DOCUMENT RESUME

ED 395 022 TM 025 039

AUTHOR	Reynolds, Anne
TITLE	Developing a Comprehensive Teacher Assessment Program: New Pylons on a Well-Worn Path.
INSTITUTION	Educational Testing Service, Princeton, N.J.
REPORT NO	ETS-RR-90-2
PUB DATE	Mar 90
NOTE	66p.; The figure on page 25 should read "Figure 3" not "Figure 4" as stated.
PUB TYPE	Reports - Evaluative/Feasibility (142) -- Information Analyses (070)
EDRS PRICE	MF01/PC03 Plus Postage.
DESCRIPTORS	*Beginning Teachers; Classroom Techniques; *Comprehensive Programs; Educational Assessment; Educational Planning; *Knowledge Base for Teaching; Knowledge Level; Models; Professional Development; *Teacher Evaluation; *Teaching (Occupation); Teaching Methods; Teaching Skills

ABSTRACT

A conceptual framework is constructed to integrate teacher actions, teacher knowledge, and state of the art assessment methodologies. Section 1 discusses teaching in terms of tasks, and Section 2 considers the knowledge base teachers draw on in order to accomplish those tasks. Section 3 illustrates the relationship between teacher actions and teacher knowledge. Section 4 details assessment forms appropriate for measuring teacher knowledge and actions. Section 5 brings together actions, knowledge, and assessment forms to describe a program of teacher assessment in four stages. Stage 1 is a checkpoint designed to protect the prospective teacher's students from educational harm by examining the teachers's enabling skills. Stage 2 addresses the teacher's content knowledge and teaching skills and knowledge. In Stage 3, whether the entry-level teacher can apply the skills and knowledge in the classroom is assessed. Stage 4 then asks if the teacher can demonstrate professional excellence over time. This conceptual framework may help in planning appropriate teacher assessments for the future. (Contains 4 figures and 123 references.) (SLD)

RESEARCH REPORT

DEVELOPING A COMPREHENSIVE TEACHER ASSESSMENT PROGRAM: NEW PYLONS ON A WELL-WORN PATH

Anne Reynolds

Educational Testing Service
Princeton, New Jersey
March 1990

ERRATA RR-90-2

Developing a Comprehensive Teacher Assessment Program: New Pylons on a Well-Worn Path

Anne Reynolds

The figure on p. 25 should read "Figure 3" and not Figure 4 as stated.

Developing a Comprehensive Teacher Assessment Program:

New Pylons on a Well-Worn Path

Anne Reynolds

Educational Testing Service

Running Head: NEW PYLONS ON A WELL-WORN PATH

Developing a Comprehensive Teacher Assessment Program:

New Pylons on a Well-Worn Path[1]

Many have trod the teacher assessment path--some with behavioral checklists in hand, others with notepad and pen, still others with bubbled answer sheets. Guiding their way have been a jumble of markers: effective teacher behaviors, teacher education curriculum objectives, evaluation methodologies, and so forth. In this paper, I organize this jumble of markers into new pylons for the well-worn path. In short, I construct a conceptual framework that integrates teacher actions, teacher knowledge, and state of the art assessment methodologies. Such a framework is critical for the improvement of teacher assessments and for enhancing teacher education curricula and continuing education activities. At the same time, the framework pinpoints areas for future educational research.

In Section I of the paper, I discuss teacher actions, that is, the job of teaching in terms of tasks. In Section II, I move to the knowledge base teachers draw on in order to accomplish the tasks of teaching. Section III illustrates the relationship between teacher actions and teacher knowledge. Section IV details assessment forms appropriate for measuring teacher knowledge and actions. In Section V, I bring together teacher actions, teacher knowledge, and assessment forms to describe a program of teacher assessment. I conclude the paper with some final thoughts about future research in the assessment of teaching.

---

[1]Heartfelt thanks go to the many people who reviewed this manuscript throughout its multiple incarnations: Carol Dwyer, Don Powers, Walter Emmerich, Doug Fiero, Sue Street, Catherine Havrilesky, and Pat Bukatko.

Teacher Actions

Teachers perform myriad tasks during the school year, from selecting instructional techniques for a particular lesson to reporting defacement of school property. To develop the teacher actions arm of the theoretical framework, I drew on past and current job analyses of teaching, the pedagogical process model proposed by Shulman and Sykes (1986), and a review of state observation systems (Logan, Garland, & Ellett, 1988; 1989). Each of these sources helped me to define and organize the tasks of teaching.

In 1986, Rosenfeld, Thornton, and Skurnik conducted a job analysis to describe the professional functions of teachers. The focus of their study was on the most important tasks performed by all teachers regardless of grade level or subject matter taught. The scholars carried out a literature search of publications that described the work teachers do, the characteristics they have, and the demands imposed on them by their jobs. Rosenfeld, Thornton, and Skurnik also conducted interviews with classroom teachers in three geographic regions of the country in order to capture the tasks of teaching not found in the literature. They rounded out their survey with teacher knowledge statements, which were derived from test specifications for the NTE Core Battery. Advisory panels helped the researchers refine the survey, which was subsequently mailed to 3,456 teachers and 148 administrators in three school districts in Georgia, California, and New Jersey.

A job analysis of teaching is now underway at Educational Testing Service (Rosenfeld, Reynolds, Wilder, Freeberg, & Bukatko, in progress). This new job analysis builds on the previous study, but differs significantly from it in three ways: (1) instead of one instrument, three survey instruments (one each for elementary, middle, and secondary school teachers) were created by several groups of elementary,

middle, and secondary school teachers in four geographic areas around the United States; (2) the survey was sent to a larger sample of educators--approximately 33,000 teachers, 1500 administrators, and 1800 teacher educators across the United States; (3) rather than include knowledge domains for teaching, the content of these surveys focused on teaching tasks. The teaching tasks were grouped into six domains: Planning Instruction, Implementing Instruction, Managing the Classroom, Evaluating Student Learning and Instructional Effectiveness, Administrative Responsibilities, and Other Professional Responsibilities.

While the job analyses describe most of the overt behaviors of teaching and detail non-instructional activities, the Shulman and Sykes (1986) pedagogical process model spotlights instruction from a cognitive perspective. As they describe it, the pedagogical process consists of seven major activities: (1) Comprehension, (2) Preparation, (3) Transformation, (4) Adaptation, (5) Presentation, (6) Evaluation, and (7) Reflection. The activities in the process

> correspond to the steps of coming to understand the material oneself, reviewing it critically in the light of one's own understanding, modifying the representations of the ideas to conform to pedagogical principles, adapting those representations to fit the characteristics of the students to be taught, presenting the ideas to the class and dealing effectively with questions and student responses, evaluating the quality of what has been learned and taught, and finally, reviewing the lesson and reflecting on what can be learned from the full experience. (p. 15)

After incorporating the pedagogical process model into the job analyses, I turned to a study of eight large-scale state performance observation systems (Logan, Garland, &

Ellett, 1988; 1989). In this study, the researchers performed a content analysis of the tasks measured in each system. Their results grouped teaching tasks into four major domains: Planning for Instruction and Student Assessment, Classroom Management, Learning Environment, and Instruction. Each of the domains consisted of a number of task statements, which I crossed with the task statements from the job analyses and pedagogical process model to ensure that the important tasks of teaching were covered.

Since my purpose in this paper is to define the domains, I do not discuss what the most important teaching tasks are, how to do the tasks effectively, or at what point in a teacher's career she or he should be expected to perform the task competently. These are issues to be resolved by the job analysis survey results and deliberations by experts in the field. The six domains are listed in Figure 1.

PLANNING INSTRUCTION refers to the first stage of the pedagogical process, that is, the act of preparing subject matter to be delivered to students. I modified the pedagogical process model proposed by Shulman and Sykes (1986) to include four phases of planning. First, teachers comprehend what they will teach and the materials they will use to teach it, that is, they make sense of the content to be taught in light of their subject matter preparation. Second, teachers critique the content, materials and possible teaching methods with regard to student abilities, context, available resources, time constraints, and their own beliefs about teaching and subject matter. They adapt the content, plans, and materials to their own context and students. Finally, they prepare the plans, materials, and physical space for the lesson. Though I have numerically ordered these steps for purposes of clarity, it is reasonable to assume that they occur simultaneously or in some other order depending on the circumstances.

I. PLANNING INSTRUCTION
Comprehend content and materials
Critique content, materials, and possible teaching methods
Adapt content, plans, and materials
Prepare plans, materials, and physical space

II. IMPLEMENTING INSTRUCTION
Implement and adjust plans during instruction

III. MANAGING THE CLASSROOM
Organize and monitor students, time, and materials during instruction

IV. EVALUATING STUDENT LEARNING AND INSTRUCTIONAL EFFECTIVENESS
Evaluate student learning
Reflect on instructional effectiveness

V. ADMINISTRATIVE RESPONSIBILITIES
Manage people during non-instructional time
Manage things during non-instructional time

VI. OTHER PROFESSIONAL RESPONSIBILITIES
Continue professional development
Interact with colleagues

Figure 1. Teacher Actions Domains

IMPLEMENTING INSTRUCTION refers to the presentation of subject matter, that is, the actual lesson that is taught. Shulman and Sykes (1986) refer to this stage as "presentation." Teachers implement plans. They give students an overview of lessons, provide opportunities for students to apply what they have learned, adjust their plans according to student responses, provide feedback to facilitate student learning, use a variety of teaching techniques to present lessons, and so forth.

MANAGING THE CLASSROOM refers to how teachers organize and monitor students, time, and materials during instruction. For instance, teachers establish classroom rules and procedures and communicate them to students, manage classroom time, deal with student misbehavior, monitor student in-class behavior to encourage effort, to

observe progress, and to maintain classroom order, interact with students in a supportive and respectful manner.

In the fourth category--EVALUATING STUDENT LEARNING AND INSTRUCTIONAL EFFECTIVENESS--teachers evaluate student learning during and after the presentation. They collect information for evaluation in multiple forms (e.g., written responses, oral feedback, simulations, role-playing), establish and maintain records of individual student achievement, and so forth. Teachers also reflect on their own instructional effectiveness in order to see what worked and what didn't; in other words, they gather and analyze information about the students, context, curriculum, pedagogy, and content in order to improve their teaching. Reflection on instruction cycles back into comprehension, which begins the pedagogical process again.

PLANNING INSTRUCTION is often referred to as the "preactive" phase of teaching, and IMPLEMENTING INSTRUCTION and MANAGING THE CLASSROOM are sometimes called the "interactive" phase (Jackson, 1968). EVALUATING STUDENT LEARNING AND INSTRUCTIONAL EFFECTIVENESS is called the "postactive" phase of teaching (Clark & Peterson, 1986). Activities are often done during different phases (e.g., evaluating student work goes on in the interactive as well as the postactive phase)--but for conceptual purposes, I separate actions into distinct phases.

