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Designing Elementary Teacher Education to Prepare Well-Started Beginners

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Abstract

This paper describes a programmatic reconceptualization of teacher education to prepare novice teachers who are positioned to do the complex work of teaching from the moment they have classrooms of their own. The elementary teacher education program at one university is used as an example case to demonstrate pivotal decisions made in the redesign effort and to depict challenges faced and solutions implemented. Three pillars provide the foundation for this redesign: teaching practice, content knowledge for teaching, and professional ethical obligations. The program's efforts with regard to each of these is described. The authors explore the challenges they have faced and describe how the development of conceptual and practical supports such as foundational frameworks, social structures, and programmatic approaches to design have been central in addressing those challenges.

Designing Elementary Teacher Education to Prepare Well-Started Beginners

Introduction

This paper describes the redesign efforts of a teacher education program. We have embarked on a significant effort to design a practice-oriented elementary teacher education program that prepares new teachers to act skillfully while doing the complex work of elementary teaching. In doing so, we have also uncovered numerous complexities in elementary teacher education. One main purpose of this paper is to describe in some detail and justify the design decisions we have made in the development of our practice-oriented program. We anticipate this description will be of use to others interested in putting a greater emphasis on practice in teacher preparation. A second main purpose of this paper is to delineate challenges we have faced in this work and to describe approaches we have taken in addressing those challenges. We hope this discussion will provide insight that can be used by others who are striving to design practice-oriented programs in teacher education.

Historically, teacher education has tended to focus on the tasks that can be easily assigned and assessed, relying on pedagogies of reflection and investigation (Grossman, Hammerness, & McDonald, 2009). An implication of this is that beginning teachers tend to develop a knowledge base and analytic skills around teaching (Ball & Forzani, 2009). But teaching is interactive and contingent, requiring knowledge, skills and dispositions that are usable in teaching (Grossman, Compton, et al., 2009). How well are novice teachers able to work with multiple small groups of students conducting a science experiment? Or to lead a whole-class discussion in mathematics? Given new teachers' self-reports, apparently not very well. A high proportion of novice teachers say they feel unprepared to teach (Levine, 2006).

How does traditional teacher education miss its target? Ball and Forzani (2009) argue that in addition to being interactive and contingent, teaching is also both unnatural and intricate work. It is unnatural, for example, in that teachers regularly ask questions to which they already know the answer and try to elicit mistakes and problematic thinking; in contrast, people usually ask only genuine questions and try to smooth over mistakes. Teaching is intricate in that a teacher is engaging in numerous tasks and moves and coordinating those with their goals. Much of what teachers do is invisible to a casual observer, yet they are regularly managing 25 or more individuals in moving toward an understanding of subject matter in a supportive and caring learning environment. The implication is that teacher educators must support preservice teachers (or "teaching interns," as they are referred to in our program) in developing not just relevant knowledge and dispositions, but also in learning to use them when *doing* the work of teaching.

This is further complicated for elementary teachers, who are expected to teach all academic subject areas: mathematics, language arts, and multiple disciplines within social studies and science. Elementary teachers tend to be differentially prepared to teach each subject, with relatively little coursework in some subject areas (e.g., Banilower et al., 2013) and coursework not typically targeted at developing content knowledge *for teaching*.

It follows, then, that elementary teacher education is notably complex. In preparing novices to teach, elementary teacher educators must support interns in understanding child development and theories of learning, recognizing and enacting the obligations of the profession, understanding the social and democratic foundations of schooling, and being able to engage in the work of teaching across the range of subject areas they will teach.

What Do Teachers Need to Know and Be Able To Do?

Teachers need extensive expertise to be effective in the classroom. The latest round of content area standards in the United States places even greater expectations on students and therefore teachers. For example, the Common Core State Standards (Common Core State Standards Initiative, 2010a, 2010b) present a coherent, ambitious set of expectations for K-12 students in mathematics and English Language Arts. For example, in mathematics, students will be expected to develop greater depth of knowledge in topic areas, such as algebra, far earlier in their schooling. Further standards for mathematical practice have established expectations for

students to become proficient in, for example, constructing viable arguments, critiquing the reasoning of others, and using appropriate tools strategically. The patchwork of state level assessment that had largely focused on evaluating students' proficiency with skills and concepts will soon be replaced by assessments that also evaluate students' proficiency with the mathematical practices. Similarly, in the *Next Generation Science Standards* (NGSS Lead States, 2013), expectations for students are framed around three dimensions: core disciplinary ideas in science; scientific practices, such as making scientific observations and constructing and revising models; and crosscutting concepts, such as energy and cause and effect. Because students are expected to develop these types of expertise—in mathematics, language arts, science, and social studies—at the K-12 level, it follows that teachers, too, must have this expertise. In sum, teachers, then, need rich *knowledge of each discipline*, including knowledge of core disciplinary ideas and practices, as well as knowledge of any key crosscutting themes in the discipline.

At the same time, though, simply knowing content is insufficient. Teachers need rich *content knowledge for teaching* (Ball, Thames, & Phelps, 2008). This content knowledge for teaching is the knowledge base that teachers use for teaching the content. It entails knowing what students are likely to understand (or misunderstand) about specific topics (e.g., Carpenter, Fennema, & Franke, 1996; diSessa, 2006; Driver, Guesne, & Tiberghien, 1985). It also entails knowing the affordances and constraints of particular representations of content. For example, how do water wheels, teeming crowds, and passing hand-squeezes all serve to support students' understanding of the flow of electric current (McDiarmid, Ball, & Anderson, 1989)? How do the examples of sharing a pizza or cutting up a rope differentially support students' understanding of division of fractions (Ma, 1999)? Teachers also need to know strategies and representations for supporting students in engaging in disciplinary practices such as supporting claims with evidence in science or revising a story in language arts (Davis & Krajcik, 2005). Thus content knowledge for teaching entails deep disciplinary knowledge, including rich subject matter understandings and pedagogical content knowledge (Shulman, 1986).

But even this robust knowledge base is not sufficient. Teachers do not just need to know information or understand concepts. They need to be able to do the work of teaching. Thus, teachers also need a rich *repertoire of teaching practices*. They need to be able to engage in teaching practices that support students' understanding of content. They also need to be able to engage in teaching practices that support students' engagement in the disciplinary practices – such as through setting up norms of discourse for using evidence to support claims or through scaffolding students to support the systematic recording of data in science, or through using contemporary images as sources of evidence in history.

