Curriculum Strategy and Contested Commonplaces: A Study of Rural Middle School Mathematics Teacher Attitudes in Curriculum Work

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Jeffrey D. Taylor
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This dissertation titled
Curriculum Strategy and Contested Commonplaces: A Study of Rural Middle School Mathematics Teacher Attitudes in Curriculum Work

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Abstract

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This multiple case study examines the development of teacher curriculum strategies in the selection of tasks for middle school mathematics. Two pairs of rural mathematics teachers—an experienced Grade 7 teacher and her intern, and a pair of second year Grade 8 teachers—provided text logs for the full school year leading up to their state’s first assessment based on the Common Core State Standards (2012), indicating tasks assigned in class and their sources. Tasks were coded for cognitive difficulty, mathematics standard addressed, and time allowed. Each teacher was interviewed five times, for a total of 13 hours of recording, to explore their strategies for selecting assignments. Transcripts of the interviews were analyzed using Burke’s (1954; 1966; 1969a) rhetorical methods to disengage pragmatic “attitudes-as-strategies.”

The two case studies trace the development of curriculum strategies, as well as showing how very different strategies for using a new textbook can lead to nearly identical rates of use. Both the experienced teacher and the three novices provide examples of “curriculum irony”: situations in which attitudes about what is best to do are overridden by other attitudes related to the context of the classroom. It may be the case that curriculum irony provides some impetus for the evolution of curriculum strategies.
Dedication

To my research participants, who gave so much of themselves that I might take on this research; and to my wife, Judith Maule, who tolerated so much that I might complete it.
Acknowledgments

More people have contributed to the work that resulted in this research than I could possibly mention. Here I would like to acknowledge Roger Aden, for stimulating my thinking about the ways Kenneth Burke’s rhetorical theories of social action could be applied to my research; Gregory D. Foley, my program director at Ohio University, for his unfailing support and trenchant questioning; John Henning, with whom many of the ideas developed here were first discussed in the context of a Pragmatist approach to teacher education; Bob Klein, my dissertation director, who provided helpful criticism, and well-timed nudges toward getting the actual writing done; Craig Howley, whose writing and teaching stimulated my thinking on, and commitment to, rural schooling; and my colleagues in the Mathematics Education program at Ohio University—Reuben Asempapa, Elisabeth Kager Bas, Kelly Bubp, Kevin Dael, Daniel Showalter, Mike Smith, and Derek Sturgill—sine qua non.
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Chapter 1: Introduction and Guiding Questions

The focus of this research is *curriculum work* as it occurs in small rural middle school mathematics classrooms. In particular, the research focuses on the ways in which teacher *orientation* and *attitudes*—as defined from a pragmatist perspective—interact with mathematics curriculum policies, curriculum materials, and student work to produce *curriculum strategies* (Drake & Sherin, 2009). This research takes place, then, at the intersection of three bodies of work:

- conceptual and empirical work on the idea of “curriculum,” particularly the middle school mathematics curriculum, and the processes by which curricular aims and policies are transformed into *curriculum strategies* in classrooms;
- conceptual and empirical work on rural schooling, particularly on the relation of local schooling aims and practices to non-local (state, national) policies; and
- a pragmatist theory of the relationship among teacher orientation, attitudes, and curriculum work.

In this chapter I outline how these three bodies of conceptual and empirical work are related to the teacher activities that were the focus of the research; lay out a pragmatist perspective on teacher orientation, teacher attitudes, curriculum work, and curriculum strategies, which I used to describe and interpret those teacher activities; and specify the questions that guided my inquiry. In Chapter 2, I review the literatures underlying each of the first two bodies of work, curriculum work and rural schooling; identify open questions in those literatures; and relate my research to those guiding
questions. In Chapter 3, I detail the materials and methods I used to collect and interpret the data in the case studies that constitute Chapters 4 and 5.

Curriculum, Attitude, and Curriculum Strategies

The modern history of curriculum in Anglo-American educational thought begins with Herbert Spencer (1860): the curriculum as he conceived it answered the question “What knowledge is of most worth” (p. 1). For Spencer, the answer to the question was practical, instrumental knowledge: knowledge of how best to achieve one’s purposes. Some of this knowledge was acquired within the family or through social intercourse. The school curriculum consisted of those categories of practical knowledge that were not readily learned through routine social experience, but were deemed by society to be of practical value. This definition contained a basic tension between the useful as determined by the individual, and as determined by society. The ensuing 150 years saw the rise of curriculum theory as an academic discipline, within which curriculum researchers and practitioners continued to battle between these poles, implicitly or explicitly attempting to answer the question logically prior to Spencer's: who has, or ought to have, the power to decide what is of most worth? Kliebard (2004) provided an overview of these contests, and of their relations to issues of politics, class and ideology in American society: I will not examine that history further.

My own approach to thinking about curriculum is based on the work of Joseph Schwab (1978), who argued that the academic curriculum field had by his day become “moribund” (p. 287). He made this charge, and outlined what he believed to be a corrective course of action, in a series of four essays that appeared originally in 1969–
1973. At that time, researchers were beginning to recognize and study the failures of curriculum reforms in the era brought on by Sputnik and the National Defense Education Act, from the late 1950s to the early 1970s (Franklin & Johnson, 2008; Payne, 2003).

Schwab himself had chaired the Biological Sciences Curriculum Study, which developed middle and high school life science curricula for national dissemination. He attributed the death throes of the curriculum field to three “flights” of university researchers: the flight upward, which replaced curriculum work—which he considered to belong to the domain of the practical—with curriculum theory; the flight to the sidelines, which replaced curriculum work with ethnographic or techno-rationalist studies of others doing curriculum work; and the flight from the field, which replaced curriculum work with the design of general-purpose curriculum materials, such as textbooks and computer software, and the study of their impacts on student learning. Schwab argued that the Practical (his capitalization), was the core of curriculum work. The ensuing debates in the curriculum literature (e.g., Fox, 1985; Garver, 1984; Reid, 1984; Schwab & Schwartz, 1984; Shulman, 1984; Tyler, 1984) made clear only that serious confusion abounded as to what this Practical was: if it was not the development and critique of curriculum theories, or empirical research on curriculum implementation, or the design of curriculum materials, then what was it?

Schwab considered work in the curriculum field to be practical work, in the classical sense in which Aristotle (Nicomachean Ethics, 1140) distinguished practical action from logical knowledge and technical production, based both on their ends, and on the types of knowledge appropriate to each. Logical knowledge, for which geometry was
Aristotle’s paradigm, has as its object knowledge of what is universally true: what the Greeks called *episteme*, knowledge whose truth could be demonstrated deductively. Technical production has as its object a specific product, and employs to this end *empirical* knowledge of materials and processes, knowledge which is historical and contingent: what the Greeks called *techne*, an art- or craft-knowledge. The practical, unlike the other two, has neither knowledge nor a reproducible object as its end: its aim is to act so as to uphold a virtue, or value, in a particular, contingent human situation. It asserts an “ought” rather than an “is.” Not only may an individual hold potentially conflicting values, however: social action requires us to reconcile the values of multiple parties, each of whom has a stake in the action. The method proper to the practical is deliberative. Alternatives are weighed against each other in the light of what the Greeks called *phronesis*, or prudential reason, which exposes, interrogates, and weighs between the implicit values that underlie actions.

Schwab intended this deliberative process to be literally embodied in curriculum work. To revise a school’s mathematics curriculum, for example, it would be important to have a mathematician’s views expressed. But it would be equally important to have the views of teachers, learning theorists, parents, and employers expressed. The collective deliberation of these representative individuals—and their potentially competing, or even irreconcilable views—would require the mediation of a curriculum specialist, trained in guiding prudential discourse for curricular ends (Schwab, 1978, pp. 365–370). This model of the Practical may in fact seem rather impractical: Schwab and his work have appeared to many “remote and insufficiently comprehending of the conditions under
which [teachers & administrators] have to work” (Reid, 1993, p. 507). What I wish to retain from Schwab’s work is the place given to the interrogation and reconciliation of incompatible values in curriculum decision-making. These values are already expressed in the attitudes by which a teacher understands her actions in the classroom:

If a teacher never engages in an interrogation of what is driving her practical reason ... she remains constrained in the degree to which she can make her practical reason (and hence her practice) vulnerable to change. (Penlington, 2007, p. 1311)

Such an interrogation of attitudes may take place internally, as Dewey’s (1933) reflective thought, but it also occurs in explaining, justifying, and questioning one’s practice with another. In this research I look to uncover the resources available within rural school practice for enabling such interrogations—and so to contribute to a “rural assets” perspective (C. Howley, 2003) on small school curriculum work.

**Curriculum and Curriculum Work**

I will use the term *curriculum work*, meaning by it the deliberative work of Schwab’s Practical. Curriculum work is to the school what experience is to the self, as we find it in Dewey’s (1933) understanding of knowledge and action. Schools, like individuals, are at least metaphorically actors: Present work is guided by goals for an envisioned future. Schools, like individuals, face recalcitrance in practice: failures, in various ways, to reach those goals. Schools, like individuals, develop means for practical deliberation, in order to reframe obstacles and resources, re-imagine strategies, and refine the definition of goals. “On the one hand, we need to state and identify the problem. On
the other hand, we need to develop suggestions for solving the problem, for finding a way to act—and hence, to find out what the meaning of the situation really is” (Biesta & Burbules, 2003, p. 46, emphasis in original). Action, not thought, determines the worth and validity of the results of practical deliberation: Knowing comes from acting upon the situation (Dewey, 1933). From this perspective, curriculum work is a variety of institutional learning: It is how schools learn, through experience, to improve at reaching their ends.

Schools, like individuals, develop habits or routines: not in the sense of mechanically repeated behaviors, but rather as an “acquired predisposition to ways or modes of response ... [and] special sensitiveness or accessibility to certain classes of stimuli” (Dewey, 1922/1983, p. 32). In individuals, these are what I have called attitudes, meaning both a manner of acting in response to a specific context or “class” of events, and also a propensity to recognize certain contexts or events as “calling for” specific responses. Routines in schools play an analogous role: They are learned ways both for dealing with certain kinds of recurring problems, and for categorizing new problems so they can be effectively dealt with in familiar ways. Curricular problems are those dealing with the relationship of pedagogic means and materials to the educational ends of the school. This relation of means and ends is neither theoretical—it cannot be deduced from an agreed-upon set of first principles—nor technical—it is not determined by an agreed upon description of a product. It is pragmatic:

A practitioner does not act educationally by acting in accordance with a set of theoretically vindicated educational principles, but by acquiring an ethical
disposition to practice in accordance with some more or less tacit understanding of what it is to act in an educationally principled way. (Carr, 2007)

Schools exist within a social environment, with potentially competing political, social, economic, and academic goals constraining their work. Curriculum work occurs within this contested environment: there is never any way to organize these competing voices in a manner that satisfies them all permanently: “to understand the curriculum, one must understand it at least in part as a political text” (Pinar & Bowers, 1992, p. 180), where I understand “text” broadly, as the socially constructed (and so socially conflicted) understanding of “what is to be taught.” This work occurs as a kind of deliberation among four voices: subject matter, student learning, teaching, and the milieu, Schwab’s (1978) term for the school and community environment, both material and cultural (p. 366–367). These are the four commonplaces of curriculum work, in the rhetorical sense: each is a set of claims and ways of framing issues within curricular discourse that recurs regularly, because each expresses a socially important orientation toward education.

There are many mutually incompatible views of how students learn best, how teachers teach best, how disciplinary knowledge or social and economic expectations should be translated into school and classroom goals. Yet between these four contested commonplaces, deliberation must be able to decide upon curriculum action in a limited period of time. This deliberation is the core of curriculum work.

Schwab, like Ralph W. Tyler (1935, 1984) before him, conceived of curricular work as necessarily local work: it was the response of a school, with an established culture and curriculum, to dissonances between the aims and results of its own practice.
But schooling is institutionally complex, and it is now more common, as the framing of curriculum has shifted from the local to the state and even national level, to think of curriculum work as occurring at least in part far from the individual school or district. Jean T. Remillard (2005) provided a model for considering the interactions of these levels, in which the enacted curriculum, which she identified with what teachers do in mathematics classrooms, is distinguished from the intended curriculum—what teachers planned to do—and the experienced or achieved curriculum—what students learned. Stein, Remillard, and Smith (2007) refined this model, combining the intended and enacted curricula as moments of the instructional curriculum, which then mediates between school and extra-local curricular documents (the formal or written curriculum), on the one hand, and what students actually experience. Remillard and Heck (2014) then reorganized the model once more, recasting student achievement as a product, rather than an element, of curriculum, and combining the intended and enacted curricula as the operational curriculum.

A virtue of the Remillard and Heck (2014) model is the preservation of the dialectical relations between these levels. This contrasts with a school of curriculum theory that conceptualizes curriculum work as a unidirectional process that begins with the specification of goals, proceeds to the creation of instructional materials for meeting these goals, and culminates in teachers’ enactment in a manner faithful to the goals and materials (e.g. Cal & Thompson, 2014; Heck, Chval, Weiss, & Ziebarth, 2012). Buxton, Allexsaht-Snider, Kayumova, Aghasaleh, Choi, and Cohen (2015, p. 491) indicated four fundamentally flawed assumptions made by those who hold such “fidelity” models: that
clear agreement exists on better or worse ways to implement specific curriculum material; that such ratings of better or worse are minimally impacted by the context of enactment; that the researcher or designer is the best judge of the quality of implementation; and that teachers’ professional learning follows a predictable path from training in the use of the material to changed practice.

The school’s ongoing curriculum work is aimed at creating and revising routines within which teachers can design and execute curriculum strategies, which Drake and Sherin (2009, p. 321) define as “the consistent patterns in the ways that teachers read, evaluate, and adapt curriculum materials before, during, and after instruction.” For my purposes, I separate the idea of a curriculum strategy from that of curriculum enactment (Remillard, 2005), the latter of which is already well-established in the literature. I use curriculum strategies to indicate what Schwab calls the practical work of mediation between the four commonplaces in order to choose a plan (and accompanying materials) for instruction. My use of curriculum strategy is analogous in this way to Remillard’s (2005) intended curriculum, while avoiding the term “intent,” which, as Pimm points out (2009, p. 190) serves to mask “the fact that everyone involved, directly or indirectly, has intentions.” Teachers’ expertise in planning for instruction consists in the fluent deployment of such acquired curriculum strategies. When curriculum strategies fail to attain their ends—or, as in the case of novice teachers, when no strategy is available for a situation—both strategy and curriculum are “put in question” and curriculum work is called for. Curriculum work is, then, a “professional subspecies” of Dewey’s (1933) reflective cycle of experience. It is not theoretical work, though it may call upon the
product of theories in any relevant domain. Nor is it reducible to the purely technical, though it may marshal techniques. It is, in Schwab’s sense (and Aristotle’s) practical work: the work of a practice.