ADMINISTRATIVE RESPONSIBILITIES encompasses functions teachers perform above and beyond the instructional process. While these activities supplement instruction, they are usually not subject matter related. Teachers perform administrative responsibilities when they manage people during non-instructional time. They administer standardized, state, and/or district tests, monitor student behavior outside the classroom in locations such as the bathroom, the hallway, or the playground,

exchange information with parents about student behavior, keep abreast of state and local school-related regulations (e.g., attendance, social service procedures, health policies) and enforce the regulations when appropriate, and so forth. Teachers also manage things during non-instructional time. They procure and organize supplies, file records of equipment and other school property, report acts of vandalism to school property, take inventory, store, distribute and collect books, and so on.

OTHER PROFESSIONAL RESPONSIBILITIES refers to activities that teachers do outside of the classroom that impact on their in-class actions and help to develop their professional understanding. Teachers continue professional development by keeping in touch with the subject matter field, and other developments in education through professional journals, professional organizations, and advanced education courses, among others. Teachers also interact with colleagues: they communicate with instructional leaders and other teachers to coordinate teaching plans and school activities, assist beginning teachers or preservice teachers, serve on school or district committees, supervise adult classroom aides, etc.

Each of these teacher actions is cast with an ethical hue. In other words, to teach is to be placed into situations which call for ethical decision-making (Soltis, 1986), or "practical moral reasoning" (Buchmann, 1984; Cochrane, 1975). As teachers decide how to group for instruction (e.g., lecture or small group discussion), they decide the balance of power between themselves and their students. As they choose what of the curriculum to omit and what to teach, teachers make ethical judgments. Questions of practical moral reasoning also surround teachers' interactions with colleagues: When and how should a veteran teacher assist a beginning teacher? Are teachers obligated to coordinate teaching plans and school activities with other teachers? Practical moral

reasoning in the classroom entails deliberation among choices. These choices are largely dependent upon the depth and breadth of a teacher's knowledge base for teaching.

Teacher Knowledge

As teachers perform the tasks of their job, they draw upon knowledge derived from personal experiences as students, teacher education program coursework, prior informal and formal teaching experience, and life in general. This teacher knowledge is shaped by the teacher's philosophy about teaching and learning and his or her world view. Thus, to talk about teacher knowledge is to talk about teacher beliefs. In theory, knowledge and belief are two distinct concepts, but because of their close links (Cobb, Yackel, & Wood, 1988; Fenstermacher & Soltis, 1986; Porter, 1988), I discuss them as if they were one concept.

In the literature on teaching, there is a cacophony of terminology regarding what is and what is not teacher knowledge. For example, some scholars talk of "knowledge domains" (Shulman, 1987), while others talk about "practical knowledge" (Carter, 1989; Elbaz, 1983) or "personal practical knowledge" (Clandinin & Connelly, 1986); still others speak of "personal knowledge" (Lampert, 1985). To make sense of the growing clamor, I separate what teachers know from how they know it, that is, the *substance* of teacher knowledge from the *forms* teacher knowledge takes.

Substance

Despite the confusion over what constitutes teacher knowledge, the research literature is fairly consistent in describing nine knowledge areas teachers draw from when they are engaged in teaching (see, for example, Bird, 1987; Pecheone, 1988; Porter, 1988; Shulman, 1987; Shulman & Sykes, 1986; Wise & Darling-Hammond,

1987).[2] These areas are: pedagogy, students, content, curriculum, context, content-specific pedagogy, professional issues, general knowledge, and enabling skills. As seen in Figure 2, the nine teacher knowledge domains are not independent of each other. Though each domain has some unique characteristics, all of the domains are interrelated at some level. For instance, both knowledge of curriculum and knowledge of content include an understanding of the content to be taught. And content-specific pedagogical knowledge, as designated by its central location, depends on the other domains to give it meaning. In the remainder of this section, I define each of the knowledge domains. The domains are normative in that they suggest that a teacher should have a broad knowledge base, but the variation in teaching situations (students, contexts, available materials, etc.) prohibits taking a normative stance on how the teacher should use his or her knowledge base.

---

[2]The lack of consensus about the content of teacher knowledge domains has not curtailed work on how to evaluate teacher knowledge frameworks. Valli and Tom (1988) describe five "adequacy" criteria for such an evaluation: (a) its inclusion of knowledge derived from relevant scholarly traditions (e.g., craft knowledge, scientific knowledge); (b) the inclusion of competing views of teaching and learning (e.g., positivist, behaviorist); (c) its demonstration of the relatedness of technical and normative aspects of teaching (e.g., examining what learning, knowledge, and schooling are and should be from historical and social perspectives); (d) its usefulness and accessibility to practitioners (e.g., how true it rings to a teacher's experience); (e) its encouragement of reflective practice (e.g., its emphasis on teachers being critics of their own practice).

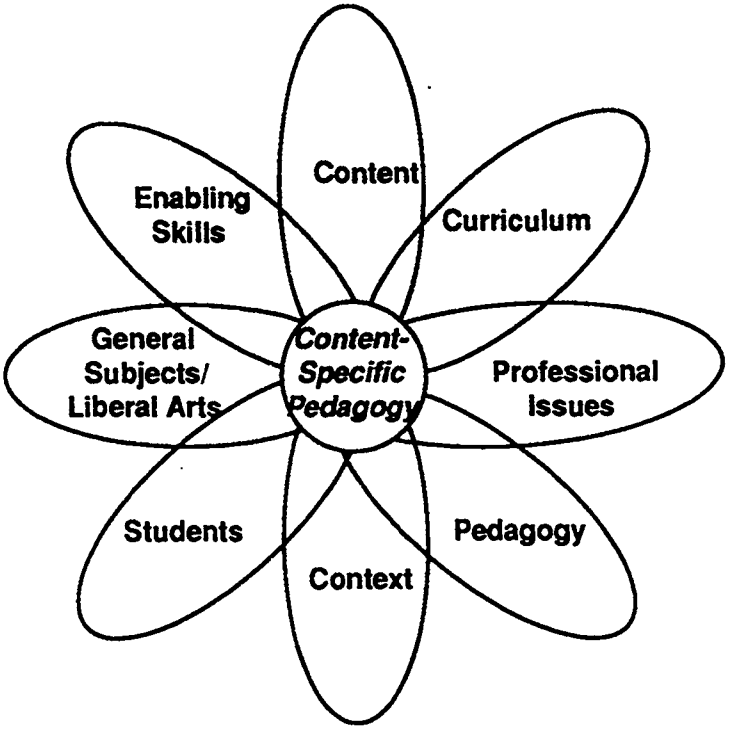

Figure 2. Teacher Knowledge Domains

KNOWLEDGE OF PEDAGOGY includes seven key elements:

(1) various theories through which teaching can be viewed and how they have changed throughout history, for example, Marxist or bureaucratic perspectives on education (Bowles & Gintis, 1976; Greene, 1989) or changes in teaching and classroom management techniques as a result of the open school movement;

(2) instructional techniques such as discussions, direct instruction, simulations, games, and independent research and how to use them in a lesson;

(3) performance skills, such as voice, manner, and movement (Gideonse, 1989);

(4) lesson structure (Leinhardt & Greeno, 1986) and how to plan for instruction;

(5) interactive instructional strategies (e.g., wait-time, questioning strategies, reactions to responses) and how to use them;

(6) evaluation techniques such as multiple-choice tests, informal observations, and anecdotal records and how to employ them (Merwin, 1989); and

(7) classroom management techniques, for instance, classroom physical arrangement, classroom rules and procedures, time management, grouping for instruction, and ways to deal with undesirable student behavior and encourage desirable behavior (Evertson, 1989).

Comprehensive reviews of the research literature concerning this domain may be found in Doyle (1986) and Good and Brophy (1986).

KNOWLEDGE OF STUDENTS encompasses three major areas (Anderson, 1989; Wang & Palincsar, 1989; Weinstein & Mayer, 1986; Wittrock, 1986):

(1) human development both inside and outside of school (Beyerbach, Smith, & Swift, 1989; Nucci, 1989), which includes development of self-concept and self-esteem, moral development, development of social conventions and social judgments, language acquisition and development, cognitive development, motivation to learn, and physical development;

(2) learning theories; and

(3) students with special needs (Fillmore and Valadez, 1986; MacMillan, Keogh & Jones, 1986; Reynolds, 1989; Stallings & Stipek,1986; Torrance, 1986), for example, at risk students such as children of migrant worker parents and inner-city youth, special education students such as mentally retarded and learning disabled, gifted and talented students, and bilingual students.

KNOWLEDGE OF CURRICULUM centers around four key issues:

(1) the historical and current political and ethical tensions that surround perennial questions of the aims of education (Strom, 1989; Walker & Soltis, 1986), for example:

What knowledge is of most worth? Who should decide what the curriculum should be? How much flexibility should a teacher have to diverge from the prescribed curriculum? Should the teacher be responsible for presenting more than one side of an issue? Should personal and social values be taught in school?;

(2) how to define "curriculum" and how the many definitions impact the teacher (Zumwalt, 1989). For example, some teachers see the curriculum as prescribed by others in curriculum guides and implemented by the teacher, while others see the curriculum as constructed by teacher and students in their interactions with each other; some believe the curriculum should encompass only the intellectual domain, whereas others believe the curriculum should cover both intellectual and affective domains (Eisner, 1982; Sprinthall, 1989). As Eisner (1979) points out, defining curriculum also means acknowledging the null curriculum (what schools do not teach) as well as the explicit curriculum (what is expressed) and the implicit curriculum (what students learn in addition to the explicit curriculum). Each definition of curriculum places the teacher in a different instructional role;

(3) the curriculum planning process and how to carry it out. The curriculum planning process includes understanding internal constraints (e.g., time, energy, interest) and external constraints (e.g., expectations from students, administrators, and parents; standardized testing; class size; mandated curricular materials) on curricular decision-making. Curriculum planning includes choosing the educational purposes for instructing students, which, according to Zumwalt (1989), should address the four "commonplaces" of education--subject matter, students, milieu, and the teacher (Schwab, 1973). Planning curriculum also includes deciding on learning experiences, which take into consideration the ways content is organized for teaching within and

across grade levels (that is, the scope and sequence of a particular subject matter) and the ways different content areas are related, also within and across grade levels (that is, the scope and sequence of subject matters taught throughout the grades). In addition, deciding on learning experiences requires understanding the strengths, weaknesses, and ways to critique and adapt curricular materials and resources (Clark & Salomon, 1986). Finally, part of the curriculum planning process involves evaluating student learning; and

(4) the overall role of evaluation in the instructional program, the multiple ways of collecting, combining, and interpreting evaluation information, and the uses and abuses of evaluation (Merwin, 1989; Zumwalt, 1989).

KNOWLEDGE OF CONTEXT refers to a teacher's understanding of social, cultural, and environmental influences on teaching and learning:

(1) the context-specific nature of student behavior, that is, how teaching and assessment techniques affect whether and how students display intelligence and language (Cole & Griffin, 1987; Heath, 1983);

(2) the classroom and school culture (Florio-Ruane, 1989), for example, the tacit classroom rules that direct behavior and the expectations students and teachers bring to classroom life and how to create a social world (Erickson, 1989) (for reviews of classroom culture literature, see Cazden and Leggett [1981] and Erickson [1984]);

(3) the larger society, which influences teaching and learning through curriculum, pedagogy, and the structure of schooling (McCarty, 1989; Sarason, 1971; Smith & Geoffrey, 1968); society, in turn, is affected by what is taught and learned in school; and

(4) how to gather information about each of the cultural settings and how to critically analyze the social and cultural influences of school in and on society (Cazden & Mehan, 1989).

