between disparate events are understood. This holistic recognition of patterns allows the proficient teacher to predict classroom events more precisely. Compared to a novice they can predict when a student might start to act out, when the class begins to get bored, or when their students are confused or excited. These teachers can read the patterns in the classroom as air traffic controllers can read locations of planes on a radar screen. Their rich case knowledge can be brought to bear on the problems they encounter or predict. The proficient performer, however, while intuitive in pattern recognition and in ways of knowing, is likely still to be analytic and deliberative in deciding what to do. The proficient stage is the stage of most tournament chess and bridge players. But the grand masters are those few who move to a stage higher, to the expert level.

The expert stage of development. If the novice is deliberate, the advanced beginner insightful, the competent performer rational, and the proficient performer intuitive, we might categorize the expert as often being arational. Experts have both an intuitive grasp of the situation and seem to sense in non-analytic and non-deliberative ways the appropriate response to be made. They show fluid performance, as we all do when we no longer have to choose our words when speaking, or think about where to place our feet when walking. We simply talk and walk in an apparently effortless manner. The expert ice-skater, no less than the expert teacher in classroom recitations, seems to know where to be or what to do at the right time.

Experts engage in performance in a qualitatively different way than do novice or competent performers. They are more like the race car driver or fighter pilot who talk of becoming one with their machine, or the science teacher who reports that the lesson just moved along so beautifully today that she never really had to teach. The experts are not consciously choosing what to attend to and what to do. They are acting effortlessly, fluidly, and in a sense this is arational because it is not easily described as deductive or analytic behavior. Though beyond the usual meaning of rational, since neither calculation or deliberative thought are involved, the behavior of the expert is certainly not irrational. Insight into the behavior of the expert teacher can be obtained from the writings of Schon (1983), as he discusses knowledge-in-action, and from the work of Polya (1954), for his discussion of the role played by tacit knowledge in problem solving.

Experts do things that usually work, and thus, when things are proceeding without a hitch, experts are not solving problems or making decisions in the usual sense of those terms. They “go with the flow,” as it is sometimes described. When anomalies occur, when things do not work out as planned or something atypical is noted, deliberate analytic processes are brought to bear upon the situation. But when things are going smoothly experts rarely appear to be reflective about their performance.

I believe that this theory of development offered by Dreyfus and Dreyfus (1986) has heuristic value for thinking about educating and evaluating teachers, as can be seen in the work of Hammerness, Darling-Hammond & Shulman (2002) and Sullivan, Vogler Coleman & Jones, 2002). It is a theory that is reasonably well supported by data from research on expertise in pedagogy, though it was not created with pedagogy in mind. As we worked with the theory we were sometimes tempted to combine the proficient and expert stage, these
The performance of expert teachers

The study of expertise in pedagogy has been hampered by two factors. It has been harder to identify expert teachers than, say, expert chess players or physics problem-solvers. And it has been difficult to document whether the behavior of expert teachers has positive effects on student achievement, a reasonable demand to accompany the claim that one is an expert teacher. Fortunately, research on both issues is emerging.

Objective criteria for designating expert teachers have been created. (Bond, Smith, Baker, and Hattie, 2000). This program of research was begun in 1987 by the newly formed National Board of Professional Teacher Standards (NBPTS). In its mission statement the Board promised to establish high and rigorous standards for what accomplished teachers should know and be able to do, and to develop and operate a national voluntary system to assess and certify teachers who meet those standards. Through standards and assessments the Board intended to identify and certify highly accomplished, expert, or master teachers in approximately thirty different areas of teaching, such as middle school language arts, or secondary level biology (National Board for Professional Teaching Standards, 1994).