**Rural schooling and rural curriculum work.** Over the last two decades or so, those who work in or study schooling in the United States have been subjected to a steady stream of reports of student achievement on state, national, and international tests such as the National Assessment of Educational Progress (NAEP), the Program for International Student Assessment (PISA), the Second and Third International Mathematics [and for the Third, Science] Studies (SIMS and TIMSS), and most recently, testing by the Smarter Balanced Assessment Consortium (SBAC) and the Partnership for Assessment of Readiness for College and Careers (PARCC). Corbett (2006), in response to the reporting of scores emphasizing the ranking of nations, states, and schools on a single scale, has observed that “what is considered to be educational improvement by educators and bureaucrats may not be understood in the same way in rural communities struggling for survival” (p. 297). Theobald (1996) already had observed that the slogan “School to Work” behind high school reform agendas in the 1990s often meant busing rural students to urban job sites, transmitting the message that there was no future for them in their home communities. Indeed, across large swaths of rural Canada and the United States since the 1950s, there has been a “hollowing out” (Carr & Kefalas, 2009; see also S. Salomon, 2003): the rapid disappearance of family-scale farms in the countryside, of family-scale businesses on small town Main Streets, and of the local schools and school districts as these were increasingly consolidated (Sher, 1977). In these consolidated
schools, students were “learning to leave” (Corbett, 2007): “rural schools are constructed as launching pads for the academically able. The rest are those perennially at risk—at risk of being stuck in the hinterlands with brains unfit for the drain” (Corbett, 2006, p. 294: see also Howley, Howley, & Huber, 2005).

Such rural-focused critics of national reform efforts have shared two concerns. The first is that federal and state penalties for school performance based on student tests tied to national standards may unfairly disadvantage rural schools (Beck, 2005; Beck & Shoffstall, 2005: Lee, 2003). The second concern these critics of national standards express is over the push for standardization that they represent: a push for decontextualizing the relation of learning to locale. Such standards, according to these critics, “drive out whatever locally developed curriculum rural schools may have” (Jennings, 2000, p. 194), and this in itself has been a blow to rural communities and their schools (Dobson & Dobson, 1990).

Other rural scholars have found the impact of the standards movement to be less dire. Jenning (1999, p. 128) suggested that rural schooling is “more complex than current rhetoric implies.” There is no reason to assume that the consequentiality of the nationwide testing that began in the spring of 2015—under which student scores on a single test carried consequences in many states for school finances and governance, as well as for teacher evaluation—has led to any one type of curricular work or curricular action by rural schools or teachers. And there is research (Jennings, 1999, 2000; Jennings, Swidler, & Koliba, 2005; Sztajn, 2003) to suggest that, rather than competing
with place-based curricular practices, the implementation of statewide standards may actually have enhanced those practices.

It may not be the case that rural residents think of themselves in terms of community. Woodrum (2004) has advanced evidence to suggest that rural community members may have views of schooling, and relations to the school, determined more by class than by any shared sense of community. The rural school administrators interviewed by Howley, Larson, Andrianaivo, Rhodes, and Howley (2007) saw state curriculum standards for mathematics education as matters requiring “modest adjustments” in their schools’ curricula, and were likely to believe that “the traditional structure of rural schools and communities ... stand as an impediment to rapid adoption of reforms” (p. 9), whose implementation they saw as unproblematic. Jennings (1999) found that the two rural South Carolina communities she studied, together with the teaching staffs of their schools, were “deferential to school administration”:

In these two rural schools, the common rhetoric that school is the heart of rural community and that because everyone knows everybody else, rural schools respond better to parents and community members than urban or suburban schools, was not evident. (p. 137)

In regard specifically to the mathematics curriculum, research by A. Howley (2004) and Lucas and Fugitt (2009) suggest that rural schools may have—and rural inhabitants may prefer—a mathematics curriculum better described as traditional than as locale- or place-based. The idea of a place-based education, according to Jennings (1999, p. 127), is less a
description of what is happening in rural communities than an expression of “the hopes of rural education advocates for how rural schools and their communities should interact.”

Whether or not state or national policy promoting standardized curricula impacts rural schools negatively, the small size of rural schools can make work in them differ from the work experience in larger urban or suburban schools. Small-school teachers generally must “wear many hats” (Webb, Shumway, & Shute, 1996; Jennings, 1999, 2000), and there will be correspondingly fewer committees, with fewer members, to take on the variety of routine and non-routine work that falls to schools. This means that curriculum work—writing local curricula, choosing texts and materials, even discussing student achievement measures with a view to improving instruction—may devolve to one person, or not be taken up at all. In such a case, it is not clear how the dialogic process of curriculum work is to find expression. Second, it is not unusual for all sections of a single middle or secondary grade level or course to be taught by a single teacher, with the result that curriculum work and curriculum strategy may become one and the same. In mathematics at this level, this potential problem is exacerbated by the absence of mathematics coaches or supervisors: the principal, who in small schools may be the only instructional supervisor, may not have a firm grasp of mathematics or of mathematics teaching (A. Howley, 2004).

Curriculum strategy, attitude and discourse. I have said that this research proceeds from a pragmatic perspective on the relationship between knowing and acting. From this perspective, action is prior to knowing, though always in a relative, or reflexive, sense: in intelligent action, “we are deliberately (though not always
consciously) seeking what we need, in order to do what we want to do,” as Cook and Brown (1999, p. 388) put it. As Dewey (1933) reminds us, we make sense of things by acting on them: Meaning and knowledge proceed from successful action. The new understanding of the world one acquires is an attitude: both a propensity to act in a certain way in a specific context (“when I see X, I do Y”), and a propensity to recognize or name contexts in a particular way (“this is an X rather than a Z”). Attitudes are made visible by both actions and naming: In a sense, the action is the name (doing Y is a recognition of this as X), the name is a kind of action, which alters the situation by making it recognizable (Mahan-Hays & Aden, 2003; see also Wertsch, 1998).

An attitude, as I use the term here, is a strategy specific to a regularly recurring situation. Teachers, in the course of mastering their craft, acquire many such attitudes-as-strategies, and these allow her to respond fluently to events that arise in the course of instruction. Attitudes are held together by an orientation, the set of expectations a teacher holds for the kinds of actions and materials that are appropriate to the conduct of her classroom. As she learns her craft, the teacher acquires an orientation to her work, within which her attitudes-as-strategies function. This way of talking about attitudes, knowledge (which in Dewey’s [1933] sense is one kind of attitude), and action is useful for disclosing how certain kinds of attitude—attitudes toward one’s students, one’s community, one’s subject, one’s curriculum, one’s work as a teacher—reveal themselves both in concrete actions undertaken by teachers as they deploy curriculum strategies, and in the way they discuss and explain those strategies.
The Questions Guiding the Research

The case studies that form the core of this research are my attempt to make audible the attitudes—both individual and organizational—through which teachers act upon curriculum documents and materials, acquiring and deploying curriculum strategies through which the curriculum standards they are charged with addressing take on meaning in the classroom.

Specifically, I explore the work of two pairs of rural middle school mathematics teachers. The first consists of an experienced Grade 7 mathematics teacher mentoring a pre-service teacher in a year-long clinical internship; the second consists of a pair of second-year mathematics teachers who together share the responsibility for Grade 8 mathematics instruction, attempting to establish a new curriculum to address the Common Core State Standards for Mathematics (2012). My focus is not on curriculum enactment in Remillard’s (2005) sense, but on the development of curricular strategies as the teachers in each pair work together to choose materials for seventh- and eighth-grade students. The methods to be used are detailed in Chapter 3. In particular, I draw upon the pragmatist rhetorical concepts of Kenneth Burke (1969a, 1969b, 1973; see also Mahan-Hays & Aden, 2003; Wertsch, 1998) in order to disengage teacher orientation and attitudes.

This research is framed by Schwab’s four commonplaces of curriculum deliberation: the subject of mathematics, student learning, teaching practice, and the milieu of the rural school and community. Commonplaces are deliberative realities: everyone concerned with schooling as an institution recognizes them as regular, recurring
issues in debating curriculum choices, whatever weight or value each individual chooses to give each. The commonplace, by nature, constitute curriculum decision-making as a contested space, because each in some sense has to do, not with what is or was, but with what should be. Teacher attitudes and curricular strategies will be explored as they articulate each of the four.

Finally, the rural setting of the two case studies plays a double role. Rural community values, orientations, and attitudes appear as one of the commonplaces that frame curriculum debate. But the small size of each school, an aspect of milieu, also imposes some constraints on curriculum choice.

The questions focusing the research were:

1. In what ways do curricular resources (textbook, supplemental materials, teacher-designed activities, assessments) get adopted and adapted in teacher and intern curriculum strategies?
2. How did teachers’, interns’, and others’ expressions of Schwab’s four commonplaces of curriculum in their orientations affect the development of curriculum strategies? How did the strategies developed, and the results of their enactment, affect those orientations?
3. Did other categories of orientation or attitude come into play in developing curricular strategies? Which ones, and whose? How did they affect orientation toward mathematics, students as learners, the practice of teaching, and the values, expectations, and culture of the local community?
To answer these questions, I looked at curriculum strategies deployed in choosing materials for instruction, rather than on those deployed in enacting them in the classroom. Both are important, but each requires a different sort of research. Studying enactment of curriculum strategies requires close observation of teacher-student interaction within classrooms. There is a small but growing literature that explores this, which I review in Chapter 2. Studying the strategies deployed in choosing materials requires finding ways to “listen in” on teacher planning, in order to gain insight into the orientations and attitudes that guide their choices. How I accomplished this I take this up in Chapter 3.
Chapter 2. : Review of the Literature

In the first chapter, I identified the three domains whose intersection is the “research space” for this inquiry:

- conceptual and empirical work on the idea of “curriculum,” particularly middle school mathematics curriculum, and the processes by which curricular aims and policies are transformed into *curriculum strategies* in classrooms;
- conceptual and empirical work on rural schooling, particularly on the relation of local schooling aims and practices to non-local (state, national) policies; and
- a pragmatist theory of the relationship among teacher attitudes, knowledge and practical action.

I then outlined the theoretical perspective within which this study of attitudes and practical curriculum work takes place, drawing on the ideas of Dewey (1933) and Schwab (1978). In this chapter, I review the literatures underlying the first two of these three bodies of work, identify open questions in the literature, and relate my inquiry to a subset of those questions. In Chapter 3, I detail the materials and methods I used in collecting and interpreting the data for the case studies.

**Concepts of Curriculum Work**

Dewey (1902) appears to be the earliest author to frame curriculum as deliberative work, practical action rather than deduction from theory or induction from empirical evidence. Dewey’s approach to curriculum activity was not at all universal in the era of the progressive education movement, roughly 1920 to 1950 (Graham, 1967), though it
was promoted most famously by those engaged in the Eight Year Study of high school curriculum reform (Aikin, 1942; Tyler, 1935). A more technical-instrumental vision of curriculum development (e.g. Charters, 1942) had always coexisted with it, and it was this more instrumental model of curriculum that predominated after World War II (Kliebard, 2004, p. 212). What was widely perceived as the failures of the federally-funded mathematics, science and social studies curricula of the 1960s to take hold or make changes in the teaching of these disciplines (Franklin & Johnson, 2008; Payne, 2003) is what produced the various “flights”—from the field, to the sidelines, and upward into theory—of which Schwab (1978) was so critical in his essays redefining the practical work of curriculum in terms drawing on both Dewey and Aristotle.

A decade later Porter (1989), noting the extremely sparse data on what actually transpired in classrooms, reported on research using teacher logs of mathematics work done at the elementary level. The logs of textbook lessons covered by teachers showed that discrete skills were emphasized, rather than conceptual understanding; that topics were taught for coverage of material rather than for mastery; and that there appeared to be much duplication of topics across grade levels in the Michigan schools he studied. The research was not designed to disclose why this was the case, or what role individual teacher attitudes, school culture and practices, or social expectations of schoolwork played in sustaining these practices.

With the publication by the National Council of Teachers of Mathematics of the *Curriculum and Evaluation Standards for School Mathematics* (1989) and *Principles and Standards for School Mathematics* (2000), there was a renewed interest in producing
changes in mathematics instruction by developing and disseminating “reform”
curriculum materials, whose purpose was to be “educative” not only for students, but for
teachers (Ball & Cohen, 1996; Remillard & Bryans, 2004). This in turn produced studies
of the new curricula, including studies of how these were enacted in classrooms,
generally carried out by surveying sets of teachers using the new materials. Tarr, Chavez-
Lopez, Reys, and Reys (2006) and Thompson and Senk (2006) reported wide variation in
how much of a textbook’s content was taught (typically between 60% and 70%), and in
which topics were omitted, even by teachers of the same course in the same school,
which the authors thematized as differences in “opportunity to learn.” But again, these
studies were not designed to determine how teachers made such decisions. Thompson
and Senk (2010), reviewing these and similar studies of “reform” curriculum
implementation, suggested that “the failure to acknowledge this variability in
implementation is potentially problematic,” as it undermined the articulation of the
intended curriculum across grade levels. They acknowledge, however, that there may be
reasons for variability in coverage: “teachers need to be sensitive to the needs of their
students and the values and learning expectations in a local community” (p. 261).

Drake (2010), reviewing anecdotal data and two small studies (of 20 and of 9
elementary teachers), tried to understand why teachers supplement or substitute other
curricular materials for those provided in textbooks. However, the methods used to elicit
motives were largely indirect (only the nine teachers in the second study were actually
asked for reasons), and no attempt was made to link reasons to teacher orientations or
attitudes.
Kehle and McCormick (2010), reflecting on a large-scale curriculum evaluation project they conducted between 2003 and 2006, found that “none of the curriculum materials used in the participating schools was used with a high degree of fidelity” (p. 341). They concluded that high-stakes test pressures explained most of the lack of fidelity: once again, the study was not designed to elicit teacher orientations or attitudes. Interestingly, they found the parallel between those testing pressures and pressures for fidelity to a written set of curricular materials suggestive: “We have found it useful to begin thinking about fidelity to a child’s learning needs and opportunities and fidelity to the teachable moments that arise” (p. 343). Though still framing their ideas in terms of what I called earlier technical-instrumental curriculum theory, they replaced the narrow concept of fidelity with what they call curriculum integrity (p. 344; see also Chval, Chavez, Reys, & Tarr, 2009), a looser allegiance of the teacher to the overarching goals of the curriculum experts’ design. This definition assumes that the teacher has access to the “overarching goals” of the designer, which may be the case when a new curriculum is first being piloted under the designers’ supervision, but is unlikely to be the case in general.