KNOWLEDGE OF CONTENT refers to what teachers know about the subject matter they teach and how they know it. It includes eight major dimensions:

(1) frameworks and paradigms used to direct inquiry and to interpret data (Schwab, 1978), for example, behaviorism, cognitivism, and humanism in the field of psychology;

(2) facts, terms, and concepts in the discipline and the relationships among them, for example, metaphor and simile and their connections in the field of English;

(3) methodologies used for inquiry in the discipline, for example, historiography in history and the scientific method in biology;

(4) the relationships among concepts and theories across subject areas (Grossman, Wilson, & Shulman, 1989), for example, sociology's "socialization" and anthropology's "enculturation";

(5) how to judge the correctness of the content (Ball, 1989), for example, when to use the informal "du" and when to use the formal "Sie" in German;

(6) how to apply the concepts and methodologies to problems (Schwab, 1978), for example, knowing when it is strategically advantageous to use a zone defense in basketball and how to employ it or when and how to use the periodic table of the elements in chemistry;

(7) the nature of the discipline as an area of inquiry throughout history, for example, knowing when and why German was a taboo subject to study; and

(8) the discipline's role in culture and society (Ball, 1989), for example, knowing how findings in physics influence technology.

Reviews of research on teaching and learning have been made in many subject areas, such as written composition (Scardamalia & Bereiter, 1986), reading (Calfee & Drum, 1986), mathematics (Romberg & Carpenter, 1986), natural sciences (White & Tisher, 1986), arts and aesthetics (Jones & McFee, 1986), and social studies (Armento, 1986).

KNOWLEDGE OF CONTENT-SPECIFIC PEDAGOGY is the most under-researched of the domains and is called by Shulman (1986b) the "missing paradigm" of research on teaching. Also called "pedagogical content knowledge" (Grossman, 1988), "subject-specific pedagogical knowledge" (McDiarmid, Ball, & Anderson, 1989), and "content-specific cognitional knowledge" (Peterson, 1988), the domain is still imprecisely defined. As Figure 2 illustrates, content-specific pedagogy is the intersection of all the other domains of teacher knowledge. In other words, content-specific pedagogy does not exist as a construct in the absence of the other domains. The central factor in content-specific pedagogical knowledge is knowledge of the subject matter for teaching as contrasted with knowledge of the subject matter *per se*. While dependent on the other domains, content-specific pedagogy nevertheless contains unique features (Grossman, 1988; Shulman, 1986a):

(1) the purposes for teaching a particular subject matter and/or topic at a given level;

(2) the scope and sequence of topics to be taught in the subject matter at a particular level for a given group of students;

(3) student cognitive and affective characteristics as they influence understanding of the subject matter being taught, for example, student conceptions and possible misconceptions of particular topics in a subject matter and student beliefs about their ability to succeed in the subject matter, students' general problem solving strategies or learning to learn strategies, understanding of the tasks at hand, understanding of the requirements for successful task completion, and their ability to transfer learning in one area to learning in another area;

(4) students' motivation for learning and perceptions of themselves as learners, that is, their academic self-concept (Rohrkemper & Bershon, 1984), for example, student beliefs about their control over their own learning, their orientation to learning in general and to specific tasks, their expectations for teachers and other students, and their awareness of their own learning styles and their comparisons with other students' learning styles and performance;

(5) the most appropriate forms of representation for the subject matter for a given group of students, that is, analogies, illustrations, demonstrations, explanations, and so forth, that make the subject matter understandable to students;

(6) teaching strategies and methods that make the subject matter comprehensible and interesting to students and that foster conceptual understanding of the subject matter;

(7) curricular materials and resources for the subject to be taught and how to critique, adapt, and use them;

(8) evaluation strategies appropriate for the subject matter and students; and

(9) professional and student organizations in the discipline.

Recent studies of particular subject areas are beginning to detail content-specific pedagogical knowledge (see, for example, reviews of research in written composition [Scardamalia & Bereiter, 1986], reading [Calfee & Drum, 1986], mathematics [Romberg & Carpenter, 1986], natural sciences [White & Tisher, 1986], arts and aesthetics [Jones & McFee, 1986], and social studies [Armento, 1986]). Some studies suggest that for beginning teachers this domain becomes more refined with teaching experience (Gudmundsdottir, Carey, & Wilson, 1985; Reynolds, Haymore, Ringstaff, & Grossman, 1988; Shulman, 1987; Steinberg, Haymore, & Marks, 1985).

KNOWLEDGE OF PROFESSIONAL ISSUES includes knowledge of:

(1) legal aspects of education, such as censorship, student evaluations, student discipline (e.g., search and seizure), employment and termination issues, teachers' rights outside of the classroom, teacher liability for student injury, and educational malpractice (McCarthy, 1989);

(2) professional organizations, such as the American Federation of Teachers and the National Education Association; and

(3) professional ethics.

KNOWLEDGE OF GENERAL SUBJECTS/LIBERAL ARTS consists of knowledge that would be expected of an educated person in the United States (e.g., knowledge of literature, geography, science, music, current events, U.S. and state constitutions). While it is seldom debated that teachers should have knowledge of a variety of subject areas, the depth, breadth, and actual topics are often disputed. The controversy, in part, is fueled by arguments about cultural bias (e.g., what should be the content of a Western Civilization course?) and the importance of certain topics given a teacher's specialty area (e.g., which general subjects are useful and/or necessary for teachers of math,

elementary education, driver's education?). In addition, direct connections between this domain and teaching are rarely validated in research, though studies of content-specific pedagogy document cases of teachers using references to current affairs (Gudmundsdottir, 1985) and to religion (Reynolds, 1987) to create metaphors for the topic under study.

KNOWLEDGE OF ENABLING SKILLS includes:

(1) speaking, for instance, enunciating words clearly enough to permit listeners to hear the words easily, using grammatical structures correctly, using vocabulary appropriate to the audience;

(2) listening, for example, getting the literal, implied, and main idea of a message, using prior knowledge deductively to understand a speaker and situation, selecting feedback to give to a speaker so that the speaker is encouraged to express emotions in a non-threatening context, attending to personal memories called forth by the message;

(3) reading, which includes determining the main idea or gist of a passage, recognizing inferences that can be derived from a passage, identifying assumptions, etc.;

(4) writing, for example, recognizing basic grammatical errors in standard written English, recognizing language that creates an inappropriate and/or inconsistent tone given the intended audience and purpose for writing, recognizing effective sentence structure free of problems;

(5) integrating communication skills, such as taking notes while listening to a speaker and summarizing the speaker's main ideas, obtaining information from several sources and synthesizing the information, observing an incident, describing the incident, and speculating on its probable cause and effect; and

(6) calculating, such as recognizing and using the form of a number that is appropriate in the context of the original problem, applying computations in problem-solving situations, and verbalizing the key concepts of mathematics in a simple, straightforward manner.

For discussions of why enabling skills are important for teachers, see, for example, Conoley (1989), Graves & Piche (1989), and Post & Cramer (1989).

Forms

In the previous section, I talked about domains of knowledge on which teachers draw as they perform the tasks of teaching. In one sense, I outlined the *substance* of teacher knowledge. In this section, I explore the *forms* teacher knowledge takes, that is, the ways knowledge is represented in a teacher's mind.

Theoretically, teacher knowledge takes at least three forms: general principles, specific cases (Perkins & Salomon, 1989; Shulman, 1986a) and strategic knowing (Shulman, 1986a). The first two knowledge forms are propositional in nature; the third form is knowing-in-action (Schön, 1987).

General principles are rules and theories of teaching that are usually not context- or content-sensitive; such principles are often the form in which teacher knowledge is taught in teacher education courses. For example, some process-product researchers advocate pedagogical principles of classroom management, such as: If a teacher waits too long to intervene or to continue a lesson after a student disruption, increases in disruptive classroom behavior may occur (Evertson & Emmer, 1982). Other general principles are responsive to context and/or content, such as descriptions of instructional techniques that are specific to small-group instruction in the primary grades (Anderson, Evertson, & Brophy, 1982). While these general principles may be

learned in the absence of a consideration of individual student needs, classroom social environment, or content, it is likely that even beginning teachers do not adhere to them without some modifications to suit their own teaching situations. It is these teaching situations that give rise to specific case knowledge.

Unlike general principles, specific case knowledge is content- and context-dependent. Examples of specific case knowledge are: Jeff's need for short-term tasks that will give him a sense of accomplishment, Lance's left-handedness that make it hard for him to use a right-handed desk, Shirley's scoliosis that make her attention waver during extended seatwork, Jose's interest in dance, Erla's father's alcoholism, and so forth. Specific case knowledge helps to concretize general principles. For example, a beginning teacher knows that John, a second-grader in her class, seems to grasp addition facts more easily when he can manipulate objects. So, the teacher tailors a lesson on addition to include cuisenaire rods. This specific case knowledge (John seems to understand concepts when he moves objects with his hands) makes the general principle (students learn best through different modalities) less abstract.

Specific case knowledge also provides evidence against the veracity of a general principle. For example, some teachers operate under the guiding principle of "suppressing emotions" (Marland, 1977), which holds that teachers should modulate their voices so that they do not excite the students and cause chaos in the class, which may result in less student learning. In my own experience as a beginning teacher, I was sometimes unable to contain my enthusiasm with the lesson. Over time, I found that not only were students still engaged in learning content when I "broke" the rule of suppressing emotions, but, as a former student related later, students were learning perhaps an equally important lesson: "Teachers can be real, too." Specific case

knowledge helped me break away from devotion to the general principle of suppressing emotions in class.

As a teacher's experience with pedagogy, students, content, context, curriculum, and content-specific pedagogy grow, general principles become enmeshed in specific case knowledge (Shedd, Conley, & Malanowski, 1986) and new, more context- and content-specific general principles emerge. For example, as a teacher uses cuisenaire rods with her second-graders, a principle new to that teacher--cuisenaire rods work with second-graders--might emerge.

Strategic knowing, also called "practical knowledge" (Elbaz, 1983; Sternberg & Caruso, 1985) or conditional knowledge (Paris, Lipson, & Wixson, 1983; Alexander & Judy, 1989), takes a dynamic form rather than a static form. It is characterized by Schön (1987) as "knowing-in-action" and "reflection-in-action" and by Petrie (1989) as "judgment." Strategic knowing involves both applying general principles to specific cases and generating general principles from specific cases. This process of moving back and forth between general principles and specific cases utilizes inference rules, which detail the conditions or situations in which a specific action is to be taken (Chi, Bassok, Lewis, Reimann, & Glaser, 1989). Effective strategic knowing requires correctly applying general principles to specific cases (or vice versa), choosing appropriate action, then reflecting on that action in order to improve practice. Ineffective strategic knowing occurs when general principles are misapplied or not applied at all to specific cases (or vice versa) and when inappropriate actions are undertaken. For example, John's teacher may choose to use cuisenaire rods in the next math lesson so that John will have the opportunity to learn the concept; this decision is effective strategic knowing. On the other hand, if John's teacher decides not to use

manipulatives (barring constraints such as the absence of manipulatives or a particularly unruly class), then though she has correctly recognized the specific case as an instance of the general principle, she has failed to act appropriately, therefore, her strategic knowing is ineffective in this instance.