Elementary teachers, of course, need this rich knowledge base and practice repertoire not just in one subject area, but in all of the subject areas they teach. Far from being a "generalist, the skillful elementary teacher has extensive expertise in multiple academic subject areas and disciplines, as well as a strong sense of connections across disciplines.

Finally, teachers need to be able to use this extensive range of expertise in a way that supports the learning of *all* students in their classroom. By drawing on the cultural practices and prior knowledge of the youth in their classrooms, teachers must support students in recognizing the structures and norms of academic domains and being able to engage in meaningful academic discourse (Nasir, Rosebery, Warren, & Lee, 2006).

An Example: The Elementary Teacher Education Program at One University

At the University of Michigan, a team of teacher educators is working to re-envision what elementary teacher education can look like. Our program's overarching goal is to support the development of well-started beginners (Hollon, Roth, & Anderson, 1991).[1] The program is supported by three pillars. These pillars serve as the central supports for the design, enactment,

[1] Our program is an undergraduate elementary teacher education program. Teaching interns enter as juniors and spend three semesters in professional program coursework complemented by six to nine hours each week in a clinical practicum classroom. They also complete their remaining subject-area coursework during these three semesters. In their fourth semester in the program, interns engage in an extended student teaching experience.

and evaluation of our program. First, the program is oriented around teaching practice. We nurture novices who can demonstrate beginning proficiency with a key set of high-leverage practices. Second, we aim to prepare what we call "subject-matter serious" elementary teachers who are able to represent the content with integrity. Third, we support novices in becoming teachers who recognize and can act on their professional obligations, to support all students' learning. These pillars, we argue, provide the essential foundation for professional work. While other programs might choose different language with which to describe the work of teaching and thus the goals of teacher education, we argue that orientation toward these three pillars is essential for effective teacher preparation: developing the commitment and skill necessary to support every student in gaining proficiency with academic content requires preparation that does not leave instructional practice, content knowledge, or ethics to chance.

We are not the first, of course, to undertake the redesign of a teacher preparation program or to undertake reform (Zeichner, 2012; see, e.g., Fullan, Galluzzo, Morris, & Watson, 1998, for a review of the work of the Holmes Group). Having the benefit of the experience of others who have traveled this path before us, we have made some important decisions. Most central among these was our focus on re-conceiving the curriculum first, rather than starting by thinking about program structures, since teacher education reform efforts have often failed due to a focus on new structures without a concomitant focus on the curriculum and the culture (Fullan, 1993). Hence, we articulated our commitment to focusing our program on practice, content knowledge for teaching, and ethical obligations, and undertook significant efforts to delineate what each entails. At the same time, though, this reconceptualization of the curriculum necessarily led us to rethinking our structures as well as to articulating the principles that would guide our decision-making (Tom, 1997). We also benefited from strong administrative support at our university, as history indicates is crucial (Goodlad, 1990; Grossman & McDonald, 2008). Our dean led our curricular work, and the provost of our large state university supported our efforts conceptually and materially. Research on redesign efforts or comparisons of different programmatic approaches, though, yields few hard-and-fast guidelines (Zeichner & Conklin, 2005). Thus, while we approached our work with insight thanks to previous efforts, we also needed to engage in our own extensive work before emerging with a pilot program in which we felt some degree of confidence as a reflection of our core commitments.

Toward the goal of depicting our design process and decisions, we unpack each of the pillars and associated goals in the sections that follow. After that, we describe some of the challenges we have faced and then approaches we have used in meeting those challenges.

Pillar 1: What Does It Mean To Be Focused on Teaching Practice?

We aim to prepare novices who are astute, ethical, *and* highly skilled. While they will leave our program able to read about teaching, analyze teaching, and talk about teaching, we aim for far more: they will be able to do the actual work of teaching. We have developed a set of high-leverage teaching practices that serve as a set of outcomes, as well as guiding our curriculum development.

Definition and examples of high-leverage practices

A high-leverage practice is the result of decomposing the work of teaching (Ball & Forzani, 2009; Grossman, Compton, et al., 2009). Examples of our high-leverage practices include choosing and using representations, examples, and models of content; engaging students in rehearsing an organizational or managerial routine; choosing and modifying lesson plans for a specific learning goal; and conducting a meeting about a student with a parent or guardian. While many of our high-leverage practices are grounded in interactive classroom instruction, others have to do with planning, reflection, and professional communication. (See Appendix A for the high-leverage practices that guide our work.)

Our high-leverage practices are written without reference to specific subject areas. Most are taught and enacted, however, in subject-specific ways. It is impossible, for example, to explain core content in a subject-neutral way; this practice is inherently grounded in the relevant discipline. Others, however, can be both taught and enacted in either subject-specific *or* subject-

neutral ways. For example, one might have a parent-teacher conference about specific content (e.g., the child's performance on mathematics tests) or about social interactions or other subject-neutral elements of school (e.g., the importance of organization and routine at home and at school to support the child in engaging in homework).

We used two types of considerations as we made choices about what to include in our set of high-leverage practices. First, we drew on considerations related to *high quality teaching*. These considerations include that the practice was likely to be (a) powerful in advancing students' learning, (b) useful in many contexts and content areas, and (c) useful in confronting inequities in American schools and schooling. These considerations are important in identifying practices that are crucial for novices to learn, among the myriad possibilities. Second, we drew on considerations related to *high quality teacher education*. These considerations include that the practice could (a) be learned by a beginner, (b) be assessed, and (c) usefully serve as a building block in learning to do the work of teaching. Other considerations in this set include that the practice (d) is unlikely to be learned well only through experience and (e) could be justified and made convincing to the interns as both meaningful and useful (Ball, Sleep, Boerst, & Bass, 2009). Employing these considerations allowed us to narrow our focus to a set of the core practices of teaching (Grossman & McDonald, 2008) that were truly high-leverage for novice elementary teachers.

Supporting interns' development with regard to teaching practice

How do we work on these high-leverage practices with teaching interns? Grossman, Hammerness, and McDonald (2009) recommend using pedagogies of practice. These pedagogies go beyond the pedagogies of reflection and investigation typical in teacher education, which support novices in developing a knowledge base and analytical skills. Grossman, Compton, and their colleagues (2009) extend this recommendation, presenting a framework for teaching professional practice. They argue that engaging novice professionals—including novice teachers—with representations, decompositions, and approximations of practice can support them in learning to engage in professional practice.