The Second International Mathematics Study (SIMS: Westbury & Travers, 1990) of the mid-1980s was the first to employ the three-tiered “intended–implemented–attained” model of curriculum (Cal & Thompson, 2014), whereby state or national educational authorities specify what was intended in formal documents; teacher lesson implemented those intentions; and student achievement scores were taken as evidence of what had been attained. Remillard (2005) added a fourth level to this model, curriculum
enactment: what actually occurred between teacher and students in the lesson, as distinguished from what was planned. In doing so, she was addressing two concerns in the literature. The first concern was that in teaching using the sorts of mathematical tasks found in the NSF-sponsored, reform-oriented curricula of the 1990s, American teachers were lowering the cognitive demand of the tasks by reframing, scaffolding, and providing consequential hints, making what transpired in lessons differ in cognitive demand from what was intended by the task’s designers (Smith, Stein, Henningsen, & Silver, 2009; Stein, Remillard, & Smith, 2007). The second concern arose from the lessons videoed as part of the Third International Mathematics and Science Study: fully 70% of the teachers videoed described themselves as teaching to the reform standards, while the video evidence showed that almost none were (Hiebert & Stigler, 2000).

Several studies of curriculum enactment have been carried out since then. Lloyd (2008), studying a high school mathematics teacher in his first two years, found that the greatest challenge he faced in changing to an inquiry-based method of instruction was student expectations about classroom work roles—what Brousseau (1997, p. 31) called the “didactical contract,” the foundation of a classroom culture. Newton (2009), studying the “enactment fidelity” of a set of 50 sixth-grade teachers implementing the NSF-funded Connected Mathematics curriculum, found that almost all teachers simplified the cognitive demand of tasks, compared to the enactments illustrated in the teacher guide. Eisenmann and Even (2011), in a case study of a single mathematics teacher enacting the same middle school unit over the same time period with two different classes, found
major differences in enactment, which were attributed to the teacher’s perception of student needs and work products.

The research discussed to this point proceeds from a technical-instrumental or “fidelity” view of the teacher’s role. Buxton, Allexsaht–Snider, Kayumova, Aghasaleh, Choi, & Cohen (2015), however, pointed to four unwarranted assumptions implicit in the fidelity view of curriculum material: that clear agreement exists about better and worse ways of implementing it; that the classroom context has minimal impact on determining these better and worse ways; that the researcher or curriculum designer is the best judge of the quality of an implementation; and that in preparing teachers to use materials, there is a predictable path from training to changed practice. Lloyd, Remillard, and Herbel-Eisenmann (2009, p. 7) indicated two additional assumptions: that everything required for quality enactment is “accessibly embedded in the material” and that implementation “does not require engagement, interpretation, or decision-making” on the teacher’s part. Thompson and Senk (2014), studying middle school teachers’ omissions from their textbooks directly, found several common reasons for omitting material: reading level, time constraints, classroom management concerns, and, in the case of technology use, discomfort with the school technology. Materials are enacted within a context of competing demands, by a teacher balancing multiple needs. In particular, they noted that in the context of high-stakes testing, curriculum topics “that are not likely to be assessed are more likely not to be used, even if these topics might be important to students’ mathematical growth” (p. 793).
These concerns have led some researchers to look at other models of the curriculum work teachers do with materials. McClain, Zhao, Visnovska, and Bowen (2009), in a design study project in middle school mathematics classrooms suggested an “emergent interpretive framework” (p. 57) that placed instructional reality at its center. They defined instructional reality as “the regularities in practice that emerge at a district or school level, as opposed to the practice of any one teacher.” This construct acts in their framework as a kind of group orientation: “teachers’ perspectives on teaching and learning and specific instructional practices they develop are always reasonable and coherent in the context of their instructional reality” (p. 61). The instructional reality of a school has a large impact on whether the teacher or the textbook has instructional agency: “the authority over both the mathematics that is taught, and the sequencing and presentation of that content” (p. 63).

Roth McDuffie and Mathers (2009), in a professional development project with middle school mathematics teachers, advanced the concept of curriculum reasoning. They define this as the “kind of thinking that teachers use while working with curriculum materials to plan, implement, and reflect upon instruction” (p. 303). As teachers gain experience with both the mathematics they teach, and the materials available to them, their curriculum reasoning becomes more developed. Roth McDuffie and Mathers is one of only a few studies to look carefully at teacher selection (as opposed to enactment) of mathematical tasks. But the concept of curriculum reasoning treats as one what I wish to separate: the attitudes-as-strategies that form the basis of fluent practice (here the practice
of selecting apt materials) on the one hand, and the process by which these attitudes are acquired on the other.

Drijvers and Trouche (2008), Gueudet, Pepin, and Trouche (2013), and Pepin (2014), looking at teacher work through the European lens of didactics (Brousseau, 1997), treat curriculum materials as artifacts, whose affordances are indeterminate outside their use by a particular teacher in a particular situation. Through a process called first instrumentation (Drijvers & Trouche, 2008), and later documentary genesis (Pepin, 2014), they elaborate a reflexive model whereby teachers modify and shape materials, while at the same time the material’s emergent affordances shape the teacher’s practice. What the artifact is as curriculum material emerges in the process of its repeated use. While this framework is related to Dewey’s (1933) understanding of experience and reflection (both finding their intellectual roots in Hegel’s concept of dialectic), it is best suited to studies of the routinization of material use in a classroom, which is not my focus.

Wilhelm (2014), in a four-year professional development project preparing 213 middle school teachers to implement high cognitive demand tasks (Smith, Stein, Henningsen, & Silver, 2009), found that, at least among her participants, higher scores on a measure of mathematical knowledge for teaching were not correlated with a tendency to select high demand over low demand tasks, and that the more years of experience a mathematics teacher had, the more likely the teacher was to choose lower demand tasks. She recorded a variety of attitudes toward cognitively demanding tasks (CDTs):
Some teachers believe that CDTs should be simplified for struggling students, while others suggest that teachers should use CDTs with multiple entry points to support struggling students. In fact, there is evidence that many teachers believe that high cognitive demand tasks are not appropriate for currently low-achieving students. (p. 643)

From a somewhat different perspective, Teo and Osborne (2012), studying a high school science teacher attempting to move his advanced chemistry class to an inquiry-based curriculum, found that over the course of implementing the change (which is not the same thing as enacting the curriculum), the meaning of “inquiry-based” shifted in his talk about his work. The Teo and Osborne (2012) case study, as well as a handful of other case studies in science education (e.g., Leander & Osborne, 2008, which looks at teachers as curriculum leaders; Fogelman, McNeill, & Krajcik, 2011, which focuses on student achievement related to curriculum adaptations) are of interest because they attempt to examine what I have called curriculum strategy—the choice of materials for instruction—rather than enactment; however, they all take a narrow view of changing practice as rooted in attitudes about either student learning or classroom management. None, however, include the rural circumstance—or any other non-instructional factor—in the scope of their investigations. A few rural studies examine school-wide curriculum work in response to external mandates: Jennings (1999, 2000) studied rural schools in South Carolina and Maine; Edwards (2011), Minty and Priestley (2011), and Priestley, Edwards, Priestley, and Miller (2012) provided comparative case studies of curriculum change in a set of Scottish secondary schools. None attempted to examine either
curricular strategies or curricular enactment. There is, then, a genuine need for improved understanding of how curricular strategies are affected by the full range of attitudes marked out by Schwab’s commonplaces.

**Concepts of “The Rural”**

What should we intend by the designation “rural” in educational research, or in social science research generally? Friedland (1982) opened a debate on this topic when he suggested that the shift to industrial agriculture had effectively eliminated the object of the rural social sciences, at least in the United States. That object, he argued, had been the set of social practices and structures that had formed around family-scale agriculture. The ensuing debate on the meaning of “rural” as an object of research occurred just as the “linguistic turn” in the social sciences took wing, with researchers such as Lincoln and Guba (1985) underscoring the unavoidable role of researcher “paradigms” or frames of meaning in investigating social action. The rural, in this way of thinking, must be studied as a “meaning”—but whose? Multiple possible meanings were offered, from multiple perspectives.

Bell (2007) has suggested one way to conceptualize this variety of definitions: he identifies two “moments” of the rural. The first is a “material moment” that is countable, mappable, and dichotomously related to the “urban,” which he labels *rural one*. The second is an “ideal moment” that is ambiguous, imposed and contested, constructed by language, which he labels *rural two* (p. 408). Some theoreticians insist on privileging one or the other of these moments. In the rural two camp are postmodern scholars such as Murdoch and Pratt (1993) or Jean (2006), who identify Bell’s material rural one with an
outdated, anthropologically-infused “monograph tradition,” in which rural communities
were reified as remnants of premodern “folkways” (Jean, p. 56). Those favoring the
“rural one” moment, while recognizing the inevitability of the contested meanings that
are the postmodernists’ focus, insist that we “ought to treat rural context as structurally
conditioned, and, therefore, presenting a material reality” (C. Howley, 2003, p. 45), or at
least to agree that “there is material that sits beneath our language games” (Corbett, 2006,
p. 291), that rural one is in some sense—methodologically if not ontologically—
privileged or foundational.

Another way of contrasting these approaches is offered by Rye (2004), who
suggests we treat the spatial–demographic definition as objective, and the local-values-
and-meanings definition as abstract. This seems to me at once clarifying and backwards. I
argue that the closer we can come to the specific ways a geographic space becomes a
place for a human community, the more concretely or “objectively” we are dealing with
the rural circumstance; while the more we try to “rise above the plane,” panoptically
surveying a variety of locales as though together they constituted “the rural,” the more
abstract we are becoming. “The social life of rural areas is indeed fractured along
numerous lines of difference constitutive of overlapping and multiple forms of
otherness,” as Philo (1992, p. 201) puts it. This is to say that “rural” is itself a
commonplace, a site of debate: each “form of otherness” is its own concrete,
recognizable rural. Whatever “material reality” (C. Howley, 2003) may underlie it, it is
less the “circumstance,” what surrounds the actor, that is of interest in understanding his
motives, than it is the “circumspect,” the way in which it is taken into account—is seen, is spoken of—in acting.

The ways in which Philo’s (1992) social “otherness” articulates local geography has been taken up in the movement for a “place-based” curriculum (Sobel, 2004). Jennings, Swidler, and Koliba (2005) provided a brief review of the place-based mathematics education literature, in which they see a conflict between “place” as an end—an increased awareness of the local social and natural environment leading to a commitment to foster and preserve it—and “place” as an instrument—using the familiar and everyday to engage students more fully in learning whatever curriculum is to hand. In the two case studies, these meanings of “place” and place-based learning appear as attitudes or orientations held by research participants.

The “rural,” that is, appears in this research to the extent that it is revealed in the attitudes and orientations of the teachers engaged in curriculum work. One object of the research was to uncover, in terms of attitudes and actions, what “rural”—this particular, perhaps contradictory “rural” in which each teacher was situated—meant for each of them, and in particular, the ways in which groups and individuals contested each other’s meanings.

Although a sense of what “rural” meant for members of the two communities in which my case studies are set will reveal itself, I do not predefine it. “Rural” remains a contested term around which participants’ attitudes articulate themselves: it is a commonplace of the discourse about social space and place. In Bell’s (2007) terms, rural one appears in our inquiry only to the extent that rural two makes claims for it.
And rural two—the culturally and ideologically contested rural—has been examined in the literature on curriculum work. Jennings’ (1999, 2000) studies of rural schools that were implementing “reform” mathematics curricula, along with the suggestive rural case studies in Sztajn (2003), and the examination by Jennings, Swidler, and Koliba (2005) of how the state of Vermont incorporated place-based practices within its state curricular frameworks, offer a counterweight to the concerns with which we began—that the imposing of national curricular standards had negative effects on rural school curriculum. Jennings (2000) in particular found that the schools most successful at implementing a reformed mathematics curriculum were those who were able to incorporate the reforms within place-based activities that were already central to their curriculum, while the schools that had treated place-based activities as “add-ons” to a traditional core curriculum were the most likely to marginalize those activities in order to “find time” for the activities of the reform curriculum.

Sztajn (2003), whose research focused on teacher beliefs—a term whose meaning is close to what I am calling orientations—as mediators for reform implementation, found that teachers with very similar beliefs ended up implementing reforms very differently in their classrooms, based on the school contexts (including the valuing of place-based curricula) they faced. This supports the role assigned to instructional reality in the model of McClain, Zhao, Visnovska, and Bowen (2009). Finally, Jennings, Swidler, and Koliba (2005) documented how, in a highly rural state, the value local educators gave to basing their curricula in local resources resulted in development of a state curriculum framework endorsing that practice. At the same time, in looking at how teachers subsequently took
up the work of curriculum design within the new state framework, they found that “practitioners used standards to support, and perhaps justify, what they already teach, or what they want to teach” (p. 60). In addition, then, to new curricular standards leading to modified curricular strategies, and perhaps to modified orientations within the commonplaces, we will have to be alert to situations where instead, existing orientations modify the scope or meaning of the new curriculum standards.

**Summary and Relation to the Guiding Questions**

As Thompson and Senk (2010) observe, one reason there is not more data on how teachers choose curriculum materials is because such data has been difficult (and expensive) to obtain:

Researchers need to continue discussions about low-cost, informative ways to solicit information about curriculum implementation that are reliable and do not require much inference on the part of researchers. They should also not place unreasonable demands on teachers and their time. (pp. 261–262)

What follows is a comparative case study of two pairs of rural teachers, focused on the orientations and attitudes expressed in their choices of curriculum materials, and their explanation of those choices. The inquiry did not require extended time in teachers’ classrooms, nor did the data collection (recording planning meetings, filling out curriculum logs) place undue burdens on the research participants.
Chapter 3: Methodology

This study of the development of curriculum strategies was designed to explore a limited number of aspects of an under-researched situation. This is “fluid research” (Schwab, 1978), for which there are “indefinite timelines, uncertainty regarding what shall be viewed as significant data, and the endpoint is unknowable” (Ross & Chan, 2008). The focus of fluid research is the discovery of new knowledge-structures—new relations, new perspectives, new activities—rather than the testing of a given set of ideas. It is more appropriate, therefore, to think of it as having research foci, encapsulated in guiding questions, rather than as providing answers to research questions. The study is designed to provide a richer, more detailed understanding of the relations of attitudes, motives, and curriculum work, guided by three sets of questions:

1. In what ways teachers deploy curricular resources (the textbook and its supplementary materials, teacher-designed activities, online resources, trade books) in curriculum strategies;

2. How teachers’, interns’, and others’ orientations, framed by Schwab’s (1978) commonplaces of curriculum—subject matter (here, mathematics), learners and teachers in a concrete classroom, and the milieu of both the school and community—are translated into curriculum strategies, and how the developed strategies, and the results of their enactment, are translated in turn into attitudes; and

3. What other categories of attitude may come into play in developing curricular strategies, whose these are, and how they relate to teachers’ attitudes toward
mathematics, students as learners, the practice of teaching, and the values, expectations, and culture of the local community?