The Relationship Between Actions and Knowledge

When teachers teach, they perform a multitude of actions and, in doing so, draw upon some or all of the domains of teacher knowledge, whether knowingly or unknowingly. In this section, I offer two illustrations of how teacher actions relate to teacher knowledge.

Example 1: When Judy plans a reading lesson for her fifth graders, she draws upon almost almost every knowledge domain. If she is an experienced, reflective teacher, she probably draws most heavily on her knowledge of content-specific pedagogy, since this domain is the integration of all the others and is the most context-dependent. For instance, she decides which aspects of reading to teach and is aware of how her choices fit within her view of what fifth graders should learn about reading. She identifies which pedagogical techniques and degree of content specificity will fit her students' cognitive developmental stages and interests and takes into account any special needs her students might have. She reflects on the social system in the class when she plans which students will work together, and adapts the content and plans to be culturally sensitive to the students in the class. She selects ways in which to represent the topic (e.g., examples, analogies, explanations) that are true to the subject matter and comprehensible to her students. She chooses evaluational techniques that are appropriate for the content and students. As she executes each of these tasks, she reflects on general principles of

effective practice and specific cases from her past teaching experiences. In effect, her knowledge of content-specific pedagogy takes the form of strategic knowing.

If Judy is relatively inexperienced, and/or unreflective, she may draw more readily on her knowledge in separate domains. In this case, her decisions of which pedagogical and evaluational techniques to use, how to structure the lesson, how to group the students, how to evaluate the students, etc. will be based mostly on general principles of effective practice, and not on specific case knowledge of the students, content, or context in which she teaches. She may employ strategic knowing, but it will be within a specific domain, such as pedagogy or students, rather than in the integrated domain of content-specific pedagogy.

Example 2: Whereas in Example 1, Judy draws from almost every domain of teacher knowledge while planning her reading lesson--and this is true for most every action that is instructional in nature--she draws on fewer domains when she is performing non-instructional administrative tasks, such as monitoring the hallway during passing time between classes. She may use her knowledge of pedagogy, such as classroom management skills (e.g., how to maintain order through tone of voice and the "evil eye"). And she certainly draws upon her knowledge of enabling skills, particularly her listening, speaking, and integrating communication skills, as she interacts with students in the hallway. For the most part, though, this particular teacher action draws on fewer domains of teacher knowledge.

Figure 3 illustrates the relationship between actions and knowledge in the form of a matrix. On the vertical axis, teacher actions are listed; on the horizontal axis, teacher knowledge domains are listed.

TEACHER ACTIONS	TEACHER KNOWLEDGE								
	PEDAGOGY	STUDENTS	CONTENT	CURRICULUM	CONTEXT	CONTENT-SPECIFIC PEDAGOGY	PROFESSIONAL ISSUES	GENERAL SUBJECTS/ LIBERAL ARTS	ENABLING SKILLS
I. PLANNING INSTRUCTION									
Comprehend content and materials									
Critique content, materials, teaching methods									
Adapt content, plans, materials									
Prepare plans, materials, physical space									
II. IMPLEMENTING INSTRUCTION									
Implement and adjust plans during instruction									
III. MANAGING THE CLASSROOM									
Organize and monitor students, time, and materials during instruction									
IV. EVALUATING STUDENT LEARNING AND INSTRUCTIONAL EFFECTIVENESS									
Evaluate student learning									
Reflect on instructional effectiveness									
V. ADMINISTRATIVE RESPONSIBILITIES									
Manage people during non-instructional time									
Manage things during non-instructional time									
VI. OTHER PROFESSIONAL RESPONSIBILITIES									
Continue professional development									
Interact with colleagues									

Figure 4. Teacher Actions and Knowledge

Using a close-up of one section of the matrix, we can see how the theoretical framework might be handy for helping to determine the content of a teacher assessment activity. Let's say that we want to assess a teacher's ability to plan for instruction. First, we need to determine the developmental stage of the teacher taking the assessment, for this will affect both how the assessment is designed and how it is scored. Research on expert/novice differences (Berliner, 1988; Berliner & Carter, 1986) supports the view that beginners' knowledge of teaching is different from that of experts. The novice's knowledge is in a relatively disorganized state and largely composed of general principles learned in teacher education, whereas experts have more well-developed, context- and content-specific knowledge structures.

Second, we must determine which aspects of the knowledge domains are pertinent to instructional planning. Figure 4 zooms in on the cross between Planning Instruction and Knowledge of Pedagogy.

	KNOWLEDGE OF PEDAGOGY						
	theories of teaching and how they have changed over time	instructional techniques and how to use them	performance skills	lesson structure and how to plan a lesson	interactive instructional strategies and how to use them	evaluation techniques and how to employ them	classroom management techniques
PLANNING INSTRUCTION		X		X		X	X

Figure 4. Pedagogical Knowledge Needed to Plan Instruction

Planning instruction requires teachers to choose a lesson structure, choose an instructional technique, choose an evaluation technique, and choose classroom management strategies. The other aspects of pedagogical knowledge are less important to this teacher action. All of the teacher's choices are constrained by the breadth and depth

of the teacher's knowledge of pedagogy. That is, if the teacher knows only one instructional technique, such as direct instruction, then the types of lessons available to the teacher will be severely limited and may affect student learning. We would continue this process of crossing teacher action with individual knowledge domain definitions to determine the substance of the assessment.

Third, we must decide on appropriate forms of assessment, such as multiple-choice questions, simulations, work samples, and/or observations. If the assessment is for an inexperienced teacher, then it's appropriate to build the activities around general principles of teaching and learning as they relate to instructional planning. These activities might include anything from multiple-choice questions about lesson structure to simulations of actual lesson planning. If the assessment is for an expert teacher, then it's probably more appropriate to build context-specific activities such as work samples and observations, since research suggests a move away from discrete bits of knowledge and toward specialized, chunked knowledge schema and strategic knowing as teachers grow in expertise. It is important to note that the link between expertise and experience is still unclear, therefore caution must be taken when applying the findings from the expert/novice studies to the actual creation of assessment activities.

Fourth, we must build the assessment instruments, which includes developing scoring rubrics. The substance identified in the second step coupled with the choice of assessment form will determine what an instrument will look like. Expert judgment, with the aid of expert/novice findings, will help determine the scoring rubric. For instance, if we choose a multiple-choice format for a test for inexperienced teachers, we might include discrete questions about lesson structure, instructional techniques, evaluation techniques, and classroom management strategies--all of which are

important to the teacher's ability to plan instruction. Or, if we choose a work sample approach to assess an expert teacher's ability to plan instruction, we might require the teacher to show how his or her choice of instructional techniques takes into consideration particular aspects of content-specific pedagogical knowledge, such as student needs.

As you can see, the theoretical framework is useful in directing the choice of assessment substance and deciding on the content of the actual instruments, but is less useful for determining the appropriate assessment forms or scoring rubrics. Additionally, while it can help us make decisions regarding what to assess, it should not be thought of as the sole source for these decisions.

Teacher Assessment Possibilities

Now that I have detailed what teachers do, what they know, how they know it, and how teacher actions and teacher knowledge interact, we are ready to look more closely at teacher assessment possibilities. In the remainder of this section, I discuss two critical elements of assessment: response types and methodologies.

Response Types

Assessment of teacher knowledge and teacher actions is available in two basic response types: selected response and constructed response.

Selected response formats require the test-taker to choose the best answer from a group of possible answers; the test-taker's answers can then be easily machine-scored. Selected responses are best at representing knowledge of general principles and specific cases. For example, if we want to know if teachers can recognize Bloom's (1956) taxonomy of educational objectives (which will give us information about their knowledge of pedagogy), we might construct a multiple-choice test question in which

teachers select the appropriate answer from a given list of alternatives. Or if we want to assess teachers' knowledge of pedagogy and knowledge of students in the act of planning for instruction, we might give them a set of five student cumulative folders that include reading test scores and informal evaluations of reading performance and ask them to select the appropriate reading group for each student. While the selected response format gives us information about the end result, for example, the reading group choices made by teachers, typically it does not tell us why teachers answered the way they did. If we want to assess teachers' strategic knowing, selected responses are probably not the best form to use; constructed responses may be a better choice.

Constructed response formats require the test-taker to produce verbal, written, and/or behavioral answers in the form of short answers, essays, figural responses, and performances. This type of response is usually best scored by a panel of experts, though work is underway to make some types of constructed responses machine scorable (Bennett, Rock, Braun, Frye, Spohrer, & Soloway, 1989; Martinez, 1989). Constructed responses can represent teachers' strategic knowing and their knowledge of general principles and specific cases both in simulated situations and in actual teaching contexts. In other words, constructed responses allow teachers to make practical arguments (Buchmann, 1988) for their actions. As we saw in the reading example above, an open-ended question that asks teachers to give a rationale for their choice of reading group in addition to selecting the reading group adds to our understanding of the teachers' strategic knowing of how general principles of pedagogy and students (e.g., grouping for instruction) interact with the specific student cases. Another example focuses on teachers' knowledge of context. We might provide teachers with information about a school and community and then structure an oral interview using questions such

as: What contextual elements should you know about in order to teach a given class? How might you gather this information? The interview answers would be evaluated according to pre-specified guidelines created by a panel of experts. A third example demonstrates the performance aspect of constructed response. We might want to assess teachers' knowledge of content-specific pedagogy as they actually teach a lesson to their class. We would interview them prior to the observation to set our expectations, observe and gather performance data while they taught, and then interview them after the observation to clarify what we saw.

Assessment Forms

While assessment responses fall generally into the two types discussed above, many assessment forms can be used to generate these responses (Bird, 1987; Dinham & Stritter, 1986). Among the forms are: multiple-choice, true/false, and matching questions; simulated work samples; structured interviews; contextualized work samples (materials that document teaching actions and thoughts; they are also called portfolio entries); and observation systems (documentation of a candidate's teaching behavior and/or actions *in situ).* (See Howard, 1983 for a discussion of both types of work samples.) All of the above assessment forms are now used in teacher assessment, though in practice each form targets different experience levels of teaching and varies in stage of implementation.

The Educational Testing Service offers the NTE Core Battery (multiple-choice tests of pedagogical knowledge, general knowledge, and communication skills), Specialty Area exminations (multiple-choice tests of specific disciplines, such as mathematics), and the Pre-Professional Skills Test (multiple-choice test of basic skills) for beginning teachers. As of September, 1989, 28 states used all or portions of the Core Battery,

Specialty Area, and Pre-Professional Skills Test in their initial licensing procedures. Researchers and test developers continue to experiment with ways to make selected response tests more appropriate. Some of these ways include using videodisc and videotape simulations which ask for responses that can be machine scored. The Connecticut State Department of Education, too, is experimenting with new forms of stimuli (e.g., videotapes) to elicit selected responses on multiple-choice tests (Carlson, 1989; Popham, 1989).