Representations of practice can include written cases describing exemplars or dilemmas of teaching or video records of novices' own or expert teaching. Decompositions of practice might entail working on elements of a larger practice like setting goals within lesson planning. Approximations of practice are "opportunities for novices to engage in practices that are more or less proximal to the practices of a profession" (Grossman, Compton, et al., 2009, p. 2058). Examples include engaging in components of larger practices in a role play or rehearsal, preparing a component of the practice, or enacting the practice with support (Grossman, Compton, et al., 2009). Other examples in teaching include teaching parts of lessons, teaching a small group of students, or peer teaching (e.g., Horn, 2010). Our program relies heavily on each of these pedagogies of practice. Here, we focus most of our attention on approximations, recognizing that the distinction among the pedagogies of practice is not as important as considering them in concert when designing learning opportunities for novices.

Approximations of practice for learning to teach are intended to support interns in engaging in deliberate practice. Deliberate practice refers to the purposeful, effortful activities in which individuals engage with the purpose of optimizing their improvement in their performance of an endeavor (Ericsson, Krampe, & Tesch-Römer, 1993). Approximations of practice allow learners to experience "instructive failure" (Grossman, Compton, et al., 2009, p. 2077)—they allow room for error in a relatively safe and low-stakes environment. And, importantly, approximations of practice focus the interns' attention on key aspects of the work, while allowing them to ignore or dismiss others. At the same time, though, the goal is not rote performance, but rather careful, reflective attention to the particulars of the instructional moves.

As an example, one theme in our program is "children as sensemakers." Early in the program, interns work with one child to elicit, interpret, and develop a student's thinking about the scientific phenomenon of day and night. Interns interview a lower elementary child about their understanding, use an interactive reading and a physical model to support knowledge development, and then assess the student's thinking. Later, interns build on insights from earlier experiences as they work with small groups of older students, interviewing students about their

understanding of fractions and designing and implementing targeted instruction. These experiences serve as approximations of practice, which in turn translate to whole-group, more extensive instruction, which the interns engage in as they continue in the program.

Assessing interns' development with regard to practice

Assessment focused on the pillars of the program plays a crucial role in the everyday conduct of the program, the long-term development and improvement of the program, and fulfilling our obligations to stakeholders who need assurance that our graduates are well-started beginners. We have thus shifted our assessment work from focusing on analyses of teaching and appraising teaching practices that occur outside of interaction with students (like planning and reflecting) toward appraising the enactment of a broader array of practices, including those performed in interaction with students. Specific feedback on practice from assessments can help beginning teachers learn to improve their practice over time (Grossman, 2010).

Assessment of teaching practice is integrated into the program from interns' very first day. Beyond providing a simple but important point of comparison for later in the program, the baseline assessments provide instructors with information that can be used to shape coursework. The work samples that are generated can be folded into later learning experiences. In addition, the baseline assessments shape interns' perspectives on the work of teaching and what it will be like to learn to be teachers in our program. Interns complete a second set of assessments at the midpoint of the program. Information from these assessments, considered in concert with information from courses and fieldwork, forms the basis for determining which interns need additional support with particular teaching practices and designing targeted support for those interns. Finally, near the end of the program, interns complete another set of assessments. Largely grounded in the work of student teaching, these assessments help us ensure that interns are well-started beginners ready to assume responsibility for their own classrooms. To complement these program-level assessments, we also identify "key course assessments" for which the resulting documentation and appraisals are shared with the program.

Different forms of assessment are used to capture and appraise teaching practices. The design of the assessments is influenced by factors such as their timing within the program, the nature of the teaching practice being appraised, and purposes for which information from the assessments will be used.

In the baseline assessments, we appraise teaching practices that happen outside of interaction with students (e.g., observing and interpreting a video of a young student reading a text aloud; analyzing and modifying a science lesson plan) as well as simulations of those that happen in interaction with students (e.g., providing a clear explanation of core mathematics content; giving directions for a task). In the mid-program assessments, interns demonstrate their skill in more complex practices and/or with higher expectations for performance, through, for example, video clips that show their enactment of classroom management routines in their practicum classroom; a live simulation that requires interns to elicit and analyze a standardized student's thinking about mathematics (building on the idea of a standardized patient in medicine); and analysis and modification of another lesson plan (this time, in social studies). In the end-of-program assessment based in student teaching, interns build a portfolio of the correspondence they have had with families in their placement classroom to illustrate professional communication with parents and caregivers and provide evidence of enactment of a set of lessons that were modified in light of the formative assessment data they collected from students.

In sum, the program-level assessments of teaching practice allow us to gather information about interns' unfolding skill in "doing teaching" at strategic points in time, in different contexts of practice, and across the range of subject matter areas. Drawing on multiple sources of information, we are able to use these assessments to enhance program design, support course instructors, provide feedback to interns, and customize learning opportunities for interns—all of which are necessary for supporting the development of well-started beginners (Moss, 2010).

Having unpacked some of our work around orienting our program toward practice, we turn next to an overview of our work in the second pillar of the program.

Pillar 2: What Does It Mean To Be Subject-Matter Serious?

A core commitment of our teacher education program is to position our teaching interns to represent all academic subjects with integrity. Thus, the second pillar of our program is content knowledge for teaching; we hope to foster the development of novices who are "subject-matter serious" in the sense that they can represent it well and that they understand that the point and focus of teaching is to help students to learn academic content.

Definition and examples of content knowledge for teaching

Ball and colleagues (2008) describe content knowledge for teaching as knowledge entailed by the work of teaching. Here, we refer to core disciplinary knowledge as well as disciplinary practices and habits of mind. As noted above, content knowledge for teaching requires deeply understanding the content in ways that make it useful for teaching (e.g., Carpenter et al., 1996; McDiarmid et al., 1989; Shulman, 1986): knowing what students are likely to understand or misunderstand about specific topics and practices, the affordances and constraints of specific representations of content and practices, and the specialized content knowledge teachers need to guide their instructional decision-making.

Supporting interns' development with regard to content knowledge for teaching

We have developed a set of assumptions and principles to guide our program design. One principle is that we engage our teaching interns in substantive work on each key academic subject (i.e., language arts, mathematics, science, and social studies) during each semester of our program. In applying this principle, we hope to ensure that our interns make connections across courses and specifically across their work on similar practices in the context of different subject areas. For example, interns should learn that there are some general strategies that can be used in facilitating classroom discussions, as well as subject-specific strategies that can be employed. We attempt to simultaneously focus significant attention on subject matter and increase the connections between the subjects.