Rigorous assessments to become Board certified were prepared for each teaching area. Assessments include portfolios and videotapes of classroom teaching submitted by each candidate, as well as hours of testing at an assessment center. Preparation for the assessment requires a few hundred hours over a one-year period. Because the development and scoring of the tests is expensive and time consuming, the cost of taking the test is US$ 2,300. The passing rate for these various tests is relatively low, making them a challenge, a tournament of sorts, that identifies experts as would a bridge tournament or an Olympic competition. But two reasonable questions surface immediately: Do teachers identified as accomplished on the basis of this assessment actually perform in their classrooms in the ways that experts are expected to? And do such teachers affect student achievement positively?

On the basis of the literature on expertise in teaching (e. g. Berliner, 1994a, b; Shulman, 1987) Bond et al. (2000) chose to specify expert classroom performance as consisting of a number of prototypic characteristics, and invented unique measures to assess each one. For example, Bond et al. asserted that the expert teacher (like other experts) has extensive and accessible knowledge. Applied to teachers this would be knowledge about classrooms, subject matter and classroom context. Trained observers and analysts assessed this feature of expertise by analyzing and numerically coding teachers’ classroom lessons and transcripts obtained from interviews with the teachers. Highly trained raters searched for evidence of
organization and re-organization of knowledge, connections of the teachers’ knowledge to other school subjects, and the connection of the teachers’ knowledge to the prior and future learning of their students.

A total of thirteen prototypical features of expertise were hypothesized, and measures were created for each feature. These features or characteristics hypothesized to be held by expert teachers were: better use of knowledge; extensive pedagogical content knowledge, including deep representations of subject matter knowledge; better problem solving strategies; better adaptation and modification of goals for diverse learners including better skills for improvisation; better decision making; more challenging objectives; better classroom climate; better perception of classroom events including a better ability to read the cues from students; greater sensitivity to context; better monitoring of learning and providing feedback to students; more frequent testing of hypotheses; greater respect for students; and the display of more passion for teaching.

For each prototypical feature raters were trained to acceptable levels of reliability and performed their analyses blind with regards to the skill level of the teachers they were assessing.

The outcomes of instruction for students of expert teachers were hypothesized as well. These included: higher motivation to learn and higher feelings of self-efficacy, higher levels of achievement, and deeper, rather than surface understanding of the subject matter.

To assess the presence of these prototypic features of expert teachers two samples of teachers were recruited from among those who had attempted to obtain National Board Certification in the areas of Middle Grade Level/Generalist, or Early Adolescent Level/English Language Arts. One of the comparison groups (N=31) consisted of those who passed the National Board tests, the other comparison group consisted of those who did not achieve Board certification through the assessment tests (N=34). All the teachers were well experienced, had prepared diligently for the examinations, and spent considerable amounts of money to demonstrate they were highly accomplished teachers. This is important because the comparison of the prototypical features of expertise, and of the outcomes of the two groups, were not between expert and non-expert. These comparisons were between equally experienced, well-prepared teachers, all of whom thought they were highly accomplished. Thus this was a very conservative investigation of whether the Board assessments could really identify expertise in teaching.

The results of this recent study are quite remarkable. The Board certified teachers, in comparison to those that failed to meet the Board standards on the assessments, excelled on each and every prototypical feature, with statistical significance of those differences achieved in 11 of the 13 comparisons of the features. When looked at as effect sizes, the differences between these two highly experienced groups ranged from just over one-quarter of a standard deviation to 1.13 standard deviations in favor of the Board certified teachers. Thus, teachers found to be expert on the basis of the assessments of the NBPTS were anywhere from 8 percentile ranks to 37 percentile ranks higher on measures of their use of knowledge, the depth of their representations of knowledge, their expressed passion, their problem-solving skills, and so forth.

The features with the greatest ability to discriminate between the expert/non-expert
teachers were the degree of challenge that the curriculum offered, the teachers’ ability for
deep representations of the subject matter, and the teachers’ skillfulness in monitoring and
providing feedback to his/her students. This study provides evidence that the National Board
assessment identifies expert teachers, individuals whose behavior resembles what research
has determined to be characteristics of experts in teaching and in other fields.