Simulated work samples are being developed and field tested on novice to experienced classroom teachers at different institutions across the United States for purposes of teacher education, teacher licensure, and advanced teacher certification. Two teacher education projects are underway at the University of Virginia and at Indiana University of Pennsylvania. At the University of Virginia, work is in progress on a microcomputer simulation that asks preservice teachers to teach a spelling lesson to a class of "Pac-man" type figures projected on a screen. The figures have computer-modulated voices and particular behavior patterns, such as whispering to adjacent students or falling asleep. As the teacher teaches the lesson, an evaluator located at the rear of the room enters information concerning the teacher's classroom management behaviors into a computer. At the end of the short lesson, the data are analyzed and the computer gives feedback to the preservice teacher concerning his/her classroom management behaviors, for instance, the number of times she or he exhibited behavior considered "appropriate" by the teacher effectiveness literature (Murphy, Kauffman, & Strang, 1987). At Indiana University of Pennsylvania, teacher educators currently run a pre-service teacher assessment center to evaluate teaching competence in the early years of the teacher education program (Byham, 1986; Millward, 1989). Prospective

teachers participate in assessment center activities which include in-baskets, such as responding to letters from parents, and leaderless group discussions, such as coordinating teaching activities with other teachers.

Other research and development is aimed at teacher licensure. For example, the Connecticut State Department of Education is field testing simulated work samples and structured interviews to gather information about a prospective teacher's knowledge of content and content-specific pedagogy (Prince, 1988; Tomala, 1989). In one structured interview, a prospective teacher is given a set of cards on which topics from a unit on ratios, proportions, and percents are written. The interviewer asks the teacher to arrange the cards in the order in which she or he would teach the unit. When the candidate is ready, the interviewer asks him or her to give a pedagogical rationale for the ordering, to tell whether some topics seem to belong in subgroups which would be taught together, and to talk about any missing topics or topics that should be deleted from the set.

Advanced certification of experienced teachers drives the work at Stanford University. Researchers are creating prototype assessments for the National Board for Professional Teaching Standards, which will consider these, along with others, for use in their certification assessment (Haertel, 1990; Shulman, Haertel, & Bird, 1988). The prototypes focus on four subject areas--elementary school math and literacy and secondary school history and biology--and require candidates to respond as they would on the job. For instance, in the "Opportunity Box" exercise (Mitchell & Marks, 1989), a teacher is given a set of unusual materials (e.g., graph paper, paper plates, socket set) and asked to spend a few minutes thinking about how she or he might use the materials to teach a lesson on equivalent fractions. At the end of the allotted thinking time, an

interviewer asks the teacher questions about how she or he would use the materials in a lesson. Some of the questions require the teacher to give rationales for his or her answers.

Contextualized work samples (portfolio entries) are also being explored at Stanford as prototypes for further development and possible inclusion in the National Board certification assessment (Bird, 1990; Olson, 1988; Vavrus & Collins, 1989). Teachers involved in the portfolio study range from novice to experienced. The portfolios are pieces of teaching evidence that teachers accumulate over the course of a year. At an assessment center, the teachers participate in structured interviews designed around their individual portfolios. For example, in the Literacy Assessment Project exercise "Reporting on Student Progress," teachers reference individual student work samples when they discuss how they would talk with parents about their child's progress. The use of portfolios is also under research and development at ETS as part of the new generation of assessments.

Observation systems are now used by at least 18 states as part of their licensure procedure (Darling-Hammond & Berry, 1988). In a study of observation systems, Logan, Garland, and Ellett (1989) found that they are based mainly on the teacher effectiveness research literature, that is, they attempt to measure observable teacher behavior that research shows is statistically linked to gains in student scores on standardized tests. Some observation systems spotlight general principles of teaching (e.g., Virginia's observation system); others are more attuned to how general principles are couched in the context and the content being taught (e.g., Georgia's observation system). Observation systems generally document a candidate's teaching behavior and/or action in the classroom and may be limited to predesignated times by trained

examiners or may include frequent, informal (sometimes surprise) visits by peers and/or mentor teachers.

The challenge to those of us who are in the business of teacher development and assessment is to find the right fit between what we want to know about teachers and what different forms of assessment can tell us. In the next section, I propose a program of teacher assessment that attends to this matter.

A Comprehensive Teacher Assessment Program:

Contrasts in Theoretical and Practical Views

In this section of the paper, I contrast a theoretical view of a teacher assessment program with a practical view. In other words, in the sections labeled "In theory," I describe what makes sense according to the teacher actions and knowledge base, its forms, and the available teacher assessment tools discussed earlier in the paper. In the sections entitled "In practice," I describe what is under consideration for development by the Educational Testing Service and by the National Board for Professional Teaching Standards, given various logistical and social factors, such as: costs/benefits of instrument development, administration, and scoring (e.g., time, money, interest, etc.); importance to the teacher's classroom effectiveness; widespread availability of testing hardware (e.g., videodiscs, videotape recorders, large memory personal computers); public opinion regarding various testing methods; and state requirements for teacher licensure.

This last factor--state requirements for teacher licensure--is a critical one, since it both strongly influences and is influenced by the types of assessments that are developed. In Figure 5, I present a table of the number of states that require some form

of testing in a particular knowledge domain for teacher licensure. These figures come from the National Association of State Directors of Teacher Education and Certification's *Manual on Certification and Preparation of Educational Personnel in the United States* (1988, pp. E-13, E-25).

Knowledge Domain	Number of States
Pedagogy	24
Students	23
Curriculum	24
Context	23
Professional Issues	23
Content	23
Content-Specific Pedagogy	approximately 3
General Subjects/Liberal Arts	19
Enabling Skills	37

Figure 5. Number of States Requiring Tests of All or Portions of Teacher Knowledge

As the table indicates, almost half of the states require testing in the knowledge domains that comprise what might be termed "general principles of teaching and learning" described in this paper: pedagogy, students, curriculum, context, and professional issues. Likewise, 23 states require teachers to pass a test of their content specialty prior to receiving a teaching certificate. Content-specific pedagogy, as described in this paper, has traditionally not been part of teacher licensure tests. This is due both to the lack of a clear-cut definition of the domain and to the constraints of multiple-choice testing formats. Approximately three states (Connecticut, California, Georgia) are now investigating ways to assess knowledge of content-specific pedagogy. Depending on the state, the final two knowledge domains are tested either prior to admission to teacher education or prior to certification: At least four states require a test of general subjects/liberal arts prior to entering a teacher education program, while the remaining 15 states require the test prior to certification; and at least 22

states require a test of basic skills prior to admission to a teacher education program, while at least 15 additional states require the test prior to receiving a teaching certificate.

Before I delineate the stages, I offer two caveats: First, underlying both theoretical and practical teacher assessment program descriptions is the assumption that a profession needs checkpoints along a developmental continuum at which its members should be evaluated. Some of the checkpoints are set to protect students from educational harm, some are designed to select teachers for employment, and others are established to reward expertise in the field. This view contrasts with the perspective of critics who advocate doing away entirely with teacher testing. Second, not all aspects of teacher knowledge and/or teacher actions are appropriate for formal evaluation (e.g., Interaction with Colleagues occurs in context and might be regulated better by informal peer pressure), nor are all aspects amenable to assessment at all stages in a teacher's career (e.g., strategic knowing of content-specific pedagogy grows over time and experience in the classroom, thus if it is assessed, a display of in-depth strategic knowing should not be expected from beginning teachers).

Both the theoretical and actual programs consist of four stages, which are linked conceptually, but are temporally independent of each other:

Stage I

In theory. Stage I is a checkpoint designed to protect the prospective teacher's students from educational harm. The assessment answers this question about the teacher: Does she or he have command of enabling skills necessary for successful completion of a teacher education program and, subsequently, for competent teaching? Focusing on skills such as listening, speaking, writing, reading, and computing, this stage's

assessment is administered around the sophomore year of college to students entering a teacher education program. The assessment methodology is multiple-choice and essay, either paper-pencil or computerized, because the intent of the test is to document the teacher's level of proficiency on a large number of enabling skills in a short period of time--a hallmark of selected response tests--as well as to test the candidate's ability to write. Built into the actual test is a diagnostic element to aid both the student and the college in the selection of remediation strategies for the remaining college years.

In practice. At this stage, reality and theory are very similar. At Educational Testing Service, work is underway to construct an enabling skills assessment such as the one described in the theoretical view. This assessment is known as Stage I of the new generation of teacher assessments.

Stage II

In theory. Like Stage I, Stage II is designed to prevent educational harm to future students, but in this stage, the content is somewhat different. Stage II addresses these questions: Does the beginning teacher have knowledge of the content he or she will teach? Does the beginning teacher have a broad repertoire of teaching knowledge and skills? Can the beginning teacher perform basic teaching activities (e.g., planning a lesson, evaluating student papers) for his or her subject matter in a simulated context? To answer these questions, the assessment spotlights knowledge of content, knowledge of general principles of teaching and learning (pedagogy, students, curriculum, context, professional issues), and teaching performance in the teacher's subject matter in mock teaching contexts. This stage's assessment is administered at the end of the teacher education program or before the teacher starts the first year of full-time teaching. Since some aspects of the knowledge domains tapped in this stage cannot be assessed by

selected response methods, the assessment methodologies also include constructed responses. The scenario might look something like this:

> At a testing center located at a local university, prospective teachers take two types of selected response tests: (1) a multiple-choice test of the facts and concepts in the subject matter; and (2) a multiple-choice test of general principles of teaching and learning, such as human growth and development and legal issues pertinent to classroom teaching. Teachers also complete a set of constructed response questions in which they are asked to comment on a variety of teaching situations in their subject area. For instance, after watching a short videodisc segment of students in a math class, the prospective math teacher is asked to describe and evaluate the classroom management techniques used and tell what she or he would have done differently in that particular situation. Finally, teachers complete a set of questions in which they are asked to perform teaching tasks, such as planning a lesson for a stated objective in the subject matter using materials and information about a fictitious class.[3]

The emphasis in Stage II is on capturing the breadth of the teacher's knowledge and performance competence, within a given subject matter, in simulated teaching contexts.

In practice. In reality, this stage is a first cousin of the theoretical view. The ETS Stage II assessment comprises tests of similar domains of teacher knowledge,

---

[3]This aspect of the Stage II assessment is similar to that used in the California Bar Examination performance tests (Committee of Bar Examiners, 1988). In the Bar exam, for example, test-takers are given a set of documents common to lawyers (e.g., relevant and irrelevant statutes and case descriptions, notes from meetings with clients, police report) and are asked to respond in written memo form to a senior partner's request for a summary of the strengths and weaknesses of the client's position, a plan for next steps in the case, a summary of additional information that was needed, and so forth.

specifically specialty area tests of subject matter knowledge (knowledge of content) and a test of general principles of teaching and learning that are not content-specific (knowledge of pedagogy, students, curriculum, context, and professional issues). Also comparable to the theoretical view, the ETS tests use selected response as the predominant methodology, but constructed response methods are offered for some aspects of the tests, such as questions that ask the candidate to explain a concept in the discipline (e.g., equivalent fractions in mathematics, Piaget's pre-operational stage in human growth and development). However, Stage II of the ETS plan does not assess a teacher's ability to apply knowledge of content in a teaching situation (i.e., the application of content-specific pedagogical knowledge). Rather, the emphasis of the ETS Stage II is on teacher knowledge, both specific to a content area and generic across content areas. Assessment of the application of knowledge and skills is slated for Stage III of the new generation of teacher assessments at ETS.