In this chapter I identify the types of data I used to investigate these questions, how the set of data was be obtained, and what methods were used to analyze it.

Data for the Study

This section describes the setting within which the research took place, as well as the four teachers who participated in the research; what the research participants did in this setting over the nine–month process of enacting the new mathematics curriculum; and the types of data and artifacts of practice collected.

The setting of the study and the research participants. The research reported here took place for the most part during the 2014–2015 school year, during which the four teachers involved in the study implemented a curriculum that:

- addressed the Common Core State Standards for Mathematics (2012);
- used new textbooks chosen for their alignment with the new standards; and
- was to be assessed using a new, multi-state online testing system.

The final interviews for the research, however, did not occur until February 2016 because of a delay in releasing the results of the testing.

The four teachers worked in pairs at two rural schools in an Appalachian state. The names of the teachers, schools, and communities have been anonymized. Roberta Porter, an experienced seventh grade mathematics teacher with Grades K–8 generalist certification, and Meg Miller, an undergraduate student teacher from a university teacher preparation program, taught at the Portland School District’s middle school. Lorene
Johnson and June Harris, both second-year teachers with Grades 7–12 certification in mathematics, shared responsibility for eighth grade mathematics at the Packersfield School District’s middle school. What follows is a description of each school and its community, and some background information on each of the four teachers. In order to preserve the anonymity of the research participants, their schools and communities, demographic, economic, and education data sources are cited only as STATE. All data were accessed online from the relevant state agencies in 2015. All education data was current as of that year. Some reported demographic and economic data is based on information from 2012–2015.

**Portland: The community.** The Portland school district served a rural population spread over nearly 150 square miles at the eastern end of Rockland County. The county had a population of just over 60,000, half of whom lived in the county seat, Sanborn, home of the state university where Meg Miller was finishing her teacher preparation program. The county’s median household income was almost $34,000 in 2014, and just over 23% of the population of Rockland County was receiving public food assistance, both just below the average for the seven-county region of which Rockland was the center. Of adults ages 25–64, about 44% had a high school education or less, and the unemployment rate was 6.8%, compared to 5.7% for the state. Though the state university, local and state government, and healthcare facilities were the major sources of employment, almost 20% of the county’s acreage was in agricultural use. Average farm size was 125 acres, but average farm income was only $13,000, roughly evenly divided between crop and livestock production (STATE, 2015).
Portland: The school. At the time of this research, the Portland school district served just over 1,000 students, a number that had been declining for a decade, but showed recent signs of stabilizing. The middle and high schools, which shared a campus, were roughly in the geographic center of the district. In 2014, the middle school served Grades 7 and 8: the sixth-grade classes had been relocated to the two district elementary schools a few years before the start of the study. The high school, with 300 students, had four mathematics teachers, two of whom were one-year replacements in 2014–2015. One of these was employed to free the mathematics department head to act as the mathematics coach on campus for a year. Just under 70% of district students qualified for free or reduced-price lunch in 2014, and the state Department of Education coded Portland as a high-poverty district. The five-year graduation rate in the district had gone up from 91% in 2010 to 97% in the school year of the study (STATE, 2015).

Under the state accountability program imposed by the federal No Child Left Behind legislation, mathematics and reading were tested annually in Grades 3–8. State score reports from the annual testing divided student results into five categories (six in 2013 and 2014). Districts, schools, and grade levels within schools were rated based on the percentage of students who scored in the top three of these categories (the top four after 2012). Portland seventh grade mathematics scores over the five school years prior to the research had been low: in the lowest 5% of all seventh grades in the state in 2009–2010 and again in 2013–14, and never placing above the second decile. The five–year average of 58.5% of seventh graders scoring proficient or better was 15 percentage points below the state average of 73.4% over the same period (STATE, 2015).
Portland research participants. The two research participants at Portland Middle School were Roberta Porter, a seventh-grade teacher with six years of experience teaching mathematics (as well as another six teaching language arts and science), and Meg Miller, a student teacher doing a year-long, clinical internship in Mrs. Porter’s classroom. I had interviewed Mrs. Porter, as well as her previous clinical intern, several times as part of an unrelated research project in 2013–2014, and she was the first teacher whose participation in this project I sought. Meg Miller was a senior at the local state university teacher education department and, through an optional program run jointly by the university and the Portland district, she had spent parts of two earlier years in Portland classrooms at several grade levels, including several months in 2013–2014 in Mrs. Porter’s room. I had not met Meg before the research began. Once she agreed to participate, and the district administration had given its approval, they were enrolled in the research.

Packersfield: The community. The Packersfield school district served a rural population spread over roughly 150 square miles, centered on the village of Packersfield (population 4,500) in the northeast corner of Paley County. The district included areas in Maxwell and Yancy counties as well. Median household income ranged from $38,000 to $43,000 in the three–county area in 2014, and about 30% of the households in Paley and Yancy counties were receiving public food assistance. Maxwell County had a higher median income, but a higher rate of food assistance (STATE, 2015): its county seat, Carson (population 26,000), was the only urban center in the area with a population great enough to qualify as micropolitan using the U. S. Census Bureau’s (2015) definition. Of
adults ages 25–64, about 60% had a high school education or less in each county, and the
2014 unemployment rate was 7.6% in Paley, 6.3% in Maxwell, and 5.8% in Yancy,
compared to a 5.7% rate in the state. Agriculture still played an economic role in the area,
with 67% of the three–county area in agricultural use, and roughly 3000 farms averaging
yearly receipts of $121,000 each, the majority from crops rather than livestock (STATE,
2015).

Packersfield: The school. At the time of the research, the Packersfield school
district served about 2,000 students from the three-county area. Just over 70% of students
in the Packersfield district received free or reduced-price lunches in 2014, and the district
was coded by the state as high-poverty. The five-year graduation rate varied between
84% and 90.5% in the five years preceding the research, averaging 87.4% with no clear
up or down trend (STATE, 2015). The high school, middle school, and one of the
district’s three elementary schools shared a campus on the main street of the town, which
was the only population center in the district. Because there was limited classroom space
in the elementary building on the Packersfield campus, students from that building were
sent to the outlying two elementary schools for their fifth-grade year, after which all
district sixth graders attended the middle school in town. At the middle school, the sixth
grade was divided into six self-contained classes, where in each, all subjects were taught
by a single teacher with a generalist certificate. The seventh and eighth grades were
divided into six classes and assigned to teacher teams, each teacher certified to teach one
or two subjects. In response to consistently low scores on state tests, the language arts
classes had been extended to 90 minutes. Beginning in the 2014–2015 year, the
mathematics class sections were also to be 90 min. long, while other subjects continued
to be taught in 45-min. sections. The high school staff included four mathematics
teachers, and the three new seventh- and eighth-grade mathematics teachers had begun to
join them for department meetings in 2013.

**Packersfield: The research participants.** Lorene Johnson and June Harris were
both in their second year of teaching: Packersfield was the only school in which they had
taught as certified teachers. Ms. Johnson had completed a masters program designed to
recruit working adults from STEM disciplines into teaching. Her undergraduate degree
was in biology and mathematics. She had taught briefly in a missionary school in
Kosovo, and had completed a year-long clinical internship as part of her masters
program. I first met her as a member of the internal evaluation team for that program, and
it was on that basis that I invited her to participate in the study.

Mrs. Harris had completed an undergraduate teacher preparation program at a
state university near her home town, earning certification to teach mathematics in Grades
7-12. Before accepting her position, she had spent a year as a substitute for several rural
districts. I had not met Mrs. Harris before the start of the research. When she agreed to
join Ms. Johnson, I secured permission from the district administration and welcomed the
two of them into the research project.

**Research Activities within the Setting**

The original research design had been to work with pairs of middle school
mathematics student teachers and their mentors that were piloting new textbooks in year-
long internships, at up to four sites in the Appalachian state where Portland and
Packersfield are located, and in a New England state in which I had worked previously. But finding such pairs proved more difficult than anticipated. I had invited Mrs. Porter at Portland middle school to join the study in the late spring of 2014, while concluding interviews for an unrelated research project. Mrs. Porter’s participation was contingent on securing the agreement of her prospective student teacher, Ms. Miller, as well as of her district and building administrators. These agreements were reached over the summer of 2014. I located and contacted three other middle school mathematics teachers in the same state, each scheduled to take on year-long student interns for 2014–2015, but each declined to participate in the study. As it turned out, there were no teacher education programs in the New England state that provided the opportunity for year-long internships.

When it became apparent there were no more year-long student teacher–mentor pairs to be had, I contacted Ms. Johnson, whom I had recently interviewed for another unrelated research project. I knew that she and another second-year teacher were taking charge of eighth grade mathematics instruction at Packersfield, that they had no curriculum to work from, and that they would be building their curriculum around a new textbook. As my research focus was on how novices develop their attitudes-as-strategies toward curriculum work, I thought Ms. Johnson and her co-teacher would be a suitable complement to Mrs. Porter and Ms. Miller at Portland. When Mrs. Harris agreed to participate, I secured administrative permissions from Packersfield and began preparing for the fall.
Near the beginning of the school year, I interviewed each research participant separately, using semi-structured interview protocols (Byrne, 1998; Seidman, 2013). The interview protocols used are given in Appendices A and B: the protocol for the intern, Ms. Miller (B), differs from the protocol for the licensed teachers (A). The purpose of these interviews was to explore each participant’s expressed attitudes toward, and understanding of:

- schooling and teaching;
- mathematics as both a discipline and a school subject;
- the roles of students, teachers, texts, and materials (including electronic technologies) in learning mathematics;
- the assessment of mathematical competence;
- the standards for mathematics identified in the new curriculum framework provided by the Common Core State Standards for Mathematics (2012); and
- the relationship of school, culture and community to learning.

I met with Ms. Johnson and Mrs. Harris the morning of September 2, and with Ms. Miller in the morning and Mrs. Porter in the afternoon, on September 3, 2014. Each interview was recorded electronically, and later transcribed for analysis. In addition to the interview itself, these meetings were used to establish research procedures. To begin with, in order to examine and code the problem sets assigned to students, I needed access to the problem sets, from the textbook or from elsewhere. At these initial meetings, the teachers provided me with detailed information on the textbooks and the supplementary materials supplied by each textbook publisher, and on any other materials the teachers
planned to use regularly. In order to track how problem sets were chosen and assigned, and how time was allocated to different sets of problems, I had designed a textbook log, the details of which are described below. At these initial meetings, I went over the logs, and how they were to be filled out. Finally, in order to be able to follow their planning discussions, I provided each pair with a digital voice recorder and a supply of batteries sufficient to last the school year.

After collecting the interview data, I set about securing the textbooks and other materials in use at each site. In Mrs. Porter’s case, this other material consisted of two trade books (Smith, 2002; Walch, 2012); in the case of Packersfield, there were two sets of materials for fluency practice, discussed later, one they had assembled themselves the previous year, the other a trade book (Stoffel, 2007). I purchased the teacher’s edition of the Grade 7 textbook (Bennett et al., 2012), as well as the two trade books used by Mrs. Porter; the other text (Burger et al., 2014), both sets of supplementary materials, and the fluency practice materials from Packersfield were provided to me in electronic form.

I had planned to visit each school site three additional times in the active phase of curriculum implementation, in November, February and April. The original purpose of these visits was to meet with the pair for a discussion of issues with the research to date, and to solve any problems in communication that had arisen. However, not all went as planned. At both sites, for somewhat different reasons, the teachers had difficulty recording planning sessions. Thus, the meetings in November, February, and early May were repurposed to focus on their planning work and their attitude toward the curriculum they were creating at each site.
A final interview was to take place with each research participant individually, after the state test scores for the students were released in 2015, using a semi-structured protocol, addressing many of the topics from the initial interview (see above and Appendices A and B), but with additional questions probing the process of curriculum implementation, the research process, and the relationships of curriculum to student success on the tests (see Appendices E and F). When it became apparent in April that the release of the test scores would not occur until late fall, I decided to use these semi-structured protocols, minus the questions probing responses to the test results, at the May interviews, while memories were still fresh. The balance of the protocol was used at the final interviews as planned. These did not occur until early February of 2016, as the test results were not available to teachers until just before the December holidays in 2015. This was in some ways a plus, as it allowed for discussion of continued curriculum work at the two sites (and in Ms. Miller’s case, at her new job site) in the 2015–16 year.

**Research data collected from the sites.** Altogether, data collected at each site for the study were of three sorts: interview transcripts, textbook use logs, and assignment sets. Each is described briefly here in relation to its role in the research.

The interviews served three interrelated purposes:

- To reveal the attitudes participants displayed in their talk about the commonplaces of curriculum: the mathematics itself, the instructional materials, student learning, the work of the teacher, and community and institutional affordances, obstacles, and expectations;
• To provide background on the kinds of experiences with mathematics, teaching, learning, and community each research participant brought to the project; and

• To provide research participants the opportunity to reflect on their curriculum work and curricular goals over the course of the project year.

The textbook use logs (see Appendix D) were designed to indicate the extent to which participants at each site

• Used the materials and followed the sequence suggested by their textbook;

• Allocated time to problem sets assigned to students; and

• Varied the emphasis they gave to the individual standards addressed.

The assignment sets collected were of two sorts: lists of assigned sets of problems from the textbook, its supplemental materials, and the trade books and other regularly-used resources; and copies, either paper or electronic, of assignments from any other source. The first sort were simply indicated on the weekly textbook use logs, as I already had copies of these materials in my possession. For ease of use, as these materials were assigned, I printed copies and collected them in large ring binders, using the weekly textbook use logs as separators. The second sort of material, as it turned out, was almost always from an online source, and so could be provided to me electronically. At Packersfield especially, some of these alternative assignments were cobbled together by the participants on copiers, using a variety of source materials, and in these cases they either mailed me copies, or provided them to me at one of our interviews. These, too, were inserted into my binders.
Finally, though not foregrounded as data for addressing the research questions of this study, I kept a field journal in which to record events, exigencies, and reflections that arose during the research project.

**Methods of Analysis**

Different types of data lend themselves differently to analysis. And in this case, the interviews, the textbook logs, and the classroom assignments were collected for different, though interrelated purposes. Each of the three is discussed here in turn.