Some of the high-leverage practices themselves attend to a focus on academic content. For example, *choosing and modifying lesson plans* is worked on purposefully across subject areas. We have developed a Instructional Planning Considerations Framework that outlines key dimensions of planning lessons or units (such as attending to learners, learning goals, and instruction). Interns apply the Framework to their work using existing curriculum materials; they analyze lessons and identify strengths, weaknesses, and modifications, to support their productive use of the kinds of curriculum materials they are likely to have access to as teachers. They learn, through this work, that "attending to learners" (as an example) requires subject-specificity; one needs to go further than a generic stance of recognizing that students have prior knowledge about the topic (e.g., Carpenter et al., 1996). In teaching a science lesson on condensation, for example, one can anticipate specific non-normative student ideas (e.g., that water leaks through the container, as opposed to the normative idea that water vapor, when cooled, forms liquid water on a surface), and one can design experiences with phenomena that can address those *specific* ideas about the content (e.g., observing condensation forming on a mirror, where liquid leaking through is not a viable explanation). Such a focus helps interns begin to develop their content knowledge for teaching.

Interns work on developing their content knowledge for teaching in multiple contexts. In subject-specific methods courses, they develop and use subject-specific knowledge for teaching. In math methods, they might focus on place value or fractions, whereas in science methods, they might focus on changes of state or the flow of energy through ecosystems. In these classes, interns work on the content itself as well as coming to understand and appreciate children's specific ideas about that content as well as representations and experiences that can help children learn the content. In cross-subject coursework, interns work on developing knowledge and practice across subject areas (e.g., through the use of the Instructional Planning

Considerations Framework, described above). Finally, interns work on developing content knowledge for teaching in their field placement settings, and work with colleagues, mentor teachers, and field instructors to enhance this knowledge.

Assessing interns' development with regard to content knowledge for teaching

Because our program seeks to nurture teachers in becoming responsible stewards of academic content, we need to have assessments across the program that monitor progress and assure a high standard of quality. At the same time, establishing such assessments conveys a message to program participants that content knowledge "matters" in teaching and in learning to teach. Our assessments need to capture interns' knowledge of content such as common misconceptions, the composite parts of complex and sometimes opaque disciplinary concepts and practices, and understanding of how knowledge is developed and supported in different disciplines.

One form of assessment that we use in multiple content areas is a selected response content knowledge for teaching test. For example, interns take a mathematical knowledge for teaching test that requires them to use mathematics to respond to teaching scenarios like student explanations, representations from textbooks, and task analysis (Hill, Rowan, & Ball, 2005). They take a similar test in science (Trygstad, Smith, Davis, & Palincsar, 2012).

We also want our assessments to capture knowledge *in use* in acts of teaching. We address this need in a variety of ways. First, we have designed opportunities to assess content knowledge into some of our assessments of teaching practice. For instance, in our lesson analysis assessments, we ask interns to demonstrate their knowledge of social studies and science content by noting the strengths and weakness of how ideas like energy (in the science lesson) and evidence (in social studies lesson) are represented in the lesson. Another example is the eliciting and interpreting student thinking simulation assessment; here, we see how interns draw on their knowledge of mathematics to construct follow-up problems and mathematically generalize from an approach used by a student in the scenario (Shaughnessy, Sleep, Boerst, & Ball, 2011). Second, we use "key course assessments" to provide insights into our interns' content knowledge for teaching. For instance, the lessons that interns teach for their science methods course are evaluated in terms of proficiency with teaching practices *and* the integrity of the content conveyed in those lessons, including the integrity of the disciplinary core ideas and the disciplinary practices. Third, we support field instructors and mentor teachers in attending to the integrity of interns' work with subject matter in day-to-day observations as interns engage in teaching.

We use these assessments of content knowledge for teaching at different times and for different purposes. We use content knowledge assessments prior to coursework to orient the course design work of instructors. These assessments also give interns a sense of the content they will be learning. We also use assessments of content at the completion of program to look for growth in performance over time, but also to assure ourselves that interns are ready to be responsible stewards of content when they assume responsibility for their own classrooms. Importantly, we have assessments that are a part of the fabric of the program as it unfolds that support course instructors, field instructors, and mentors to track collectively on the way that content knowledge is informing, and embodied, in interns' teaching.

We have thus far discussed our work on practice and content knowledge for teaching. We describe our work on the third pillar next.

Pillar 3: What Does It Mean To Work on Ethical Obligations?

The third pillar of our program is the ethical obligations of teaching. A fundamental component of these obligations involves actively working to foster equity—that is, working to redress the inequities and gaps in American schools. Recognizing teaching as a moral endeavor (e.g., Ball & Wilson, 1996; CCSSO, 2013; Tom, 1984), these obligations begin to operationalize how we can promote equitable learning and schooling opportunities for all students. Our goal, in articulating these obligations and in framing them as one pillar of our program, is that interns' teaching reflects their attempts to instantiate the obligations *in practice*.

Definition and examples of ethical obligations

A working group at our School of Education, the Teacher Education Initiative's Ethics Project Working Group, engaged in an intensive research-based process to develop the set of ethical obligations that we use in our program. Examples include caring for and demonstrating commitment to every student and working to ensure equitable access to learning opportunities (Teaching Education Initiative's Working Group, 2009). Figure 1 provides the set of obligations on which we focus in our program.

Figure 1

Ethical Obligations

1. To care for and demonstrate commitment to every student
2. To develop and continually work to improve instructional competence, and to strive to engage in professionally-justified teaching practice at all times
3. To ensure equitable access to learning in one's own classroom
4. To learn about and demonstrate awareness of and appreciation for cultural differences and social diversity, particularly as they are present in one's classroom, and to draw on diversity as a resource in instruction
5. To demonstrate through concrete actions an awareness of the capacity of every individual to learn
6. To take responsibility for obstacles to student success and to work assiduously to ensure equitable access to learning opportunities
7. To understand and exercise carefully the power and authority of the teaching role
8. To treat students, colleagues, parents and care-givers, and community members with respect and generosity in all communications with and about them
9. To represent the ideas of the academic disciplines and subject-matter that one teaches with integrity

Supporting interns' development with regard to ethical obligations

How do we work on these ethical obligations in our program? One approach is through coursework throughout the program focused on teaching in a multicultural society. This coursework centers on social foundations of schooling and the forces that produce inequalities in students' educational opportunities and outcomes. Interns also learn about culturally responsive pedagogy (Ladson-Billings, 1995) as a way of working to mitigate inequalities. Later, teaching interns further build their own capacity for engaging in culturally responsive pedagogy, in part through carefully scaffolded work with children's caregivers and in communities.