Stage III

In theory. Like Stages I and II, Stage III is designed to yield important information about beginning teachers in order to protect their students from educational harm. Unlike Stages I and II, Stage III brings the assessment lens to the teacher's own classroom. It answers this question: Can the entry-level teacher apply the knowledge and skills in his or her own classroom? Whereas Stage II centers around teacher knowledge and actions in the form of general principles and strategic knowing in simulated contexts, Stage III concentrates on teacher knowledge and action in the form of strategic knowing within the teacher's own classroom. Stage III is given prior to licensing and during the first year of full-time teaching.

This stage utilizes state of the art methodologies for assessing *in situ* actions--contextualized work samples and observation systems. Fledgling teachers create a portfolio of their teaching, which includes relatively simple pieces of evidence, such as a unit plan or videotape of a lesson; other work samples may include more intricate pieces of evidence, such as formal and informal records of student progress over time (e.g., the teacher chooses three students who represent the class ability range and tracks their progress throughout the year by keeping copies of their work, anecdotal records, and formal evaluation records; the teacher also provides explanatory notes about how he or she interpreted the students' progress along with the actual student artifacts). At the end of the year, teachers participate in structured interviews at a nearby testing center. Interviewers ask the teachers to provide more contextual information about particular teaching artifacts in their portfolios so that evaluators can score them with greater understanding of the teaching situation.[4]

Over the course of the year, teachers are also observed by evaluators who represent various constituencies in the profession: principal, subject matter specialists, and teachers from other schools. The observations include showcase lessons chosen by the teachers (so that they have a chance to demonstrate their best teaching in a formal situation) and everyday teaching (to see how they teach in an informal situation). The visits include pre-observation interviews in which teachers have the opportunity to explain what is planned and post-observation interviews in which they describe what

actually happened, why, and what they would do the next time they taught the particular lesson.

In practice. Like Stage II of the ETS plan, Stage III is a first-cousin of the theoretical view. As defined thus far, the ETS Stage III centers around the application of knowledge and skills in both simulated and live environments and uses the constructed response methodologies of simulated work samples, contextualized work samples, and observations (however, unlike the theoretical view, the ETS Stage III does not employ structured interviews). For example:

> During the teacher's first year, she or he may be observed by teaching specialists (as described in the theoretical view); she or he may be asked to pull together artifacts of her or his teaching (contextualized work samples) which are then sent to a regional testing center where they are evaluated; and at the end of the teacher's first year of teaching, she or he may attend a testing center to participate in simulated teaching activities, such as creating a lesson plan from various sources of information (e.g., textbooks, student cumulative folders, student papers, filmstrips) and critiquing a videotaped lesson for classroom management problems. Some of the performance evidence gathered about a teacher (observation records, contextualized and simulated work samples) is evaluated on the basis of the application of general principles of teaching (e.g., Does the teacher use divergent questions? Does she or he demonstrate a range of pedagogical techniques?). Other evidence is evaluated on the basis of the application of content-specific pedagogy (e.g., Does the teacher demonstrate an awareness of differences in student preconceptions of the

subject matter and adjust her or his plans accordingly? Are the evaluation techniques appropriate to the students and the content?).

In summary, the actual view differs from the theoretical view in two ways: (1) unlike the theoretical view, which concentrates on *in situ* assessments, the actual view also includes simulated teaching activities; and (2) the actual view assesses the application of general principles of teaching and learning in addition to content-specific pedagogical knowledge and skills, whereas the theoretical view assesses only the application of content-specific pedagogical knowledge and skills.

Stage IV

In theory. Stage IV differs from the other three stages in that it moves assessment from knowledge and skills necessary for teaching to the realm of teaching expertise.[5] Specifically, Stage IV answers this question about the teacher: Can he or she demonstrate professional excellence over time? Like Stage II, Stage IV assesses content knowledge, but a deeper understanding of the subject matter is expected of expert teachers. As in Stage III, Stage IV is centered around teaching in a familiar context, but Stage IV teachers are judged according to more holistic standards. In other words, instead of being judged on the rudimentary aspects of teaching, such as how to plan a lesson, Stage IV teachers are evaluated for a deep understanding of and ability to apply content-specific pedagogical knowledge. Unlike any of the stages, Stage IV also assesses teacher actions

that fall into the "Administrative Responsibilities" and "Other Professional Responsibilities" domains--two domains that are not tapped in previous stages.[6] In essence, Stage IV assesses a teacher's ability to demonstrate a high level of skills, knowledge, dispositions, and commitments to student learning and to the profession. Since Stage IV is designed to evaluate teaching expertise, a teacher must have at least three years of full-time teaching experience to take this battery of assessments.

Stage IV triangulates assessment methodologies in order to render a judgment of the teacher's expertise. In other words, Stage IV uses the assessment methods of previous stages (multiple-choice tests, simulations, observations, portfolios), but tailors these methods to collect information about the teacher's excellence from traditional and non-traditional sources, such as parents, students, and documents (e.g., graduate school transcripts). For example, part of a teacher's documentation for evaluation might be a survey of student and parent attitudes about the teacher's relationships with each constituency; the survey would be administered by outside evaluators. Or the teacher might include in his or her portfolio letters of commendation from school district personnel and parents. While the content and assessment methodologies of Stage IV are similar to the other stages, the evaluation guidelines in Stage IV are more stringent, since they are designed to distinguish adequate teachers from expert teachers.

In practice. Since Stage IV is still a vision in the eyes of the National Board for Professional Teaching Standards, there is no practical view with which to contrast it. The National Board is grappling with the enormity of the task inherent in creating an

assessment of excellence. They have collected prototypes of teacher assessment created by the Stanford Teacher Assessment Project (described previously in the section on methodologies) and are commissioning more prototypes from other authors. By 1993 they expect to have an assessment program in place. At that time, we can better compare and contrast theory with practice.

As illustrated by the contrast between theory and practice, what is theoretically possible is not always pragmatically possible. Sometimes there is a lack of money to realize the theoretical, sometimes there is a lack of time, and sometimes there is an inertia caused by the strongly held belief that the theoretical cannot be translated into the actual. Whatever the reason, the theoretical assessment program described above is not yet a reality.

Both the theoretical and actual assessment programs describe ways of taking snapshots of a teacher's development over time. They are not meant as replacements for formative assessment that should occur throughout the teacher's career via inservices, suggestions from colleagues, and district supervision. Rather, Stages I through IV provide formal benchmarks for the educational community and indicators of quality for the lay community that must be supplemented with more informal, formative types of assessment provided by the teacher's school and district.

Final Words

Our opportunities for creating more appropriate assessments for teachers increase as research and development efforts delve more deeply into the nature of teaching and assessment. A few areas seem ripe for further investigation.

The first area of study focuses on the constructs themselves. We need to know if the teacher actions and knowledge definitions proposed in this paper make sense and if they

are useful to various constituencies. We need to know if the domain definitions cross all teaching levels (elementary, middle, high school). Likewise, we need to know if the domain definition of content-specific pedagogy transfers across all disciplines. Most important, we need to know how these domains are related to student learning, that is, how the breadth and depth of a teacher's understanding of teacher actions and knowledge affects what and how students learn.

A second area for investigation is learning to teach. Cognitive science advances in the past ten years have shed theoretical light on how people think and on differences between expert and novice thinking. However, the research base is scant, especially in the field of teacher cognition (Clark & Peterson, 1986; but see Berliner, 1988, Berliner & Carter, 1986). We still know little about how a teacher's understanding in each domain and across domains changes over time, that is, what breadth and depth of knowledge to expect of a novice teacher or a five- or ten-year veteran. And we're unclear as to the best forum for learning teacher actions and knowledge--an area especially important for discussions surrounding alternate route programs.

Further research is also needed to explore how knowledge representations (e.g., propositional, analogical, pictorial) can be matched to assessment methodologies, such as evaluation of semantic nets (Roehler, Duffy, Conley, Herrmann, Johnson, & Michelson, 1987) and educational criticism (Eisner, 1979). While we have ways to tap some important aspects of what teachers know and do, other critical areas are left unevaluated for lack of ways to assess them. For instance, when we focus our evaluations on cognition, we leave unassessed the interpersonal, affective side of teaching. And, as Eisner (1979) points out, when we narrow our definition of cognition to aspects that

can be verbalized and rendered quantitatively, we fail to tap forms of cognition that are best represented through artistic means, such as dance.

A fourth area of investigation is the assessment methodologies. We need to know more completely what each assessment methodology can and cannot tell us about a teacher. For example, what do we learn about a teacher from a portfolio entry that we cannot learn from a multiple-choice test? Is there a way to standardize simulated work samples that are tailored to a teacher's familiar teaching context and subject matter? How do we score the ill-structured problems introduced by simulations and portfolio entries? What is the purpose of teacher assessment in the first place? Is there a better way to assure quality teaching?

I close the paper with a few lines from Alice in Wonderland. At this point in the story, Alice asks the Cheshire Cat, "Would you tell me, please, which way I ought to go from here?"

"That depends a good deal on where you want to get to," said the Cat.

"I don't much care where--" said Alice.

"Then it doesn't matter which way you go," said the Cat.

"--so long as I get *somewhere*," Alice added as an explanation.

"Oh, you're sure to do that," said the Cat, "if you only walk long enough."

Like Alice, we're at a point in our assessment of teachers where we need directions. We have choices to make about what to assess (e.g., teacher knowledge, teacher performance, teacher thinking), how to assess (e.g., multiple-choice, simulations, observation systems), when to assess (e.g., entry to teacher education, licensing, identification of expert teachers), and whether to assess at all. Unlike Alice, our goal is much more well defined: We want to create assessments that are meaningful to members

of both the educational and lay communities. By just walking "long enough," we will not reach that goal. Instead, we must thoughfully plan our route. In this paper, I've presented a conceptual framework of teaching and assessment that should help us along our way.

References

Alexander, P. A., & Judy, J. E. (1989). The interaction of domain-specific and strategic knowledge in academic performance. *Review of Educational Research, 58*(4), 375-404.

Anderson, L. M. (1989). Learners and Learning. In M. C. Reynolds (Ed.), *Knowledge base for the beginning teacher* (pp. 85-99). Oxford: Pergamon Press.

Anderson, L., Evertson, C., & Brophy, J. (1982). *Principles of small-group instruction in elementary reading* (Occasional Paper No. 58). East Lansing, MI: Michigan State University, Institute for Research on Teaching.

Armento, B. J. (1986). Research on teaching social studies. In M. C. Wittrock , Ed. Handbook of research on teaching, third edition (pp. 942-951). New York: Macmillan Publishing Company.