**Analyzing textbook use log data.** The weekly textbook use logs (Appendix D) provided me a means to examine the material used for daily lessons. The logs basically divided instructional information into three columns, each divided into a “textbook” and an “other” section daily. The leftmost column asked for materials (such as the textbook’s lesson guides) read by the teacher in preparing for each day’s lesson, together with a rough indication of the time spent doing this.

The middle column was for problem assignments given to students. If the problems were from the textbook, they were indicated by page and problem numbers; if from the textbook’s supplementary material, they were listed in the “textbook” section as “TS” with their name (e.g., “TS Prac 7.1”) or a page reference (e.g., “Assmt p38-9”) so I could locate them in my copy of the materials. Alternative materials from regular sources—Packerfield’s *Math Minutes* (Stoffel, 2007) or Portland’s *How to Solve Word Problems* (Walch, 2012)—were indicated by an abbreviation and page reference (e.g., “MM 45”). Materials from other sources were named by whatever appeared at the top of the page, and a copy of the assignment page was forwarded to me. For either type of
assignment, “textbook” or “other,” an underlined assignment was one done as a class with teacher guidance, as in working examples; and all assignments had an indication of the number of minutes devoted to them.

The right column of the textbook use log was for homework. The assignments were recorded as for class work, but no time was to be indicated unless class time was given for starting homework.

Data from the log was transferred to a worksheet where I recorded codings for cognitive demand (discussed in the next section), summarized time spent on activities, and added information on Common Core standards addressed, and, for alternative assignments, what lesson in the textbook had been omitted or supplemented. I did not attempt to make an independent judgment as to how well problem sets actually addressed the new standards. I used the textbooks’ own standards alignment guides for that information, which is where teachers would have found it.

Analyzing problem sets: Coding for cognitive demand. The problem sets teachers assign to students result from a variety of considerations: the mathematics to be taught, the level of mathematical ability and the learning needs of a particular set of students, the results of the previous day’s classwork, rehearsal for an imminent consequential test, the materials and time available for making a selection. This choice, which constitutes one aspect of curriculum reasoning, is the focus of my research. Having chosen the problem set, teachers must in addition decide how to present it to students, and to scaffold the consequent student work; and later, how to assess students’ success in acquiring whatever knowledge or skills were the teacher’s object in making the original
choice. These other aspects of curriculum reasoning are—despite their importance—beyond the scope of my research.

In order to understand the teachers’ choices of problem sets, a method of comparing the alternatives between which the teacher chose was necessary. In the current study, I restrict this to a comparison between what the textbook proposed, and what the teacher actually chose to assign. As a consequence, the first level of coding I applied was an indication of the content addressed by the assignment, in terms both of the textbook’s lesson sequence, and the Common Core State Standards for mathematics (2012). For example, in an eighth-grade lesson on solving equations, the teacher might have assigned the set of practice problems given in the text or an alternative set of problems from an online source either instead of, or in addition to, the textbook assignment. Whatever the source of the problems assigned, I looked at these along two dimensions, the “extensive” and the “intensive.” The extensive measure was the number of problems, as well as the number of minutes, devoted to each lesson (and so cumulatively to each standard associated with a set of lessons) by the teacher, compared to the numbers of problems and minutes devoted to it by the textbook. For example, the teacher’s guide for a particular lesson may have suggested assigning 15 exercises from the text, plus 10 problems from the supplementary material in a 45–min. class. The teacher may have assigned only 10 of the textbook problems, and substituted a problem-solving activity with three open-ended problems, in a 60-min. period.

As the example suggest, an extensive measure does not capture well what the teacher chose to do: the teacher chose to assign significantly fewer problems, but devoted
significantly more time to them. Measuring the intensiveness of the problems—their level of challenge for the students—must accompany the extensive measure in order to get a reasonable picture of the teacher’s selection. My original choice for measuring intensity was the five-point scale of the *Study of Enacted Curriculum (SEC)* instrument discussed in McMaken and Porter (2014), which I describe below. However, two factors emerging in the course of the research caused me to move to a multiple-measure coding for problems. In order to explain my decision, a little background on the coding of tasks may be helpful.

I had been drawn to McMaken and Porter’s (2014) SEC scale because I had wanted to use a reflective process with my research participants; as weekly assignments were coded, I would share the coding with teachers, giving us a common language for talking about intensiveness of assignments. The SEC scale had the virtue of being similar to Benjamin S. Bloom’s (1956) taxonomy, which is widely known by teachers, and I expected it to be easier to use during the study. As the research process unfolded, the flow of materials was less smooth than I had hoped, and as a consequence that opportunity for an ongoing reflective dialogue was lost. In that light, the disadvantages of the SEC scale took on more significance.

Bloom’s (1956) taxonomy had been developed by university testing specialists faced with the huge influx of new undergraduates funded by the G. I. Bill after World War II and the Korean conflict:

The prevalent view was that education was to serve a selection function; that is, the purpose of education was to determine which students should be dropped at
each stage of the educational process, and which merited and were fitted by nature or nurture for the rigors of more advanced education. (Bloom, 1994, p. 7)

Implicit in the taxonomy was a hierarchy of intellectual attainment: it was designed as a hierarchy of “descriptions of student behavior” (Bloom, 1994, p. 2) on the assumption that the further “up” the hierarchy one went, the fewer the students who would display the correlative behaviors.

By the 1980s, Bloom’s hierarchical categories had been reframed as a classification of “thinking skills” that all students could master if taught appropriately, and emphasis was now placed on moving instruction and learning toward the “higher order thinking skills” (Costa, 1991) at the top of the taxonomy: analysis, synthesis, and evaluation. At the same time, the modern “standards” movement was coming to the fore, as with the National Council of Teachers of Mathematics’ (1989) Curriculum and Evaluation Standards for School Mathematics, and states were developing new testing programs, so it was natural that attention turned to ways of specifying and developing tasks that would elicit these higher-order skills (e.g. McTighe & Clemson, 1991).

The new standards movement, and associated testing programs of the 1990s, posed in turn the challenge of alignment: how could school districts effectively measure the alignment of their curricula to the new standards? And how could test designers, researchers and policymakers examine the alignment of the new tests to the standards on which they were based, or examine how well different state standards were aligned between themselves?
The Surveys of Enacted Curriculum (SEC) rating scale was developed in response to this need. According to Vockley (2009), the “central idea” of the SEC model was the creation of a uniform language “of descriptors of topics covered in a particular subject and categories of cognitive demand that distinguish what students are expected to know or be able to do” (p. 34). The SEC rating procedure for sets of mathematics tasks consists of two parts: a “taxonomy” of 193 school mathematics topics (e.g. “fractions,” “multi-step equations,” “logarithmic functions”) organized in 16 domains (e.g. “number sense,” “consumer applications,” “trigonometry”) to measure curricular coverage; and a five-point scale to measure the cognitive demand for each task. I use “task” here somewhat loosely, as the scales apply to the wording of standards, as well as to tasks on state tests measuring achievement of those standards (Blank, Porter, & Smithson, 2001; McMaken & Porter, 2014).

What had initially seemed a virtue of the SEC—the rough parallels with Bloom’s six levels—was now outweighed by the way the SEC stretched general descriptions of cognitive levels to fit specific school subjects, in this case mathematics. At the lower end of the SEC scale, “Demonstrate Understanding” is ranked above “Perform Procedures,” while in Bloom’s hierarchy, “Understand” is placed below “Apply.” The difficulty appears to be with what is intended by “procedures” in the SEC classification: “recalling procedures” is listed as a descriptor under the lowest level, “Memorize,” while “do computational procedures or algorithms” is listed as a descriptor under the second level, “Perform Procedures” (Council of Chief State School Officers, 2009). At the higher end of the scale, it is not clear in what way “Solve Non-routine Problems” is cognitively more
demanding than the next lower level, “Conjecture, Analyze, Generalize, and Prove”; in fact, these two have traded positions in the SEC hierarchy in the past (Vockley, 2009, p. 35).

The research project was committed to use of the SEC, but I decided in November to supplement the coding work. Two other scales for measuring the cognitive demand of tasks were widely used in the literature on mathematical tasks: N. L. Webb’s (1999; 2002) Depth of Knowledge (DOK) scale, which was designed, like the SEC, primarily for aligning test tasks to standards; and the Mathematical Task Framework (MTF), created originally for professional development research with mathematics teachers (Stein, Smith, Henningsen, & Silver, 2009).

The Depth of Knowledge (DOK) scale has been used to provide a second dimension to the analysis of cognitive demand (Hess, Carlock, Jones, & Walkup, 2009):

Bloom’s Taxonomy categorizes the cognitive skills required of the brain to perform a task, describing the “type of thinking processes” necessary to answer a question. Depth of knowledge, on the other hand, relates more closely to the depth of content understanding and scope of a learning activity, which manifests in the skills required to complete the task from inception to finale. (p. 3)

While the four–level DOK scale is conceptually different from Bloom’s six–level scale, creating a matrix from the two scales, as Hess, Carlock, Jones, & Walkup (2009) do, suggests that in fact they are measuring a similar construct: cells of the matrix far from the major diagonal have either no descriptors, or vague ones.
Table 3.1

*Common Systems for Scaling Cognitive Demand*

<table>
<thead>
<tr>
<th>Bloom’s Taxonomy</th>
<th>Survey of Enacted Curriculum (SEC)</th>
<th>Depth of Knowledge (DOK)</th>
<th>Mathematical Task Framework (MTF)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recall</td>
<td>Recall</td>
<td>Recall</td>
<td>Memorize</td>
</tr>
<tr>
<td>Understand</td>
<td>Perform procedures</td>
<td>Skills/concepts</td>
<td>Procedures without connections</td>
</tr>
<tr>
<td>Apply</td>
<td>Communicate understanding</td>
<td>Strategic thinking</td>
<td>Procedures with connections</td>
</tr>
<tr>
<td>Analyze</td>
<td>Solve nonroutine problems</td>
<td>Extended thinking</td>
<td>Doing mathematics</td>
</tr>
<tr>
<td>Synthesize</td>
<td>Analyze, prove, generalize</td>
<td>***</td>
<td>***</td>
</tr>
<tr>
<td>Evaluate</td>
<td>***</td>
<td>***</td>
<td>***</td>
</tr>
</tbody>
</table>

The Mathematical Task Framework (MTF) provides a method for discussing the complete cycle of task selection, implementation, and student execution, but here I am interested only in its four–level task categorization. The focus of the scale is not cognitive demand per se, but rather the eliciting of mathematical thought. The two middle levels apply to procedural tasks, which continue to make up much of the school mathematics curriculum, but distinguish between the lower level “Procedures without Connections,” where procedures are learned in a context-free manner as stand-alone objects of knowledge, and “Procedures with Connections,” where procedural work is tied to
contexts with affordances for mathematical relationships, concepts, explanations and arguments. Table 3.1 provides a comparison of the three scales, along with Bloom’s (1956) original cognitive scale.

In November and December of 2014, I began to apply each of these three coding systems to the assigned tasks I was receiving from my research participants. This led me to search for a way to use recurrent patterns in the resulting code triplets to identify a somewhat broader taxonomy specific to the range of middle school mathematics problems I was seeing. The result was the eight–code system I use in the case studies. The triplets consist of a number for the MTF coding, a letter for the DOK coding, and a number for the SEC code. The lowest code for cognitive demand on this system would be 1A1, the “recall” level on all three scales. Appendix C shows an “anchor task” for Grades 7 and 8 for each code triplet. There are only three DOK levels in this eight–code system, because DOK’s fourth level requires a kind of complex project, extended over many days, that does not appear in my data. Similarly, SEC level five, for tasks that involve mathematical proofs or a highly abstract level of generalization, did not appear: the highest of my eight codes was 4C4.

Ordinarily, the use of such a coding scheme would initially be tested for consistent application by having several people apply the codes to a subset of the data, and comparing their results in order to establish intercoder reliability. I chose not to do this, for two reasons, one having to do with my prior experience assessing mathematics tasks for their cognitive difficulty, and one having to do with the nature of the coding itself, as it applied to the data I was seeing from the two school sites.
I had already been a member of a group trained not only to apply the Mathematical Task Framework (MTF) to mathematics task appropriate for upper elementary and middle school students, but to train others to do so: This was a scale with which I had developed some expertise. The five levels of the Survey of Enacted Curriculum (SEC) scale—my original choice as a coding scheme—was, by design, similar to the five lower levels of Bloom’s (1956) original taxonomy, another scale with which I had developed fluency through many years of work on school mathematics curricula.

My familiarity with two of the three scales would not, however, justify not testing my blend of the three systems for reliability, had it not been for a second factor. This factor was the pattern of problem types that was emerging from the assignments of the four teachers involved in the study. On the one hand, it quickly became obvious that the vast majority of assigned problems were going to fall on the lowest two levels of all three scales—factual recall and executing rote procedures—while problems at the highest level on each scale—solving non-routine problems, doing mathematics, strategic or extended thinking—were vanishingly rare. For most purposes, problems could be classified in a binary way: those of low cognitive demand (the majority) and those of higher cognitive demand. On the other hand, it was soon apparent that the abstract descriptors of the three scales were less useful in placing a problem than the recognition that most problems at each grade level fell into a handful of readily identifiable types. The “benchmark problems”—exemplars of each of these types—are given in Appendix C. In the great majority of cases, I coded problems by matching them to these typical problems.
|----------------------------------|--------------------------|------------------------------|
| **1. Memorization:**  
  Facts/Definitions/Rules/Formulas  
  Recall rule/fact/definition/formula  
  **A. Recall Facts/Definitions/Rules/Formulas**  
  Recall/recognize fact/definition/property | **1. Memorize Facts/Definitions/Rules/Formulas**  
  Recall basic facts/definitions/formulas | **2. Perform Procedures**  
  Do computational procedures or algorithms  
  Solve 1-step equations/word problems  
  Read/make simple graphs/tables |
| **2. Procedures without Connections**  
  Called-for 1-step procedure evident  
  Execute a known algorithm–limited cognitive demand  
  Focus on correct answer  
  Explanation focused solely on steps of algorithm  
  **A. Recall Procedures/Algorithms**  
  Apply a rehearsed algorithm/formula  
  Measure/Perform routine procedure  
  Solve 1-step word problem  
  Read information from a simple graph | **2. Perform Procedures**  
  Do multi-step computational procedures/algorithms  
  Solve 1-step equation, routine multi-step word problems  
  Read/make simple graphs/tables | **2. Perform Procedures**  
  Do multi-step computational procedures/algorithms  
  Solve 1-step equation, routine multi-step word problems  
  Read/make simple graphs/tables |
| **3. Procedures with Connections**  
  Focus on developing understanding of underlying concept  
  Usually, multiple representations  
  Identify patterns, but without generalizing  
  **B. Skills/Concepts**  
  Solve 1-step linear equation  
  Solve routine multistep word/number problem  
  Interpret information from a simple graph | **3. Communicate Understanding**  
  Communicate mathematical ideas  
  Explain findings from data analysis | **3. Communicate Understanding**  
  Represent/model mathematical relations |
| **3. Procedures with Connections**  
  Focus on developing understanding of underlying concept  
  Usually, multiple representations  
  Identify patterns, but without generalizing  
  Conjecture, without evidence/explanation  
  **C. Strategic Thinking**  
  Solve open problems, explain/justify steps  
  Use concepts to solve non-routine problems | **3. Communicate Understanding**  
  Represent/model mathematical relations | **4. Solve Non-Routine Problems**  
  Use models, concepts to solve non-routine problems  
  Adapt strategies to new contexts |
| **3. Procedures with Connections**  
  Focus on developing understanding of underlying concept  
  Usually, multiple representations  
  Identify patterns, but without generalizing  
  Conjecture, without evidence/explanation  
  **C. Strategic Thinking**  
  Solve open problems, explain/justify steps  
  Use concepts to solve non-routine problems | **4. Solve Non-Routine Problems**  
  Use models, concepts to solve non-routine problems  
  Adapt strategies to new contexts  
  Apply math in non-mathematical contexts | **3. Communicate Understanding**  
  Communicate mathematical ideas  
  Explain findings from data analysis  
  Explain relationship between representations |