Each other course in the professional program also makes connections to the issues of equity raised in the multicultural education courses, with focus on the ethical obligations. For example, one of the Instructional Planning Considerations asks interns to describe how they will make the content of the lesson accessible to all learners. In another course, classroom management strategies are tied directly to how they give access to all students' access to learning (e.g., van Tartwijk & Hammerness, 2011).

A third place in which interns work on issues of equity and ethics is, of course, in the field, where they are supported by their mentor teachers and field instructors. For example, the field instructors and mentor teachers hold practice-centered seminars in which they explore the meaning of the ethical obligations using examples that have arisen as interns work to effectively

communicate with and learn from families of the students in their classrooms. Field instructors also are themselves mentored in creating teachable moments during ongoing activities to surface the meaning and importance of ethics.

Assessing interns' development with regard to ethical obligations

Our assessment of ethical obligations aligns with the same stance, methods, and purposes described in our discussions of assessing teaching practice and content knowledge for teaching. As in other areas, we focus our assessments here on the use of ethical obligations in teaching. The assessments are not about determining what ethics our interns know about or what they believe, but rather how we can see attention to ethical obligations in the actual work of teaching. Admittedly this is not an easy distinction to make, let alone to assess, but it is the stance that drives our assessment development.

We draw on the same methods of assessment used with the other pillars. As was the case with content knowledge for teaching, we embed assessment of interns' ethical obligations into assessments of their teaching practice. For example, one of the key considerations our interns learn to use when analyzing and modifying curriculum materials is, "Would the lesson help my students make meaningful connections between the content and their lived experiences?" We use our assessments of this teaching practice to see the ways in which the analysis reflects attention to equity. In addition, we noted above that we have developed tools that support field instructors and mentor teachers in attending to the integrity of interns' work with subject matter in day-to-day observations of teaching; we use these same tools to capture information about the alignment of an intern's teaching with the ethical obligations. For example, we use these observational tools to note instances where a child seems to be marginalized in a discussion or, alternatively, where an intern works assiduously to draw all children in to the discussion. We are also developing simulations of practice, such as a simulation of a parent-teacher conference, through which we will be able to see how an intern's engagement in the practice reflects attention to the ethical obligations.

As we prepare our interns to engage in the high-leverage practice of "analyzing and improving specific elements of one's own teaching," we want them to actively use ethical principles as a cornerstone of this analysis (Zeichner & Liston, 1987). Therefore, we have augmented our approaches to include assessments that involve reading narrative cases reflecting ethical issues and dilemmas and analyzing them through the lenses of the ethical obligations (O'Connor, Khasnabis, & Boerst, 2011). The case analysis is not viewed as an end in itself; instead, interns are assessed on the way in which they use their analysis as the basis for developing pedagogical enhancements that will address the ethical dilemma posed in the case. The cases allow us to see the "use" of ethical obligations inside of a reflective teaching practice. This provides early insight into how interns may use ethical obligations to analyze and enhance their own teaching.

Key Challenges We Have Faced

In our design work, we have faced numerous challenges related to orienting our program around teaching practice, content knowledge for teaching, and the ethical obligations of teaching. These fall in three main categories, including challenges relating to program structure and design, instruction and assessment design, and program administration. We do not attempt to catalogue all of the challenges we have faced along the way, nor do they all fall neatly in these categories, but we select a few illustrative examples, in hopes that identifying these categories will support others with similar aims to work more effectively and efficiently.

Program design and structural challenges center on our need to be purposeful in selecting where we focus our attention in a complex and inherently multidimensional change process. For example, we chose to focus the articulation of teaching practices on those practices that are key across the teaching of multiple subjects. As described above, we developed considerations to avoid arbitrary selection and help us make those decisions. We face similar dilemmas in identifying focal content knowledge for teaching and ethical obligations. In addition, we wanted to continuously attend to all subject areas, every term, to help interns recognize ways

in which the high-leverage practices are applied across content areas. Our goal was to avoid a "silo" approach to teacher education. Instead we worked to design courses and structures that can be collectively taught, integrate content, and remain stable over time.

Our *instruction and assessment design challenges* have included issues related to the design of courses and assessments and building capacity among our faculty and in our partner settings for those courses and assessments. Course design for the goal of developing practice is difficult because pedagogies of practice—such as coached rehearsals—tend to be highly resource- and expertise-intensive (Lampert et al., 2013). Furthermore, teaching the sometimes "invisible" work of the ethical obligations of teaching requires coordinating the work on ethics across the courses and contexts of the program. Assessment design challenges center on developing tasks that elicit and capture the intended practices, content knowledge, and ethical obligations, and doing so fairly. Because teaching practice is ephemeral (Boerst et al., 2011), contingent (Sleep & Boerst, 2012), and dependent on content knowledge (Ball et al., 2008; Hill et al., 2005), designing assessments that we trust as representing interns' skill with particular practices is difficult. We triangulate across multiple pieces of evidence, rather than making high-stakes decisions based on single instances. We also, as described above, use simulations where we can better ensure that interns have opportunities to generate similar records and encounter the same content knowledge demands in the assessments, and in which we can systematically untangle contingent practices such as eliciting and then interpreting student ideas.

Another set of instruction and assessment design challenges centers on issues of building capacity. Elementary teacher educators in a coherent program like this must develop wide-ranging expertise, including being positioned to make connections across content areas and infuse the ethical obligations into everything we do. Related to this is our need to support and maintain settings for practice-based, ethical, and content-rich learning opportunities. We have developed classes that are "embedded" in schools (e.g., Garner & Rosaen, 2009; Lampert et al., 2013; Zeichner, 2010). These classes—taught at elementary or middle schools by university teacher educators, sometimes with K-8 teachers—provide shared experiences with students and mentor teachers, in a practice context directly mediated by the teacher educators. Embedding teacher education coursework in school settings, though, requires extensive relationship-building and creativity in establishing structures that are manageable and beneficial to interns, as well as students and mentor teachers (Khasnabis, Reischl, Stull, & Boerst, 2013).

We say less here about the *program administration challenges* that we have faced, in part because some of these are idiosyncratic to our institution. Some of these have included monitoring our new designs for sustainability and fiscal responsibility, navigating institutional policies to ensure that teaching interns have transcripts that reflect the work they have done in the redesigned program, building and maintaining instructors' goodwill and buy-in, recognizing and compensating instructors for their engagement in intensive course design and enactment, and developing ways for graduate students to be involved in the design and instructional work.