Ball, D. L. (1989, February). *What teachers need to know to teach mathematics.* Paper presented at the Seminar for Education Policymakers, in Washington, D.C., and sponsored by the National Center for Research on Teacher Education at Michigan State University.

Bennett, R. E., Rock, D. A., Braun, H. I., Frye, D., Spohrer, J. C., & Soloway, E. (1989). *The relatinoship of constrained free-response to multiple-choice and open-ended items.* Princeton, NJ: Educational Testing Service.

Berliner, D. C. (1988, October). *Implications of studies of expertise in pedagogy for teacher education and evaluation.* Paper presented at the Educational Testing Service Invitational Conference on New Directions for Teacher Assessment, New York.

Berliner, D. C., & Carter, K. J. (1986, October). *Differences in processing classroom information by expert and novice teachers.* Paper presented to the International Study Association on Teacher Thinking, Leuven, Belgium.

Beyerbach, B. A., Smith, J., & Swift, P. R. (1989, March). *Exploring preservice and practicing teachers' thinking about children and teaching.* Paper presented at the annual meeting of the American Educational Research Association, San Francisco.

Bird, T. (1987). *Teacher assessment and professionalization.* Paper prepared for the Task Force on Teaching as a Profession, Carnegie Forum on Education and the Economy.

Bird, T. (1990). The schoolteacher's portfolio: An essay on possibilities. In J. Millman and L. Darling-Hammond (Eds.). *The new handbook of teacher evaluation: Assessing elementary and secondary school teachers* (pp. 241-256). Newbury Park, CA: Sage.

Bloom, B. (1956). *Taxonomy of educational objectives: Handbook I: Cognitive domain.* New York: David McKay.

Bowles, S., & Gintis, H. (1976). *Schooling in capitalist America.* New York: Basic Books.

Buchmann, M. (1984). The use of research knowledge in teacher education and teaching. *American Journal of Education, 92,* 421-439.

Buchmann, M. (1988). *Practical arguments are no accounts of teacher thinking: But then, what is?* (Occasional Paper No. 119). East Lansing, MI: Michigan State University, Institute for Research on Teaching.

Byham, W. C. (1986). *Use of the assessment center method to evaluate teacher competencies.* Pittsburgh, PA: Development Dimensions International.

Calfee, R., & Drum, P. (1986). Research on teaching reading. In M. C. Wittrock (Ed.), *Handbook of research on teaching, third edition* (pp. 804-849). New York: Macmillan Publishing Company.

Carlson, R. E. (1989, March). *The intersection of subject-matter and pedagogical knowledge in teacher assessment: Practical considerations for item development.* Paper presented at the annual meeting of the American Educational Research Association, San Francisco.

Carter, K. (1989) Personal communication at Rutgers University seminar.

Cazden, C. B., & Leggett, E. C. (1981). Culturally responsive education: Recommendations for achieving LAU remedies II. In H.T. Trueba, G. P. Guthrie, & K. H. Au (Eds.), *Culture and the bilingual classroom: Studies in classroom ethnography* (pp. 69-86). Rowley, MA: Newbury House.

Cazden, C. B., & Mehan, H. (1989). Principles from sociology and anthropology: Context, code, classroom, and culture. In M. C. Reynolds (Ed.), *Knowledge base for the beginning teacher* (pp. 47-57). Oxford: Pergamon Press.

Chi, M. T. H., Bassok, M., Lewis, M. W., Reimann, P., & Glaser, R. (1989). Self-explanations: How students study and use examples in learning to solve problems. *Cognitive Science, 13,* 145-182.

Clandinin, D. J., & Connelly, F. M. (1986). What is 'personal' in studies of the personal. In M. Ben-Peretz, R. Bromme, & R. Halkes (Eds.), *Advances of research on teacher thinking* (pp. 21-35). Lisse, The Netherlands: Swets & Zeitlinger B.V.

Clark, C. M., & Peterson, P. L. (1986). Teachers' thought processes. In M. C. Wittrock (Ed.), *Handbook of research on teaching, third edition* (pp. 255-296). New York: Macmillan Publishing Company.

Clark, R. E., & Salomon, G. (1986). Media in teaching. In M. C. Wittrock (Ed.), *Handbook of research on teaching, third edition* (pp. 464-478). New York: Macmillan Publishing Company.

Cobb, P., Yackel, E., & Wood, T. (1988). Curriculum and teacher development: Psychological and anthropological perspectives. In E. Fennema, T. Carpenter, & S. J. Lamon (Eds.), *Integrating research on teaching and learning mathematics* (pp. 92-131). Madison: University of Wisconsin, National Center for Research in Mathematical Sciences Education.

Cochrane, D. (1975). Moral education: A prolegomenon. *Theory Into Practice, 14*(4), 236-246.

Cole, M., & Griffin, P. (1987). *Contextual factors in education: Improving science and mathematics education for minorities and women.* Madison: University of Wisconsin, School of Education, Wisconsin Center for Education Research.

Conoley, J. C. (1989). Professional communication and collaboration among educators. In M. C. Reynolds (Ed.), *Knowledge base for the beginning teacher* (pp. 245-254). Oxford: Pergamon Press.

Committee of Bar Examiners of the State Bar of California. (1988, August). *California Bar Examination. Information regarding performance tests.* San Francisco: Committee of Bar Examiners of the State Bar of California.

Darling-Hammond, L., & Berry, B. (1988). *The evolution of teacher policy.* Santa Monica, CA: The Rand Corporation.

Dinham, S. M., & Stritter, F. T. (1986). Research on professional education. In M. C. Wittrock (Ed.), *Handbook of research on teaching, third edition* (pp. 952-970). New York: Macmillan Publishing Company.

Doyle, W. (1986). Classroom organization and management. In M. C. Wittrock (Ed.), *Handbook of research on teaching, third edition* (pp. 392-431). New York: Macmillan Publishing Company.

Eisner, E. W. (1979). *The educational imagination. On the design and evaluation of school programs.* New York: Macmillan Publishing Co., Inc.

Eisner, E. W. (1982). *Cognition and curriculum. A basis for deciding what to teach.* New York: Longman.

Elbaz, F. (1983). *Teacher thinking: A study of practical knowledge.* New York: Nichols.

Erickson, F. (1984). School literacy, reasoning, and civility: An anthropologist's perspective. *Review of Educational Research, 54,* 525-546.

Erickson, G. (1989, March). *High-school teacher decisions in problematic situations.* Paper presented at the annual meeting of the American Educational Research Association, San Francisco.

Evertson, C. M. (1989). Classroom organization and management. In M. C. Reynolds (Ed.), *Knowledge base for the beginning teacher* (pp. 59-70). Oxford: Pergamon Press.

Evertson, C. M., & Emmer, E. T. (1982). Effective management at the beginning of the school year in junior high classes. *Journal of Educational Psychology, 74,* 485-498.

Fenstermacher, G. D., & Soltis, J. F. (1986). *Approaches to teaching.* New York: Teachers College Press.

Fillmore, L. W., & Valadez, C. (1986). Teaching bilingual learners. In M. C. Wittrock (Ed.), *Handbook of research on teaching, third edition* (pp. 648-685). New York: Macmillan Publishing Company.

Florio-Ruane, S. (1989). Social organization of classes and schools. In M. C. Reynolds (Ed.), *Knowledge base for the beginning teacher* (pp. 163-172). Oxford: Pergamon Press.

Galluzzo, G. R. (1984). *A study of student-teaching thinking.* Paper presented at the annual meeting of the American Educational Research Association meeting, New Orleans.

Gideonse, H. D. (1989). *Relating knowledge to teacher education. Responding to NCATE's knowledge base and related standards.* Washington, D.C.: American Association of Colleges for Teacher Education.

Good, T. L., & Brophy, J. E. (1986). School effects. In M. C. Wittrock (Ed.), *Handbook of research on teaching, third edition* (pp. 570-602). New York: Macmillan Publishing Company.

Graves, M., & Piche, G. (1989). Knowledge about reading and writing. In M. C. Reynolds (Ed.), *Knowledge base for the beginning teacher* (pp. 207-219). Oxford: Pergamon Press.

Greene, M. (1989). Social and political contexts. In M. C. Reynolds (Ed.), *Knowledge base for the beginning teacher* (pp. 143-154). Oxford: Pergamon Press.

Grossman, P. L. (1988). *A study in contrast: Sources of pedagogical content knowledge for secondary English.* Unpublished doctoral dissertation, Stanford University, Stanford, CA.

Grossman, P. L., Wilson, S. M., & Shulman, L. S. (1989). Teachers of substance: Subject matter knowledge for teaching. In M. C. Reynolds (Ed.), *Knowledge base for the beginning teacher* (pp. 23-36). Oxford: Pergamon Press.

Gudmundsdottir, S. (1985). *Story maker, story teller: Case study of Chris*. Unpublished research report. Stanford, CA: Knowledge Growth in a Profession Project.

Gudmundsdottir, S., Carey, N., & Wilson, S. M. (1985). *Role of prior subject matter knowledge in learning to teach social studies* (Tech. Rep. No. CC-05). Stanford, CA: Knowledge Growth in a Profession Project.

Haertel, E. H. (1990). Performance tests, simulations, and other methodsn J. Millman & L. Darling-Hammong (Eds.). *The new handbook of teacher evaluation: Assessing elementary and secondary school teachers* (pp. 278-294). Newbury Park, CA: Sage.

Heath, S. B. (1983). *Ways with words*. Cambridge, England: Cambridge University Press.

Hollingsworth, S. (1989). Prior beliefs and cognitive change in learning to teach. *American Educational Research Journal, 26*(2), 160-189.

Howard, A. (1983). Work samples and simulations in competency evaluation. *Professional Psychology: Research and Practice, 14*(6), 780-796.

Jackson, P. W. (1968). *Life in classrooms*. New York: Holt, Rinehart & Winston.

Jones, B. J., & McFee, J. K. (1986). Research on teaching arts and aesthetics. In M. C. Wittrock (Ed.), *Handbook of research on teaching, third edition* (pp. 906-916). New York: Macmillan Publishing Company.

Joyce, B. (1980). *Toward a theory of information processing in teaching* (Research Series No. 76). East Lansing, MI: Michigan State University, Institute for Research on Teaching.

Lampert, M. (1985). How do teachers manage to teach: Perspectives on problems in practice. *Harvard Educational Review, 55*(2), 178-194.

Leinhardt, G., & Greeno, J. G. (1986). The cognitive skill of teaching. *Journal of Educational Psychology, 78*, 75-95.

Logan, C. S., Garland, J. S., & Ellett, C. D. (1988). *Development of content for a teaching performance assessment system for intern teachers in Louisiana.* Paper presented at the annual Southeastern Regional Meeting of Division G of the American Educational Research Association , Nashville, Tennessee.

Logan, C.S., Garland, J.S., & Ellett, C. D. (1989, March). *Large-scale teacher performance assessment instruments: A synthesis of what they measure and a national survey of their influence on the preparation of teachers. Phase 1, 2.* Paper presented at the annual meeting of the American Educational Research Association, San Francisco.