*Figure 3.1.* The eight–level coding system, using Mathematical Task Framework (MTF), Depth of Knowledge (DOK), & Survey of Enacted Curriculum (SEC) descriptors. Arrows indicate shifts of level.
Code triplets were applied to every problem assigned by the teachers over the course of the year. Because one focus of the research was on how and why teachers decide to substitute (as opposed to supplement) textbook problem sets, I also coded parts of each text. To have coded two entire texts, plus their supplementary materials, was beyond what I could accomplish with the time available. To focus my selections from the textbook, I used the definition of “major content” within the Common Core standards, as identified by the testing consortium chosen by the state, the Partnership for the Assessment of Readiness for College and Careers (PARCC, 2014). I then used each textbook’s alignment guide to determine which lessons a teacher following the textbook would choose to address this major content. From the resulting list of lessons linked to standards, I chose roughly half. The criteria for selection differed for each school. At Portland, where the two teachers took the lead in different parts of the year, I selected major-content standards alternately one by one for each domain that each teacher had addressed in her teaching for more than three days, until I had a list including half the major content standards. At Packersfield, where the two teachers taught in parallel, I divided the school year into three 10-week periods, and selected standards, one per domain, alternating periods—again with the condition that a standard could only be selected if addressed for more than three instructional days—until half the standards in each domain had been selected. Having selected this subset of lessons, I coded all the problems provided for each lesson in the text, as well as all the problems on the two practice assignments from the textbook’s supplementary materials provided for each lesson.
The overwhelming majority of tasks, not unexpectedly, were coded 2A2 or 2B2: They were essentially algorithmic exercises. For this reason, I followed a practice, common to the Bloom and MTF scales, of collapsing the coding into two categories, “low-demand” (1A1, 2A2, 2B2) and “high-demand” (3B3 and above). Figure 3.1 shows the numbers/letters used, with descriptors. Arrows in the figure indicate where, on each scale, the cognitive demand changes.

In summary, all problems assigned by teachers were coded for date, time, source, and in the case of the Portland study, for teacher. In addition, each problem was assigned one of eight codes for cognitive demand, as shown in Figure 3.1. Using the standards PARCC (2014) identified as “major content” for each grade, I identified the aligned textbook lessons, and coded all the problems in about half of these in order to be able to compare teachers’ substitutions to what the textbook offered them.

Analyzing discourse data. This study, like much of social science research, is what the University of Chicago biologist and curricular theorist Joseph Schwab (1978) called fluid research (as opposed to the “stable” research in the physical sciences). The physical sciences work within what Kuhn (1970) termed paradigms, stable sets of assumptions about the nature of the object of study, a central feature of which is that the object of study is a complete system of entities and relationships independent of the scientist. Social science research is fluid, on the other hand, because it has as its object an ongoing process that we are continually recreating not only as we study it, but through the study of it. In such research we find “indefinite timelines, uncertainty regarding what
shall be viewed as significant data, and [that] the endpoint is unknowable” (Ross & Chan, 2008, p. 1706).

The object of fluid research is to “name the world”—to say what recurrent patterns of action are significant—in a way that permits us to act on the world: “The names for typical, recurrent social situations are not developed out of ‘disinterested curiosity,’ but because the names imply a command (what to expect, what to look out for)” (Burke, 1967, p. 294). We study social situations (such as that of teachers acting in classrooms) because we have particular “ends-in-view” (Dewey, 1933, p. 17), goals we seek to achieve. Achieving (or failing to achieve) those goals entails acting not only on, but also in the situation, leading to a new situation, in which new “ends-in-view” may emerge. So the kinds of knowledge we acquire in fluid research are temporally bound:

What we may be able to say now about a person or school or some other is given meaning in terms of the larger context, and this meaning will change as time passes. Our social science knowledge is, like the things we study, something “in passing.” (Clandinin & Conelly, 2000, p. 19)

This stance toward doing social science, which draws on the pragmatist tradition in philosophy (e.g. Dewey, 1933; Burke, 1954; Mead, 1956) places language at the center of the social activity under study: speech is never understood simply as naming, but always understood as “a system of attitudes or implicit exhortations” (Burke, 1954, p. 177).

It remains to lay out how language, attitudes, and what Kenneth Burke called orientations are related in teachers’ curriculum work, and how I disclose those relations in analyzing the transcripts of the interview data collected over the course of the study.
Blankenship, Murphy, and Rosenwasser (1974), in their examination of the development of Burke’s way of approaching language and action, focus on the triad “orientation–motive–attitude.” Burke (1954) used orientation to refer to a world-view, a general way of schematizing possible situations. He thought of attitude in strategic terms: one’s attitudes are the collection of deployable namings and corresponding actions for “putting right” emergent situations (Burke, 1969, p. 54). Attitude and strategy are two faces of the same social “object,” and I will frequently use the portmanteau term “attitude-as-strategy” to indicate this. Attitudes are kept available linguistically in anecdotes, proverbs, and parables, which may be private or (to varying degrees) public. Between these two terms Burke situated motives, which he saw as essentially linguistic: one’s motive “followed immediately” from one’s naming of a situation—it essentially was this naming—given one’s orientation, and the set of corresponding attitudes upon which one drew. Motives, in Burke’s vocabulary, are paradoxical. On the one hand, a motive displaces agency to the situation: Rather than “I chose to . . .,” we say, “because the situation was X, I did Y.” On the other hand, by acting, I create possibilities for further action that inhere in my action itself: “Our act itself alters the conditions of action, as ‘one thing leads to another’ in an order that would not have occurred had we not acted” (Burke, 1969, p. 67). The action, as Burke conceives it, is motivated not by the situation, but by the action itself, as a kind of causa sui.

Talk about motivation, including both the teachers’ talk in the transcripts, and my own talk in analyzing them, is situated in the middle of this paradox. Accounts of motivation are always post hoc, and are related to the orientation of the person ascribing
the motive. That is, a teacher, in saying why she did X, is making a claim about the way X coheres with her orientation within that situation. I can observe what she did (here, what problem sets she chose to assign) empirically, and I can use the evidence in the transcripts to identify the claims of coherence, using these to disclose orientations. It is in this sense that, following Burke (1969, p. 57), I can claim that the study “of language acts as we use them is empirical.”

The method that follows from all this is a kind of attending to the text that looks for “parables,” “proverbs,” “representative anecdotes” of practice (Burke, 1969, p. 59; see also Shulman, 1986) that summarize attitudes-as-strategies, as well as for the ways attitudes-as-strategies are organized into coherent “sensible systems” (Leatham, 2006) that constitute orientations.

As an example, I give one teaching intern’s insight when asked in a seminar I led what new understandings about teaching he had acquired: “Never pick up a student’s pencil.” This is what Burke means by a proverb that encapsulates an attitude. This is not the same as a motive. In the first place, there were no students, or pencils on the floor at the time. More to the point, it was easy to tease out in discussion that the young intern could, in fact, think of situations in which it might be sensible and appropriate to pick up a student’s pencil. Attitudes do not live in a cognitive vacuum: they are associated with contexts within which they are appropriate, and clusters of other attitudes belonging to the same or overlapping contexts (Leatham, 2006). To “recognize” a situation is (among other things) to “name” it in a way that identifies it with a context, and so an attitude: “In this situation, don’t pick up that pencil!” It is the naming that mobilizes the attitude as a
strategic action, as something that moves us. What we often think of as a motive is instead an explanation of the action, not its cause—and explanations, as rhetorical actions, often have motives of their own.

These coherent systems of attitudes-as-strategies that Burke calls orientations—or, elsewhere, “equipments for living” (Burke, 1973)—are what I disclose in the transcripts of the interviews. My goal is to identify curriculum attitudes-as-strategies that may come into play in action (Mahan-Hays & Aden, 2003), here the action of choosing curriculum materials. As Geertz (1983) has observed, there is no reason to expect that these attitudes will always appear consistent with one another: one can hold both “Look before you leap!” and “He who hesitates is lost” as attitudes. What makes attitudes cohere in orientations is the way each is bound to a context of application: in addition to the attitude, we need to discover how it is situated in the actor’s sensible system (Leatham, 2006), or overall orientation to his world—or, specifically, the participating teachers’ orientation toward their work, their students, their materials, and their community.

In the case studies that follow, this has entailed providing the reader with extensive excerpts from the transcripts, so that the process of disengaging attitudes-as-strategies can be observed, as well as put in question.
Chapter 4: Grade 7 Mentor and Intern at Portland Middle School

Introduction

In this chapter, I describe the data collected from the Portland Middle School site, and use those results to articulate curriculum work as practiced by a seventh-grade mentor mathematics teacher and her intern. I begin with a brief introduction to the two teachers, Roberta Porter and her student co-teacher Meg Miller, and the Portland Middle School in which their work takes place. I then describe the data collected from the work at Portland, which consisted of:

- The 21 completed text logs and 13 text log substitutes, covering 34 of the 35 weeks of instruction studied;
- The 230 assignment sets, consisting of 2,271 mathematical tasks, each individually encoded for cognitive demand;
- Anonymized individual scores on the 2015 PARCC test for Portland Middle School’s seventh grade, along with the state’s five-band summary of Portland’s seventh grade results;
- Transcripts of two planning sessions recorded by Mrs. Porter and Ms. Miller; and
- Transcripts of five interviews with each teacher recorded between the beginning of the study in September 2014 and its conclusion in February 2016.

Each of these data sources will be examined in turn below. I will then provide a critical summary of the ways teacher orientation, as revealed in the transcripts, related to the
selection of mathematical tasks for students, and to the state’s assessment of student mathematical achievement. But first, I introduce my research participants, Roberta Porter and Meg Miller, their classroom situation, and their textbook.

**Portland Middle School and Teachers**

**Portland: The school.** At the time of this research, the Portland school district served just over 1,000 students, a number that had been declining for a decade, but showed recent signs of stabilizing. The middle and high schools, which shared a campus, were roughly in the geographic center of the district. In 2014 the middle school served Grades 7 and 8: the Grade 6 classes had been relocated to the two district elementary schools a few years before the start of the study. The high school, with 300 students, had four mathematics teachers, two of whom were one-year replacements in 2014–2015. One of these was employed to free the mathematics department head to act as the mathematics coach on campus for a year. Just under 70% of district students qualified for free or reduced-price lunch in 2014; the state Department of Education coded Portland as a high-poverty district. The five-year graduation rate in the district had gone up from 91% in 2010 to 97% in the year of the study (STATE, 2015).

From Mrs. Porter’s point of view, parent expectations of the school, and of the mathematics program, varied:

There is a small contingent of parents who really think that their kids need to have more science, more math, and really push them to do that, and make sure that we offer those things. And then—case in point, I had a kid last year whose mom came in and said, “I don’t know why he’s got to learn this stuff, he’s never going
to learn it anyway. And he’s never going to use it: he’s going to be a race car
driver when he grows up.” And she was deadly serious about that, so there really
is a difference in what people think about what we should be teaching their
children, and they want to be able—some, very few, but a very vocal few—to be
able to dictate what we should make them do. (Roberta Porter interview,
September 3, 2014)

Under the state accountability program imposed by the federal No Child Left
Behind legislation, mathematics and reading were tested annually in grades 3–8. State
score reports from the annual testing divided student results into five categories: Limited,
Basic, Proficient, Accelerated, and Advanced (six in 2013 and 2014). Districts, schools,
and grade levels within schools were rated based on the percentage of students who
scored in the top three of these categories (the top four after 2012). Portland seventh
grade mathematics scores over the five years before the research had been low: in the
lowest 5% of all seventh grades in the state in 2009–2010 and again in 2013–2014, and
never placing above the second decile. The five–year average of 58.5% of seventh
graders scoring proficient or better was 15 percentage points below the state average of
73.4% over the same period (STATE, 2015).

The district administration at Portland was not focused on these annual ratings
from the state based on the test scores:

Our district has never been all about the test. In fact, our leadership doesn’t
believe that those tests, one snapshot, is a true measure of what our kids are
capable of doing, so that has never been a real focus for us. And if it was
determined that the test was driving what we do in the classroom, there would be a real problem. Honestly, our leadership would not be too upset if the Common Core just went away. (Roberta Porter interview, February 13, 2015)

Although the state required districts to evaluate teachers based on student achievement, teachers at Portland measured that achievement using student learning objectives (SLOs) they created based on their subject material, in order to supplement the students’ results on the state tests. In the year preceding the research, the administration had been working with faculty and the community to prepare a district set of principles for teaching and learning, which put the emphasis not only upon “being child-centered, and engaging in the child,” but also on student choice:

We want to make sure that not only are the activities student-centered, but is there choice involved? Do students get a say in how they demonstrate their mastery of a concept? And that has been really important this year. (Roberta Porter interview, November 18, 2014)

The building principal, Mr. Roberts, and the Portland superintendent, Dr. Samuels, were frequent classroom visitors in 2014–15, as the teachers put the new principles into practice.

**Portland teachers: Roberta Porter.** Mrs. Porter has taught at Portland middle school for over a dozen years. She earned an Associates degree in computer science at a local community college before deciding to pursue teaching certification at the state university in Rockland, where she lives. She took no mathematics courses beyond the college algebra she had done in her computer science program. After receiving her K-8
generalist certification, she was initially hired at Portland to teach music. But a mathematics vacancy opened at the beginning of her first year, and once thrust into that position, she found that she enjoyed it. Seventh grade mathematics has been her regular assignment for the last few years, though she has not always been the only mathematics teacher at that grade level. Because she is certified as a generalist, she has also been assigned sections of science and language arts, as needed, and other teachers have sometimes shared responsibility for the mathematics. In the year before this research began, Mrs. Porter had joined a “math circle” for teachers, sponsored by the university in Rockland. She enjoyed the opportunity to “just grapple” with open problems, and she has collected useful teaching materials from the meetings.