But what about student outcomes? Over a dozen scales were used to measure the
motivation and self-efficacy of the students of these two groups of teachers. These results
revealed few differences.

Student achievement was evaluated through written assignments. But covariates
reflecting initial ability of the students could not be obtained, so these data are untrustworthy.
On the analysis of student work samples, however, 74 percent of those obtained from the
students of Board Certified teachers demonstrated higher understanding through more
relational and more abstract student work. Only 29 percent of the work samples from the
students of the non-Board Certified teachers showed these characteristics. The authors of
this study note that through its assessments the National Board is “identifying and certifying
teachers that are producing students who differ in profound and important ways from those
taught by less proficient teachers. These students appear to exhibit an understanding of
concepts targeted in instruction that is more integrated, more coherent, and at a higher level
of abstraction than understanding achieved by other students (p. 113).”

In sum, Board certified teachers designated as experts from rigorous assessments,
met the criteria for expertise set forth in the prototypic model of expertise derived from the
research on expertise. And they had students whose work samples were of higher quality
than a comparable group of experienced, well-prepared, and confident teachers.

More recently the test scores of 600,000 elementary students from North Carolina
were examined over a 3-year period by a research team unconnected with the National
Board (Goldhaber and Anthony, 2004). They found that Board Certified Teachers were far
more likely to improve student achievement on the state’s standardized tests than non-
Board Certified Teachers. In this study Board Certified Teachers raised student achievement
about seven percent more on math and reading tests than did teachers who took the tests
but failed to get certified. The Board Certified Teachers had their greatest impact with
younger and with low-income students, with the scores of these students up to 15 percent
higher than the scores of students who did not have Board Certified Teachers.

Finally, Vandevroot, Amrein-Beardsley and Berliner (2004), examined the standardized
test scores of students from 35 Board Certified elementary teachers were compared with
the scores from students in the classes of their fellow (non-Board Certified) teachers.
Analyses of covariance were used to assess adjusted gain scores in 4 separate years, over
four different grades, and on three different outcomes of the SAT9 standardized tests. This
produced 48 different assessments of the gains in classes of Board Certified Teachers vs.
non-Board Certified Teachers who worked in the same schools and districts. The gains for
the students of the Board Certified Teachers exceeded those of the non-Board Certified
Teachers in 35 cases, with 11 of those being statistically significant. In no case were the
gains for students of the non-Board Certified Teachers significant. The effect size in this
study was equivalent to one months greater growth in achievement for the students of the

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Board certified teachers compared to the students of the non-Board certified students. Students of Nationally Board Certified teachers, that is teachers recognized to be expert, or exemplary or accomplished, who have students achieve more.

**Conclusion**

The search for expert pedagogues has proven successful. From a disparate and unconnected set of investigations of expertise in teaching has come a set of propositions about expert teachers that are similar to propositions about expertise in the general literature on expertise. Experts in teaching share characteristics of experts in more prestigious fields such as chess, medical diagnosis, and physics problem solving. Thus there is no basis to believe that there are differences in the sophistication of the cognitive processes used by teachers and experts in other fields. This is an important conclusion for educators who are generally held in low esteem by the public.

In addition, a theory for describing the development of expertise has been assessed and found to have heuristic value. This theory helps teacher educators, in particular, think deeper about the abilities and competencies of teachers in various stages of their careers. Thus expectations for performance and the design of training might be better matched to the developmental level of teachers.

Finally, we now have evidence that those who are identified as experts through the National Board Certification do, in fact, behave in classrooms as experts are expected to. These accomplished or expert teachers also have learned the skills required to increase their students test scores beyond that of non-expert or less-accomplished teachers. The related fields of research on teaching, teacher education and public policy concerned with teachers have all benefited enormously from the study of expertise in teaching. And the psychological study of expertise across different fields is richer for having this literature on expertise in pedagogy available.

**References**


NATIONAL BOARD FOR PROFESSIONAL TEACHING STANDARDS (1994): *What teachers should know and be able to do*. Detroit, MI. Author.