Key Approaches for Addressing the Challenges

Because of these challenges, engaging in this work has allowed us to explore numerous forms of support for ourselves and others in our school of education, including our interns. We have used three types of tools to help us address these challenges: foundational frameworks, social structures, and programmatic approaches to design. We unpack each of these in turn. But to demonstrate the need for such tools in meeting the challenges, we first describe three non-negotiable characteristics of our program.

First, our program design must be *sustainable*. We need to ensure that our program design is not just pedagogically sound, but also financially responsible. The demands of practice-based work, like teaching embedded courses, and the innovations that allowed us to avoid the pitfalls of a siloed approach to teacher education, like co-designing and co-teaching courses, have transformed the way in which we enact teacher education. They do not, however, allow us to shift the economics of running a program with roughly the same number of students; our goal is to engage in the new work without substantial new expense. Our program must also be *consistent*. Instructors need to be able to count on certain elements of our program remaining the same so that they can make cross-course connections. In addition, as we describe our program

to the state department of education and other accrediting agencies for approval, we need to be able to guarantee consistency from year to year regarding what our interns are learning. Finally, our program must be *coherent*, particularly from the standpoint of the interns. Language, philosophies, and values need to be shared. This is especially crucial in our context of *elementary* teacher education.

Foundational Frameworks

By "foundational frameworks," we mean documents that serve as touchstones articulating taken-as-shared perspectives across the program. These frameworks make explicit our goals and intentions for our program redesign. They allow us to develop institutional memory that helps us stay on course through a long and challenging redesign process and also serve to help newcomers learn about how we work and what we value.

Our foundational frameworks help us to address our needs for a sustainable, consistent, and coherent program. These foundational frameworks serve different constituencies. Some are used internally, by those engaged in the work of teacher education design and instruction. Others are used instructionally, by both instructors and interns. Figure 2 gives examples of the foundational frameworks we have developed in our program design work.

Figure 2

Examples of Foundational Frameworks

Articulation of high-leverage practices
Articulation of ethical obligations
Principles and assumptions document
Instructional planning considerations framework
Instructional planning template

The lists of the *high-leverage practices* (Appendix A) and the *ethical obligations* (Figure 1), clearly, serve as touchstones for us. We share the perspective that these are the foci of our work with interns, and along with subject-specific articulations of content knowledge for teaching, are the building blocks for the curriculum of the program.

A *principles and assumptions document* guides our design. This framework articulates our shared values and core commitments that shape the parameters within which we work. One important characteristic of the principles and assumptions document, in fact, is that we *use* it regularly, revisiting it as we make decisions to ensure that our designs continue to meet the expectations we have outlined for ourselves. Figure 3 gives examples of the principles and assumptions that guide our work. These principles and assumptions differ in some of the specifics from those articulated by Tom (1997; e.g., our program is not compressed in time), but fall in the same intellectual space, and help us attain sustainability, consistency, and coherence.

Figure 3

Examples of Principles and Assumptions

a) Interns should have repeated opportunities to engage in increasingly complex, increasingly authentic practices over time, with the fading of scaffolding and support.

b) Interns should have opportunities to work on all subject areas in each semester.

c) Interns should have opportunities to work on issues of equity in each semester.

d) Interns' experiences in different settings will be balanced with care.

e) The program will reflect a systematic, principled process for (a) constructing program-level frameworks and resources, (b) using frameworks and resources with integrity in and across coursework, and (c) revising those frameworks and resources as necessary.

f) We will strategically design or select and support settings in which interns can learn to do the work of teaching, content for teaching, and use professional ethics.

The *instructional planning considerations framework* and the *instructional planning template* are planning tools used across all courses in the program to guide interns' engagement in the work of teaching. By sharing these programmatically, we help to ease the learning process for interns and increase the program's consistency and coherence. For example, the planning template provides a single lesson plan format, using consistent language and sections across every course. This contributes to the program's teacher educators and interns developing a shared technical language of teaching (Lortie, 1975).

Thus, foundational frameworks provide one form of support as we work to address the challenges we face. Social structures are a second form of support.

Social Structures

By "social structures," we mean norms and forums that guide our collective work. These structures capitalize on and foster the interpersonal resources for design work and enactment of the program (Lampert, Boerst, & Graziani, 2011). We employ a range of social structures. For example, we hold an annual event we call a "grading party" where teams working to evaluate particular program-level assessments have access to the collective expertise, know-how, and resources of those in the wider teacher education program. As a second example, we have put in place processes to guide how task forces are constituted and charged with longer-term tasks, how they engage in their collaborative work, and the ways in which they are expected to consult with program leaders and other groups during the process. Our most central and routine social structure, though, is our working group, which we call the Elementary Curriculum Design Group (ECDG).

The ECDG is a collaborative group engaged in significant, collective program design work. This entails articulating our shared curricular goals and imagining structures to help us reach those goals with interns. The group includes approximately 20 individuals with different roles within our School of Education, including course instructors, field instructors, program staff, and program leaders. We represent many different kinds of faculty members and staff members and have a range of expertise, including field work, settings development, the teaching of all subject areas, assessment, policy, state accreditation, and university regulations. Our constitution and general process might reflect what Tom (1997) refers to as a "family style" orientation toward program reform; our participants are inside the program, and work on planning and implementing using an iterative, highly collaborative process.

ECDG meets routinely to engage in activities such as the collective design and refinement of program structures and frameworks, deliberation about substantive instructional issues such as how particular high-leverage practices can be addressed, and discussion of common courses and students. As we engage in collective design work, we sometimes openly

brainstorm options, but we also do extensive pre-meeting work to develop multiple options that can serve as provisional suggestions. We have found that having ideas to react to allows us to capitalize on our distributed expertise and to move forward in a large group setting more quickly. While our goal is program design, our meetings also serve as the kind of social space in which information (e.g., about courses, schools, interns) is informally shared, small problems are addressed, and ideas are hatched. The group helps us to build capacity among ourselves as teacher educators.

The social structures we have developed over time are a key approach that fosters progress toward sustainability, consistency, and coherence of the redesigned program. We are convinced that a top-down approach, without the opportunity for collective buy-in, would have been less successful in the long run (see Tom, 1997, for a review of some caveats associated with this approach). Our third approach to addressing our challenges is described next.