MacMillan, D. L., Keogh, B. K., & Jones, R. L. (1986). Special educational research on mildly handicapped learners. In M. C. Wittrock (Ed.), *Handbook of research on teaching, third edition* (pp. 686-724). New York: Macmillan Publishing Company.

Marland, P. W. (1977). *A study of teachers' interactive thoughts.* Unpublished doctoral dissertation, University of Alberta, Edmonton, Canada.

Martinez, M. (1989). Personal communication at Educational Testing Service.

McCarty, D. J. (1989). The school district: A unique setting. In M. C. Reynolds (Ed.), *Knowledge base for the beginning teacher* (pp. 155-162). Oxford: Pergamon Press.

McCarthy, M. M. (1989). Legal rights and responsibilities of public school teachers. In M. C. Reynolds (Ed.), *Knowledge base for the beginning teacher* (pp. 255-266). Oxford: Pergamon Press.

McDiarmid, G. W., Ball, D. L., & Anderson, C. W. (1989). Why staying one chapter ahead doesn't really work: Subject-specific pedagogy. In M. C. Reynolds (Ed.), *Knowledge base for the beginning teacher* (pp. 193-205). Oxford: Pergamon Press.

Merwin, J. C. (1989). Evaluation. In M. C. Reynolds (Ed.), *Knowledge base for the beginning teacher* (pp. 185-192). Oxford: Pergamon Press.

Millward, R. E. (1989, March). *Implementing a preteacher assessment center.* Paper presented at the annual meeting of the American Educational Research Association, San Francisco.

Mitchell, J., & Marks, R. (1989). *M4: Opportunity box, final.* (Tech. Rep. No. M4). Stanford, CA: Teacher Assessment Project.

Murphy, D. M., Kauffman, J. M., & Strang, H. R. (1987, November). Using microcomputer simulation to teach classroom management skills to preservice teachers. *Behavioral Disorders*, 20-34.

National Association of State Directors of Teacher Education and Certification. (1988). *Manual of certification and preparation of educational personnel in the United States.* Salt Lake City, UT: NASDTEC, E-13, E-25.

National Board for Professional Teaching Standards (1989). *Toward high and rigorous standards for the teaching profession. Initial policies and perspectives of the National Board for Professional Teaching Standards.* Detroit, MI: National Board for Professional Teaching Standards.

Nucci, L. (1989). Knowledge of the learner: The development of children's concepts of self, morality, and societal convention. In M. C. Reynolds (Ed.), *Knowledge base for the beginning teacher* (pp. 117-127). Oxford: Pergamon Press.

Olson, L. (1988, June 8). Capturing teaching's essence: Stanford team tests new methods. *Education Week, 1*, 20-21.

Paris, S. G., Lipson, M. Y., & Wixson, K. K. (1983). Becoming a strategic reader. *Contemporary Educational Psychology, 8*, 293-316.

Pecheone, R. L. (1988, April). *The catalytic role of new teacher assessment strategies: Designing assessments to measure subject matter pedagogical understandings.* Paper presented at the annual meeting of the American Educational Research Association, New Orleans.

Perkins, D. N., & Salomon, G. (1989). Are cognitive skills context-bound? *Educational Researcher, 18*(1), 16-25.

Peterson, P. L. (1988). Teachers' and students' cognitional knowledge for classroom teaching and learning. *Educational Researcher, 17*(5), 5-14.

Petrie, H. G. (1989, March). *Teacher knowledge and teacher practice: A new view.* Paper presented at the annual meeting of the American Educational Research Association, San Francisco.

Popham, W. J. (1989, March). *Videotape-based teacher tests: Old medium, new methods.* Paper presented at the annual meeting of the American Educational Research Association, San Francisco.

Porter, A. (1988, April). *Understanding teaching: A model for assessment.* Paper presented at the annual meeting of the American Educational Research Association, New Orleans.

Post, T. R., & Cramer, K. A. (1989). Knowledge, representation, and quantitative thinking. In M. C. Reynolds (Ed.), *Knowledge base for the beginning teacher* (pp. 221-231). Oxford: Pergamon Press.

Prince, C. D. (1988, April). *The essential role of educational research/knowledge base: Establishing a grounding for the reform.* Paper presented at the annual meeting of the American Educational Research Association, New Orleans.

Reynolds, A. (1987). *"Everyone's invited to the party": A case study of Catherine, a beginning English teacher* (Technical Report No. CS-09). Stanford, CA: Knowledge Growth in a Profession Project.

Reynolds, A., Haymore, J., Ringstaff, C., & Grossman, P. (1988). Teachers and curricular materials: Who is driving whom? *Curriculum Perspectives*, *8*(1), 22-29.

Reynolds, M. C. (1989). Students with special needs. In M. C. Reynolds (Ed.), *Knowledge base for the beginning teacher* (pp. 129-142). Oxford: Pergamon Press.

Roehler, L., Duffy, G., Conley, M., Herrmann, B., Johnson, J., & Michelson, S. (1987, April). *Exploring preservice teachers' knowledge structures.* Paper presented at the annual meeting of the American Educational Research Association, Washington, D.C.

Rohrkemper, M. M., & Bershon, B. L. (1984). Elementary school students' reports of the causes and effects of problem difficulty in mathematics. *Elementary School Journal*, *85*(1), 127-147.

Romberg, T. A., & Carpenter, T. P. (1986). Research on teaching and learning mathematics: Two disciplines of scientific inquiry. In M. C. Wittrock (Ed.), *Handbook of research on teaching, third edition* (pp. 850-873). New York: Macmillan Publishing Company.

Rosenfeld, M., Reynolds, A., Wilder, G., Freeberg, N . E., & Bukatko, P. (in progress). *Analysis of the professional functions of teachers, final report.* Princeton, NJ: Educational Testing Service.

Rosenfeld, M., Thornton, R. F., & Skurnik, L. S. (1986). *Analysis of the professional functions of teachers. Relationships between job functions and the NTE core battery.* Princeton, NJ: Educational Testing Service.

Sarason, S. B. (1971). *The culture of the school and the problem of change.* Boston: Allyn and Bacon.

Scardamalia, M., & Bereiter, C. (1986). Research on written composition. In M. C. Wittrock (Ed.), *Handbook of research on teaching, third edition* (pp. 778-803). New York: Macmillan Publishing Company.

Schön, D. (1987). *Educating the reflective practitioner.* San Francisco: Jossey-Bass.

Schwab, J. S. (1973). The practical 3: Translation into curriculum. *School Review, 81*, 501-522.

Schwab, J. S. (1978). Education and the structure of the disciplines. In I. Westbury & N. J. Wilkof (Eds.), *Science, curriculum, and liberal education* (pp. 229-272). Chicago: University of Chicago Press. (Original work published 1961).

Shedd, J. G., Conley, S. C., & Malanowski, R. M. (1986). *Teachers as decision-makers.* Paper presented at the annual meeting of the American Educational Research Association, San Francisco.

Shulman, L. S. (1986a). Those who understand: Knowledge growth in teaching. *Educational Researcher, 15*(2), 4-14.

Shulman, L. S. (1986b). Paradigms and research programs in the study of teaching: A contemporary perspective. In M. C. Wittrock (Ed.), *Handbook of research on teaching, third edition* (pp. 3-36). New York: Macmillan Publishing Company.

Shulman, L. S. (1987). Knowledge and teaching: Foundations of the new reform. *Harvard Educational Review, 57*(1), 1-22.

Shulman, L. S., Haertel, E., & Bird, T. (1988). *Toward alternative assessments of teaching. A report of work in progress.* Stanford, CA: Teacher Assessment Project.

Shulman, L. S., & Sykes, G. (1986). *A national board for teaching? In search of a bold standard.* Paper prepared for the Task Force on Teaching as a Profession, Carnegie Forum on Education and the Economy.

Smith, L., & Geoffrey, W. (1968). *An analysis toward a general theory of teaching: Complexities of an urban classroom.* New York: Holt, Rinehart, & Winston.

Soltis, J. F. (1986). Teaching professional ethics. *Journal of Teacher Education, 37*(3), 2-4.

Sprinthall, N. A. (1989). Meeting the developmental needs of pupils: Toward effective classroom guidance. In M. C. Reynolds (Ed.), *Knowledge base for the beginning teacher* (pp. 233-243). Oxford: Pergamon Press.

Stallings, J. A., & Stipek, D. (1986). Research on early childhood and elementary school teaching programs. In M. C. Wittrock (Ed.), *Handbook of research on teaching, third edition* (pp. 727-753). New York: Macmillan Publishing Company.

Steinberg, R. Haymore, J., & Marks, R. (1985). *Teachers' knowledge and structuring content in mathematics* (Tech. Rep. No. CC-09). Stanford, CA: Knowledge Growth in a Profession Project.

Sternberg, R. J., & Caruso, D. R. (1985). Practical modes of knowing. In E. Eisner (Ed.), *Learning and teaching the ways of knowing* (pp. 133-158). Chicago: The University of Chicago Press.

Strom, S. M. (1989). The ethical dimension of teaching. In M. C. Reynolds (Ed.), *Knowledge base for the beginning teacher* (pp. 267-276). Oxford: Pergamon Press.

Tomala, G. (1989, March). *Designing semi-structured interviews for statewide assessment.* Paper presented at the annual meeting of the American Educational Research Association, San Francisco.

Torrance, E. P. (1986). Teaching creative and gifted learners. In M. C. Wittrock (Ed.), *Handbook of research on teaching, third edition* (pp. 630-647). New York: Macmillan Publishing Company.

Valli, L. , & Tom, A. R. (1988, September-October). How adequate are the knowledge base frameworks in teacher education? *Journal of Teacher Education*, 5-12.

Vavrus, L., & Collins, A. (1989). *Portfolio documentation and assessment center exercises: A marriage made for teacher assessment.* Stanford, CA: Teacher Assessment Project.

Walker, D. F., & Soltis, J. F. (1986). *Curriculum and aims.* New York: Teachers College Press.

Wang, M. C., & Palincsar, A. S. (1989). Teaching students to assume an active role in their learning. In M. C. Reynolds (Ed.), *Knowledge base for the beginning teacher* (pp. 71-84). Oxford: Pergamon Press.

Weinstein, C. F., & Mayer, R. F. (1986). The teaching of learning strategies. In M. C. Wittrock (Ed.), *Handbook of research on teaching, third edition* (pp. 315-327). New York: Macmillan Publishing Company.

White, R. T., & Tisher, R. P. (1986). Research on natural sciences. In M. C. Wittrock (Ed.), *Handbook of research on teaching, third edition* (pp. 874-905). New York: Macmillan Publishing Company.

Wise, A. E., & Darling-Hammond, L. (1987). *Licensing teachers* (R-3576-CSTP). Santa Monica, CA: The Rand Corporation.

Wittrock, M. C. (1986). Students' thoughts processes. In M. C. Wittrock (Ed.), *Handbook of research on teaching, third edition* (pp. 297-314). New York: Macmillan Publishing Company.

Zumwalt, K. (1989). Beginning professional teachers: The need for a curricular vision of teaching. In M. C. Reynolds (Ed.), *Knowledge base for the beginning teacher* (pp. 173-184). Oxford: Pergamon Press.