Students came to the middle school from two district elementary schools, each with two sixth grade generalist teachers. In the years preceding the study, there had been some turnover among these teachers. Mrs. Porter expressed her satisfaction at our first interview that the turnover had “settled down”: Only one of these four was a new teacher in the 2014–2015 school year. During that year, Grade 7 enrollment was 75–80 students, assigned to three classes of 25–28 each. Mrs. Porter taught mathematics for all three classes.

One class included 12 of the 16 students with Individual Education Plans (IEPs). Betty Winthrop, a special education teacher, was assigned to that class, though she sometimes pulled groups of students out of the room to work with separately. Mr. Rudolph, the special education teacher for mentally handicapped students, was responsible for testing the students he worked with, based on the materials Mrs. Porter
provided him, but he did not work in her classroom. The mathematics coach, Georgia Herbert, was in another of Mrs. Porter’s section for the first three months of the school year, so there were two certified teachers in two of the three classes each day for most of the fall. Beginning with the 2014–15 school year, the enrollment in the three classes was to be shuffled in the middle of the school year, in order to allow students a choice of electives. Because Mrs. Porter taught all three Grade 7 mathematics classes, this had little impact on her in 2014–15.

As a part of its program to transition to the Common Core standards, Portland had altered its schedule to allow 90-min. instructional blocks for mathematics and language arts. In 2013–2014 this had been pared back to 80 min., and for 2014–2015 it was to be reduced again, to 65-min periods. In September, Mrs. Porter worried about the impact this would have on her teaching: “We’re down to 65 minutes, and I’m like, ‘I need those 15 minutes back!’ How did I ever survive without it?” (Roberta Porter interview, September 3, 2014). In February, she had still not fully adjusted to the change: “[Formative assessment] is getting harder and harder to fit in, losing those 15 minutes. I’m finding that they are not exactly completing what I expected them to complete for classwork” (Roberta Porter interview, February 13, 2015).

Mrs. Porter had experience working as mentor for student teachers from the university. In the year prior to the research, she and her student teacher were involved in a research program conducted by the university to examine the impacts of moving their internship program to a “clinical” model. Under that program, seniors in the teacher certification program could volunteer to be placed in their internship in August rather
than in January. They would act as co-teachers with their mentors two or three days each week in the fall, and full time in the spring. I first met Mrs. Porter as an interviewer for that research program, and it was based on that acquaintance that I invited her to participate in the current study.

**Portland teachers: Meg Miller.** During the main part of the research project, Ms. Miller was a senior at the state university in Rockland, completing the certification program for teaching mathematics in Grades 7–12. She came to the university from a prosperous suburb of the state capital, about two hours away, planning to major in nursing. Her experience tutoring fellow students in her freshman algebra class—“I was the one, like, tutoring everybody. So I was like, ‘This is what I should do!’”—convinced her to change majors to mathematics teaching. By her senior year, she had taken a wide range of mathematics courses, which she generally enjoyed, and most of the required sequence of education courses, which she found much less satisfying. She had joined an alternate program at the university, co-sponsored by the Portland district, that allowed her to observe and do some preliminary student teaching in a variety of settings in Portland schools her sophomore and junior years, while taking education courses from Portland faculty. In her senior year, as the research began, she had returned to taking the required education courses on the university campus: “These classes I am in, they are almost pointless. I would rather be doing this stuff. You know? Getting in the classroom” (Meg Miller interview, September 3, 2014).
In the year before the research, she had been in Mrs. Porter’s room two days a week for a significant part of the year. I had not met her before I extended to her the invitation to work with Mrs. Porter and me on the research project.

**Portland: The textbook.** The textbook used the year of the research (Bennett et al., 2012) had been newly selected by a committee of the Grades 6–12 mathematics teachers in order to align instruction with the Common Core State Standards (2012). These standards had been adopted by the state two years previously, but were to be the basis of the state accountability system for the first time in the spring of 2015, based on tests designed by a multi-state consortium, the Partnership for Assessment of Readiness for College and Careers, usually referred to by participants as PARCC. The newly-adopted textbook had a traditional format, with two- or three-page lessons giving examples of an algorithm or process, followed by a set of 40–50 exercises, with about a quarter of the lessons followed by a hands-on exploration activity. Each lesson clearly indicated which of the new standards it was intended to address. This textbook replaced an earlier version of the same text, in use in the district for a decade. The supplementary material, consisting of pre-made quizzes and tests, two pages of practice exercises per lesson, and extra pages of exercises allowing for a limited degree of differentiation, was provided on a CD, and the text came with a license for online access to a practice site. Because Internet bandwidth, both at school and in homes across the district, was limited, teachers did not use the online materials with classes, though online work was sometimes assigned to individual students who could not attend school.
Portland Text Logs

The Portland district began the 2014-2015 school year on August 19, two weeks before I met with seventh grade mathematics teacher Roberta Porter and her student co-teacher Meg Miller on September 3 to explain how to complete the textbook logs and record the planning meetings. As a result, the logs do not include the first 10 days of instruction. Mrs. Porter, who was the lead teacher in the fall term, provided an unbroken set of logs from the beginning of September to the third week of November (12 weeks). For the four weeks from Thanksgiving to the December holiday break, there were no logs. However, for all but Thanksgiving week (with only one instructional day), she provided all the assignment data (but no time or planning data) in an alternate form described below.

Ms. Miller assumed responsibility as lead teacher in the second week of January (after they lost three days to snow closures the first week), but Mrs. Porter continued to take major responsibility for sending the textbook logs. Over the 13 school weeks before the April vacation, I received text logs for nine weeks (Mrs. Porter provided logs for all nine; five logs, covering the same weeks, were completed by Ms. Miller), as well as three alternate forms listing assignments. The missing week was taken up with PARCC testing, so no student assignments were unaccounted for. For the final six weeks of instruction (four led by Ms. Miller), I received only the alternate assignment forms from Mrs. Porter, which omitted information on time allowed and planning.

As a consequence, the data provide a nearly complete picture of what tasks students were assigned (only one day of material is missing for the research period of 140
instructional days). However, the 13 alternate forms, unlike the 21 collected logs, omitted times. These alternate forms were a part of an ongoing, cross-grade, curriculum-writing project at Portland, and were written more like standard lesson plans: each identified daily curriculum objectives for the week, citing Common Core standards and mathematical practices addressed, and listed both the problem sets and their sources. The Portland administration required Mrs. Porter to prepare these weekly, and she substituted them for the research project’s textbook use logs in those weeks when her workload was heaviest: in the weeks between Thanksgiving and the December holidays (when she administered tests of her Student Learning Objectives, a part of Portland’s teacher evaluation program); during the first round of state testing in late February and early March; and at the end of the year, when she no longer had the assistance of Ms. Miller, and her final grades were being prepared. Because the existing logs, and the descriptions of class procedure in the interviews, show that these teachers had a reasonably regular routine, I have roughly estimated times for the more regular types of assignments over the missing 13 weeks: the resulting estimates of time spent doing various types of problems are consequently of limited reliability.

The planning data that was to be gathered from the first column of the logs were even less reliable. The teachers were asked to indicate for each day how much time they had spent reading either the teacher’s edition of the textbook, or other sources in order to prepare assignments. But, as will become clear in the discussion of the assignments and interviews below, the new textbook series chosen by Portland was intentionally put aside in favor of tasks from other sources after only a few weeks of use. And it turned out that
most teacher “planning” time was spent in finding, rather than in examining, these alternative materials. It is unlikely, as a result, that the time indication as requested in the log would have yielded useful information on how teachers were preparing to use them. However, despite the missing data, the nine hours of transcribed interviews, together with the record of curricular choices provided by the textbook logs, permit an examination of the strategies teachers deployed in selecting mathematical tasks for their students.

**Portland Mathematical Tasks**

For purposes of this study, a problem *set* is a group of problems presented to students as a single assignment, regardless of the sources of the individual problems. For example, a teacher might choose one of the textbook’s supplementary pages, but delete certain problems and add others, either of her own or from some other source. Or she might assign “odd-numbered problems on page 143, along with problems 53 and 54 on page 144.” Despite the multiple sources, this is presented to the student as one assigned task, and so is one set. On the other hand, a teacher might take an online source with several challenging problems, and use each problem separately as a “Problem of the Day”: in that case, one source could lead to several “sets,” each of which might be an individual problem.

In the course of the 139 instructional days for which information on assignments was returned, students were given 2,271 individual problems (some with multiple parts) in 230 sets, including tests and quizzes. An average set, then, contained about 10 problems, and in an average class period (65 minutes at Portland), students would see 1.65 sets, or about 16–17 problems. This estimate is slightly low, as both teachers often
used “exit slips”—single problems on the topic of the day’s lesson, meant to assess students’ level of understanding formatively—without usually recording these in the logs. And the actual number of problems varied quite a bit, from days with one complex problem that took all or most of the instructional period, to a high of 72 arithmetic exercises in a single day in April.

To gain further insight into Mrs. Porter’s and Ms. Miller’s curricular reasoning (Roth McDuffie & Mathers, 2009), I coded these 2,271 problems for cognitive demand, as described in Chapter 3, and then grouped them into two levels, high or low, based on their coding. I also coded problems for their source: the textbook (including its supplementary materials); trade books; online sites; and other sources, including those problem sets assembled by the teacher, either from scratch or from multiple sources. In order to get a clearer picture of curricular alternatives facing the teacher, I also coded a subset of textbook problems not used by the teachers. To do so, I used the PARCC testing consortium’s identification of certain standards as “major content” for testing purposes (PARCC, 2014) and matched these to chapters in the textbook, from which I then selected a subset of about half of the matched textbook lessons, including major content addressed by each teacher, and spread over the course of the year.

To summarize, problems presented to students are coded based on date, alignment with both the seventh-grade standards and the textbook (whether they came from the textbook or not), cognitive demand (using both the eight-code system described in Chapter 3, as well as a high/low dichotomy), and whether or not they address “major content” as identified by the testing consortium. In addition, a subset of textbook
problems and supplementary materials was also coded for cognitive demand, using the same two systems, in order to allow comparison with problems chosen by the teachers to address that major content. I now take up a discussion of each of these in turn.

**Looking at problem sets across time.** There are two obvious time–related variations in the tasks students were assigned: a change in the lead teacher, and a change in use of the textbook. The first follows from the situation: Ms. Miller was expected to become the lead teacher in January, and to continue in that role until the end of April. Mrs. Porter was the lead teacher for 96 of the 139 instructional days, and Ms. Miller took the lead for the other 43 days. This was more disproportionate than planned: Ms. Miller lost nearly two instructional weeks to snow closures, and another week to the interruptions for two rounds of state testing. Nevertheless, she selected lessons and exercises for about nine weeks’ worth of classes (spread over twelve calendar weeks), and her task assignments over that time do show some differences from Mrs. Porter’s: in average number of problems assigned, in the time devoted to working on problems, in the proportion of problems chosen from the textbook, and in the proportion of problems categorized as high-level. I begin with an examination of the first two of these: the number of problems assigned, and the time devoted to student work on those problems.

Of the 2,271 problems assigned over the school year, Ms. Miller was responsible for 784, or just over a third (34.1%), of all problems. For Ms. Miller, that yielded an average of 18.2 problems per day, compared to an average of 15.5 for Mrs. Porter, or about one-sixth more problems per day (17.4%). It seems likely that this difference is related to the difference in average daily time devoted to problem solving. While several
text logs were missing, there were enough logs to support the time estimates made for the weeks with no logs. Taken together, these suggest that Mrs. Porter averaged 46.3 minutes each instructional day on assigned problems, while Ms. Miller averaged 57.1 minutes a day, almost a quarter more time (23.3%) than her mentor.

This does not necessarily mean that Ms. Miller showed a greater preference for assigning problem sets. In her first three weeks, she lost over half her instructional days to snow closures. As the threat of snow lessened, the state testing approached, with the first round in late February and early March, and the second round in April. As a result, many of her days, as well as at least a part of every day’s work, was targeted at getting students ready for the tests by running them through problem sets drawn from PARCC practice exams, and older state testing material. While some of these problems, as I discuss below, showed significant cognitive demand, many more were targeted at building fluency, especially with the rational and integer operations that were expected to be heavily tested. Given this outside impetus, then, it would be premature to conclude that the increased time devoted to problem solving, and the correlative increased average number of problems assigned, was motivated by differences in orientation to problem solving or to pedagogy between the teachers.

**Looking at problems across sources.** In Chapter 3, I described how the assignments were collected and coded. Here I examine the patterns found by examining the sources for all 230 sets of problems.

The most obvious pattern in the use of sources came from the decision, after six weeks of the research project (and 8 weeks of school) to stop using the textbook as the
main source of work for students. The change was certainly abrupt, as illustrated in Table 4.1, which shows the number and proportion of textbook problems selected by Mrs. Porter during the first six weeks, when the textbook was the main source of student work; the number and proportion of textbook problems she selected over the 16 weeks in fall and late spring that she taught without relying on the text; and the number and source of textbook problems selected by Ms. Miller during her 12 weeks as lead teacher. Here, as elsewhere, “textbook problem” includes assignments from the textbook’s supplementary material.

Table 4.1


<table>
<thead>
<tr>
<th>Teacher</th>
<th>Weeks</th>
<th>Problems</th>
<th>From Text</th>
<th>Percent From Text</th>
</tr>
</thead>
<tbody>
<tr>
<td>Porter (first wks)</td>
<td>6</td>
<td>769</td>
<td>643</td>
<td>83.6</td>
</tr>
<tr>
<td>Porter (other)</td>
<td>16</td>
<td>718</td>
<td>151</td>
<td>21.0</td>
</tr>
<tr>
<td>Miller</td>
<td>12</td>
<td>784</td>
<td>451</td>
<td>57.5</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>34</td>
<td>2,271</td>
<td>1,245</td>
<td>54.8</td>
</tr>
</tbody>
</table>

Of the 1,245 textbook problems assigned during the year, just over half (643, or 51.6%) were assigned in the first six weeks of school. Once the decision was made to move away from reliance on the textbook, Mrs. Porter moved away aggressively, drawing less than a quarter (21.0%) of her next 718 problems from that source. Ms.
Miller, on the other hand, though choosing many assignments from other sources, still used the textbook for over half (57.5%) of her problems.