Programmatic Approaches to Design

By "programmatic approaches to design," we mean a set of collectively developed resources that facilitate and structure our collective design work. Figure 4 provides examples. Many take the form of tools (e.g., templates and charts that help us develop depictions of the program and maintain institutional memory), while others reflect administrative decisions (e.g., how instructional credit is given).

Figure 4

Examples of Programmatic Approaches to Design

Structures to support co-design and co-teaching of courses
Structures to coordinate the purposefully flexible use of time across the program
Course design templates
Charts for tracking how high-leverage practices are addressed within and across courses

Our program design necessitates teacher educators working closely together, because the program addresses every subject area in every semester, individual courses focus on practices and ethical obligations across subject areas, and courses intentionally support trajectories of work on particular practices and ethical obligations over time. Furthermore, we made a commitment to jointly designed courses that can be transitioned from one instructor to another over time. Therefore, we have developed structures that allow us to value and support the co-design and co-teaching of courses. By incentivizing this work, we make it possible to have robust resources in place when instructors change, so that the focal practices, activities, assessments, and settings of a course can be sustained. This allows us to maintain the trajectories of work, and thus the consistency and coherence of the program.

To accomplish this, we provide faculty (writ large) with instructional credit for engaging in significant design work and for engaging in non-traditional teaching approaches. In our program, we use time differently; not all courses are "traditional" semester-long courses that meet three hours/week. Thus, we delineate different numbers of credits for shorter and longer courses, or for courses with more or fewer contact hours with interns. Similarly, we provide additional instructional credit for working in highly relational settings (e.g., embedded courses). We also provide supportive credit for courses that are co-taught, recognizing that effective co-teaching is both necessary for many of our courses *and* takes similar effort as teaching independently. We suspect that a program designed around preparing novices who are ready from day one to engage in the work of teaching in their own classrooms may, in the end, be a more expensive proposition, however as mentioned above we strive to make the redesign as cost-neutral as possible (Zeichner, 2012).

As noted above, we need to develop coherent and consistent courses within a complex program with many moving parts and priorities. Toward that end, we have developed a set of course design templates that allow us to engage in systematic instructional design across each course. Having this documentation helps us to maintain consistency when instructors change, as they invariably do, and provides a resource that captures what a course is in a way that is readily understood across instructors. A similar kind of structure is a program-level document that tracks how each high-leverage practice is addressed across the entirety of the program coursework and assessment portfolio.

In sum, programmatic approaches to design serve as tools for us as we engage in our design work and face the resulting challenges. Together with the foundational frameworks and social structures, these help us to work in a principled, purposeful way as we move forward.

Concluding Thoughts

Learning to teach at the elementary level is hard. One must teach all academic subject areas while still maintaining focus on the affective and developmental needs of one's young charges. Understanding each academic subject area entails knowing the core disciplinary ideas and understanding and being able to engage oneself in the practices of the discipline. But being able to *teach* each academic subject area entails, additionally, having content knowledge for teaching (in each subject) and having a rich repertoire of teaching practices on which to draw. And, all at the same time, teachers must meet the needs of all of their students. Elementary teaching, then, is extraordinarily complex work, and thus the preparation of elementary teachers is inherently complex as well. We are redesigning our elementary teacher education program to help our graduates meet the needs of the increasingly diverse classrooms in American schools from the moment they enter the classroom.

The challenges we encounter when redesigning such a complex enterprise give rise to new opportunities to learn and to generate approaches, tools, and resources that can help to guide and move the design along in ways while also enhancing the program's sustainability, consistency, and coherence. In the process we are establishing a line of research that can simultaneously contribute to local program improvement and also to knowledge-building in the wider profession.

References

Ball, D., & Forzani, F. (2009). The work of teaching and the challenge for teacher education. *Journal of Teacher Education, 60*(5), 497-511.

Ball, D., Sleep, L., Boerst, T., & Bass, H. (2009). Combining the development of practice and the practice of development in teacher education. *The Elementary School Journal, 109*(5), 458-474.

Ball, D., Thames, M., & Phelps, G. (2008). Content knowledge for teaching: What makes it special? *Journal of Teacher Education, 29*(5), 389-407.

Ball, D., & Wilson, S.M. (1996). Integrity in teaching: Recognizing the fusion of the moral and intellectual. *American Educational Research Journal, 33*(1), 155-192.

Banilower, E., Smith, P.S., Weiss, I., Malzahn, K., Campbell, K., & Weis, A. (2013). *Report of the 2012 National Survey of Science and Mathematics Education*. Chapel Hill, NC: Horizon Research, Inc.

Boerst, T., Sleep, L, Ball, D.L., & Bass, H. (2011). Preparing teachers to lead mathematics discussions. *Teachers College Record. 113*(12), 2844-2877.

Carpenter, T., Fennema, E., & Franke, M. (1996). Cognitively guided instruction: A knowledge base for reform in primary mathematics instruction. *The Elementary School Journal, 97*(1), 3-20.

Common Core State Standards Initiative (2010a). *Common Core State Standards for English language arts*.

Common Core State Standards Initiative (2010b). *Common Core State Standards for mathematics*.

Council of Chief State School Officers. (2013). *Interstate Teacher Assessment and Support Consortium InTASC model core teaching standards and learning progressions for teachers 1.0: A resource for ongoing teacher development.* Washington, DC.

Davis, E.A., & Krajcik, J. (2005). Designing educative curriculum materials to promote teacher learning. *Educational Researcher, 34*(3), 3-14.

diSessa, A. (2006). A history of conceptual change research: Threads and fault lines. In R. K. Sawyer (Ed.), *Cambridge handbook of the learning sciences* (pp. 265-281). New York: Cambridge University Press.

Driver, R., Guesne, E., & Tiberghien, A. (Eds.). (1985). *Children's ideas in science*. Philadelphia: Open Univ. Press.

Ericsson, K., Krampe, R., & Tesch-Römer, C. (1993). The role of deliberate practice in the acquisition of expert performance. *Psychological Review, 100*(3), 363-406.

Fullan, M. (1993). *Change forces: Probing the depths of educational reform*. London: Falmer Press.

Fullan, M., Galluzzo, G., Morris, P., & Watson, N. (1998). *The rise and stall of teacher education reform*. Washington, DC: American Association of Colleges for Teacher Education.

Garner, G., & Rosaen, C. (2009). Strengthening partnerships and boosting conceptual connections in preservice field experience. *Teaching Education, 20*(4), 329-342.

Goodlad, J. (1990). *Teachers for our nation's schools*. San Francisco: Jossey-Bass Inc.

Grossman, P. (2010). *Learning to practice: The design of clinical experience in teacher preparation*. AACTE & NEA policy brief.

Grossman, P., Compton, C., Igra, D., Ronfeldt, M., Shahan, E., & Williamson, P. (2009). Teaching practice: A cross-professional perspective. *Teachers College Record, 111*(9), 2055-2100.

Grossman, P., Hammerness, K., & McDonald, M. (2009). Redefining teaching, re-imagining teacher education. *Teachers and Teaching: Theory and Practice, 15*(2), 273-289.

Grossman, P., & McDonald, M. (2008). Back to the future: Directions for research in teaching and teacher education. *American Educational Research Journal, 45*(1), 184-205.

Hill, H., Rowan, B., & Ball, D. (2005). Effects of teachers' mathematical knowledge for teaching on student achievement. *American Educational Research Journal, 42*(2), 371-406.

Hollon, R., Roth, K., & Anderson, C. (1991). Science teachers' conceptions of teaching and learning. In J. Brophy (Ed.), *Advances in research on teaching* (Vol. 2: *Teachers' subject matter knowledge and classroom instruction*, pp. 145-185). Greenwich, CT: JAI Press.

Horn, I. (2010). Teaching replays, teaching rehearsals, and re-visions of practice: Learning from colleagues in a mathematics teacher community. *Teachers College Record, 112*(1), 225-259.

Khasnabis, D., Reischl, C., Stull, M., & Boerst, T. (2013). Distributed mentoring: Designing contexts for collective support of teacher learning. *English Journal*, *102*(3), 71-77.

Ladson-Billings, G. (1995). Toward a theory of culturally relevant pedagogy. *American Educational Research Journal, 35*, 465-491.

Lampert, M., Boerst, T., & Graziani, F. (2011). Organizational assets in the service of school-wide ambitious teaching practice. *Teachers College Record*, *113*(7), 1361-1400.

Lampert, M., Franke, M., Kazemi, E., Ghousseini, H., Turrou, A., Beasley, H., ... Crowe, K. (2013). Keeping it complex: Using rehearsals to support novice teacher learning of ambitious teaching. *Journal of Teacher Education, 64*(3), 226-243.

Levine, A. (2006). *Educating school teachers*. Washington, D.C.: The Education Schools Project.

Lortie, D. (1975). *Schoolteacher: A sociological study*. Chicago: University of Chicago Press.

Ma, L. (1999). *Knowing and teaching elementary mathematics*. Mahwah, NJ: Lawrence Erlbaum.

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). New York: Pergamon.

Moss, P.A. (2010). Thinking systematically about assessment practice. In M. Kennedy (Ed.) *Teacher assessment and the quest for teacher quality: A handbook.* San Francisco, CA: Jossey Bass.

Nasir, N., Rosebery, A., Warren, B., & Lee, C. (2006). Learning as a cultural process: Achieving equity through diversity. In R.K. Sawyer (Ed.), *Cambridge handbook of the learning sciences* (pp. 265-281). New York: Cambridge University Press.

NGSS Lead States. (2013). *Next Generation Science Standards: For states, by states*. Washington, DC: The National Academies Press.

O'Connor, C., Khasnabis, D., & Boerst, T. (2011). *Baseline assessment: Attending to professional ethics*. Ann Arbor, MI: School of Education, University of Michigan.

Shaughnessy, M., Sleep, L., Boerst, T., & Ball, D.L. (2011). *Baseline assessment: Eliciting and interpreting student thinking*. Ann Arbor, MI: School of Education, University of Michigan.

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

Sleep, L., & Boerst, T. (2012). Preparing beginning teachers to elicit and interpret students' mathematical thinking. *Teaching and Teacher Education, 28*(7), 1038-1048.

Teacher Education Initiative's Ethics Project Working Group. (2009). *Ethical obligations of teachers*. Ann Arbor, MI: Teacher Education Initiative, University of Michigan.

Tom, A. (1984). *Teaching as a moral craft*. New York: John Wiley.

Tom, A. (1997). *Redesigning teacher education*. Albany, NY: State University of New York Press.

Trygstad, P., Smith, P.S., Davis, E.A., & Palincsar, A.S. (2012). *Assessment tools for studying the effect of educative curriculum materials.* Paper presented at the annual meeting of the National Association for Research in Science Teaching, Indianapolis, IN.

van Tarwijk, J., & Hammerness, K. (2011). The neglected role of classroom management in teacher education. *Teaching Education, 22*(2), 109-112.

Zeichner, K. (2010). Rethinking the connections between campus courses and field experiences in college and university-based teacher education. *Journal of Teacher Education, 61*(1-2), 89-99.

Zeichner, K. (2012). The turn once again toward practice-based teacher education. *Journal of Teacher Education, 63*(5), 376-382.

Zeichner, K., & Conklin, H. (2005). Teacher education programs. In M. Cochran-Smith & K. Zeichner (Eds.), *Studying teacher education: The report of the AERA Panel on Research and Teacher Education* (pp. 645-736). Mahwah, NJ: Lawrence Erlbaum Associates, Inc.

Zeichner, K., & Liston, D. (1987). Teaching student teachers to reflect. *Harvard Educational Review, 57*(1), 23-48.

Appendix A
High-leverage practices at the University of Michigan

1. Explaining core content
2. Posing questions about content
3. Choosing and using representations, examples, and models of content
4. Leading whole class discussions of content
5. Working with individual students to elicit, probe, and develop their thinking about content
6. Setting up and managing small-group work
7. Engaging students in rehearsing an organizational or managerial routine
8. Establishing norms and routines for classroom discourse and work that are central to the content
9. Recognizing and identifying common patterns of student thinking in a content domain
10. Composing, selecting, adapting quizzes, tests, and other methods of assessing student learning of a chunk of instruction
11. Selecting and using specific methods to assess students' learning on an ongoing basis within and between lessons
12. Identifying and implementing an instructional strategy or intervention in response to common patterns of student thinking
13. Choosing, appraising, and modifying tasks, texts, and materials for a specific learning goal
14. Enacting a task to support a specific learning goal
15. Designing a sequence of lessons on a core topic
16. Enacting a sequence of lessons on a core topic
17. Conducting a meeting about a student with a parent or guardian
18. Writing correct, comprehensible, and professional messages to colleagues, parents, and others
19. Analyzing and improving specific elements of one's own teaching