Table 4.2

*Portland: Source Distribution for Non-Textbook Problems by Teacher*

<table>
<thead>
<tr>
<th>Teacher</th>
<th>Tradebook</th>
<th>Online</th>
<th>PARCC</th>
<th>Other/Teacher*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Num</td>
<td>Pct</td>
<td>Num</td>
<td>Pct</td>
</tr>
<tr>
<td>Porter</td>
<td>68</td>
<td>9.8</td>
<td>274</td>
<td>39.5</td>
</tr>
<tr>
<td>Miller</td>
<td>3</td>
<td>0.9</td>
<td>82</td>
<td>24.6</td>
</tr>
<tr>
<td>TOTAL</td>
<td>71</td>
<td>6.9</td>
<td>356</td>
<td>34.7</td>
</tr>
</tbody>
</table>

*Includes teacher files, and material assembled from multiple sources.*

The distribution of the sources for the 1026 problems not drawn from the textbook materials is shown in Table 4.2. The relatively high percentage of material Ms. Miller chose from PARCC practice tests and earlier state tests (combined in the PARCC column) is largely a product of the period during which she had control of the class, a period that included the most intensive test preparation work in February and March. Mrs. Porter also drew on this material. She had copies of all released state tests going back over a decade in her files, with problem sets organized by curriculum topic, and she used these—especially open response items that require explanations—throughout the year. But even with her extensive file of problems, and her set of trade books with standards-oriented problems, Mrs. Porter looked most frequently for problem material
online. Ms. Miller also used online sources regularly for material, but used Mrs. Porter’s files extensively. Without trade books of her own, she rarely used that source.

Table 4.3

*Portland: Distribution of Problems over School Year by Source*

<table>
<thead>
<tr>
<th>Teacher</th>
<th>Problems</th>
<th>Text pct</th>
<th>Online pct</th>
<th>PARCC pct</th>
<th>Other(^a) pct</th>
</tr>
</thead>
<tbody>
<tr>
<td>Porter:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>First 6 wks</td>
<td>769</td>
<td>83.6</td>
<td>0.0</td>
<td>1.9</td>
<td>14.4</td>
</tr>
<tr>
<td>Other 16 wks</td>
<td>718</td>
<td>21.0</td>
<td>38.2</td>
<td>9.3</td>
<td>31.5</td>
</tr>
<tr>
<td>Miller 12 wks</td>
<td>784</td>
<td>57.5</td>
<td>10.5</td>
<td>8.2</td>
<td>23.9</td>
</tr>
<tr>
<td>TOTAL</td>
<td>2,271</td>
<td>54.8</td>
<td>15.7</td>
<td>6.4</td>
<td>23.1</td>
</tr>
</tbody>
</table>

\(^a\) Includes both teacher-assembled and trade book categories.

In summary, as shown in Table 4.3, the teachers at Portland Middle School began the year using their new textbook, but decided after the eighth week of school (the sixth week of data) to de-emphasize its use for the rest of the year. About half (51.3%) of the textbook problems assigned during the year were assigned in those first weeks. Mrs. Porter led the class for 16 of the remaining weeks, split between the fall and late spring, drawing on the textbook for 21% of the work she assigned, preferring to put materials together from her files or her set of trade books (31.5% of assigned problems), or search for new materials online (38.2% of assigned problems). Ms. Miller, who was the lead teacher during the period most focused on preparing for the two-part state test in
February and April, went to the textbook for 57.5% of her problems, with 23.9% coming from teacher–assembled materials or trade books, 10.5% from online sources, and 8.2% coming from PARCC and other standardized test practice material.

Looking at problems across cognitive demand levels. The cognitive demand of individual problems was coded using the methods described in Chapter 3. Table 4.4 shows the distribution of codes for problems selected by Mrs. Porter and Ms. Miller over the course of the year. The first three codes—1A1, 2A2, and 2B2, which applied to the vast majority of problems (87.9%)—are considered low-demand tasks.

Table 4.4
Portland: Total Problems by Cognitive Demand Code

<table>
<thead>
<tr>
<th>Teacher</th>
<th>Problems</th>
<th>1A1</th>
<th>2A2</th>
<th>2B2</th>
<th>3B3</th>
<th>3C3</th>
<th>3C4</th>
<th>4C3</th>
<th>4C4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Porter</td>
<td>1,487</td>
<td>108</td>
<td>532</td>
<td>690</td>
<td>114</td>
<td>32</td>
<td>9</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>percent</td>
<td></td>
<td>7.3</td>
<td>35.8</td>
<td>46.4</td>
<td>7.7</td>
<td>2.2</td>
<td>0.6</td>
<td>0</td>
<td>0.1</td>
</tr>
<tr>
<td>Miller</td>
<td>784</td>
<td>87</td>
<td>292</td>
<td>287</td>
<td>101</td>
<td>14</td>
<td>3</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>percent</td>
<td></td>
<td>11.1</td>
<td>37.2</td>
<td>36.6</td>
<td>12.9</td>
<td>1.8</td>
<td>0.4</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>TOTAL</td>
<td>2,271</td>
<td>195</td>
<td>824</td>
<td>977</td>
<td>215</td>
<td>46</td>
<td>12</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>percent</td>
<td></td>
<td>8.6</td>
<td>36.3</td>
<td>43.0</td>
<td>9.5</td>
<td>2.0</td>
<td>0.5</td>
<td>0</td>
<td>0.1</td>
</tr>
</tbody>
</table>

There are a few differences between the two teachers. Ms. Miller assigned simple recall problems (1A1) at a rate of 11.1% of all problems, compared to Mrs. Porter’s 7.3%. On the other hand, Ms. Miller was somewhat more likely than her mentor to assign
a high-demand problem (3B3 or greater—15.1% of her problems compared to Mrs. Porter’s 10.6%); and less likely than her mentor to assign routine computations or word problems (2A2 or 2B2—73.8% of her problems compared to Mrs. Porter’s 82.2%). Or put another way, under Ms. Miller students averaged about one high-demand problem for every six low-demand problems, while under Mrs. Porter they averaged one high-demand problem for every nine low-demand problems.

Table 4.5

*Portland: Teachers' Choice of High-demand Problems by Source*

<table>
<thead>
<tr>
<th>Teacher</th>
<th>Source</th>
<th>Problems</th>
<th>High-demand</th>
<th>Pct high-demand</th>
</tr>
</thead>
<tbody>
<tr>
<td>Porter (first 6 wks)</td>
<td>Text</td>
<td>643</td>
<td>44</td>
<td>6.8</td>
</tr>
<tr>
<td></td>
<td>Other</td>
<td>126</td>
<td>12</td>
<td>9.5</td>
</tr>
<tr>
<td>Porter (later wks)</td>
<td>Text</td>
<td>151</td>
<td>53</td>
<td>35.1</td>
</tr>
<tr>
<td></td>
<td>Other</td>
<td>567</td>
<td>48</td>
<td>8.5</td>
</tr>
<tr>
<td>Miller (12 wks)</td>
<td>Text</td>
<td>451</td>
<td>7</td>
<td>1.6</td>
</tr>
<tr>
<td></td>
<td>Other</td>
<td>333</td>
<td>111</td>
<td>33.3</td>
</tr>
<tr>
<td>Portland Total</td>
<td>Text</td>
<td>1245</td>
<td>104</td>
<td>8.4</td>
</tr>
<tr>
<td></td>
<td>Other</td>
<td>1026</td>
<td>171</td>
<td>16.7</td>
</tr>
</tbody>
</table>

The difference between the teachers is more striking if we look at the sources of the high-demand problems. As Table 4.5 shows, even though Mrs. Porter reduced her use of the textbook after the first six weeks, using it for only 21% of problems (see Table
4.3 above), when she did go to the text, she assigned a very high proportion (35.1%) of high-demand problems. Ms. Miller, on the other hand, used the textbook problems at a significantly higher rate (57.5% of assigned problems), but rarely used the textbook for high-demand problems (only 1.6% of assigned problems). Instead, she found such problems in online sources, or in Mrs. Porter’s file of problems and old testing items.

**Looking at problems across the Standards.** The year this study took place was to be the first year that the state testing would be fully aligned with the Common Core State Standards for Mathematics (2012). The new textbook that Mrs. Porter and Ms. Miller used (Bennett et al., 2012) was chosen on the assumption that it aligned with the new standards, and so would prepare students for the new tests. In this section, I compare the characteristics of the problems students were assigned to those of the problems provided by the textbook (including its supplemental materials). This comparison does not take the entire school year into account. Instead, I used those standards identified by the PARCC testing consortium as “major content” (PARCC, 2014, pp. 48–49), which consisted of all the standards for the domains of *Ratio & Proportion* (7.RP.1–5), *Number System* (7.NS.1–3), and *Expressions & Equations* (7.EE.1–4). I matched the standards in each of these three domains to lessons in the textbook, using its alignment chart (Bennett et al., 2012, pp. cc1–cc5), then selected roughly half the lessons aligned with each domain, in order to sample the teaching year from September to April (the end of testing), including sets of lessons taught by each teacher. A more detailed discussion of the method used is given in Chapter 3 above.
Table 4.6

*Portland: Emphasis on Major Content Standards by Teachers and by Textbook*

<table>
<thead>
<tr>
<th>Teacher</th>
<th>Number Sense</th>
<th></th>
<th>Ratio &amp; Proportion</th>
<th></th>
<th>Expressions &amp; Equation</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Porter</td>
<td>416</td>
<td>42.2</td>
<td>549</td>
<td>55.7</td>
<td>21</td>
<td>2.1</td>
</tr>
<tr>
<td>Miller</td>
<td>0</td>
<td>0.0</td>
<td>28</td>
<td>13.8</td>
<td>175</td>
<td>86.2</td>
</tr>
<tr>
<td>Portland</td>
<td>416</td>
<td>35.0</td>
<td>577</td>
<td>48.5</td>
<td>196</td>
<td>16.5</td>
</tr>
<tr>
<td>Textbook</td>
<td>190</td>
<td>7.9</td>
<td>1292</td>
<td>53.7</td>
<td>923</td>
<td>38.6</td>
</tr>
</tbody>
</table>

Table 4.6 shows how the teachers’ selection of problems matched the emphases of the textbook in each of the three domains identified as “major.” The number of problems given for the textbook includes all exercises in each lesson of the textbook, plus all the exercises on two practice pages from the textbook’s supplementary materials. This is of course considerably more than what a teacher following the textbook would assign in the 45–minute periods by which the textbook’s sequencing is structured. What is important is not the number of problems, but the relative proportion of problems targeted at each domain. What is most striking is the disproportion between Mrs. Porter’s work on the major standards and Ms. Miller’s. The interview data will make it clear that this was intentional: Mrs. Porter structured the sequence of work in the fall, both while using the text and de-emphasizing it, to focus her instruction on ratio and proportion (the RP domain) and work with rational numbers (the NS domain), which she saw as the major emphases of the standards. Over the course of the school year, the Portland teachers
devoted a significantly smaller proportion of problems (16.8% compared to the textbook’s 38.6%) to Expressions and Equations, and significantly greater proportion (35% compared to the textbook’s 7.9%) to the Number System. It should be kept in mind that these figures are based on a sample of about 50% of the textbook material devoted to the “major content”: a different sample would yield somewhat different percentages, but given the size of the sample I used, the differences in emphasis would not be likely to disappear.

**Summary of the data on mathematical tasks.** I coded the 130 sets of mathematical tasks, totaling 2,271 individual problems, by date, teacher, source, cognitive demand, and alignment with both the textbook arrangement of topics, and the state standards that were to be tested in the late winter and early spring of 2015. There are two obvious time–related variations in the tasks that students were assigned: a change in the lead teacher, and a change in use of the textbook. Mrs. Porter acted as lead teacher up to the December break; the week after returning to school, Ms. Miller assumed the lead until late April, when Mrs. Porter resumed responsibility for instruction. In addition, a decision was made in mid–October to de-emphasize the textbook as a source of problems. Looking at differences over these time periods, we found that Ms. Miller averaged slightly more problems per day—18.4 problems compared to 15.8 for Mrs. Porter—and had students doing problem solving for slightly longer each 65–minute period—an average of 57.1 minutes, compared to Mrs. Porter’s 46.3 minutes. One possible explanation for this small difference was timing: Ms. Miller was in charge of
instruction during the weeks before the two parts of the new state tests, when test practice was being most emphasized.

During the first six weeks of the research, the textbook was the main source of student work, with 83.6% of problems coming from that source. When the text was de-emphasized, the shift was most dramatic for Mrs. Porter, who used it for just 21% of problems over the remaining 16 weeks she was in charge. Her major sources of problems were online (38.2% of problems) and in her own files of previously used materials (31.5% of problems). Ms. Miller, on the other hand, still used the textbook as a major source of work during her 12 weeks of teaching, drawing 57.5% of problems from it. Her next most common problem sources were Mrs. Porter’s files (23.1%) and online (15.7%).

Examining the distribution of problems based on the coding for cognitive demand, we found that under Ms. Miller students averaged about one high-demand problem for every six low-demand problems, while under Mrs. Porter they averaged one high-demand problem for every nine low-demand problems. A more obvious difference appeared in examining the source of high-demand problems. Even though Mrs. Porter reduced her use of the textbook after the first six weeks, using it for only 21% of problems, when she did go to the text, she assigned a very high proportion (35.1% of assignments) of high-demand problems. Ms. Miller, on the other hand, used the textbook problems at a significantly higher rate (57.5% of all assigned problems), but rarely used the textbook for high-demand problems (only 1.6% of assigned textbook problems). Instead, she used online sources, Mrs. Porter’s file of problems, and old testing items as sources of high-demand problems.
Finally, comparing the teachers’ emphases to those of the textbook on what the testing consortium defined as the “major standards” for seventh grade, we found that together, the Portland teachers devoted fewer problems to standards in the Expressions and Equations domain (7.EE.1–4): 16% of Portland problems, compared to 38.6% of textbook problems. On the other hand, they devoted more problems to standards in the Number Sense domain (7.NS.1–3): 34%, compared to 7.9% of textbook problems. The percentages here are of matched sets of lessons addressed to a subset of the standards in each of the three domains, thus of a sample of the range of major standards. A different sample would yield somewhat different percentages, but given the sample size (about 50% of the lessons addressed to major standards), the differences in emphasis would be unlikely to change.

**Portland PARCC Test Scores**

In 2015, the PARCC series of tests was administered in all the schools in the state, including Portland. The test was administered in two parts: a Performance Based Assessment (PBA) emphasizing constructed response items, given in late February and early March; and the End of Year assessment (EOY) with a mix of multiple choice and constructed response items, given in April. Because not all school districts in the state had the communication bandwidth necessary for online test administration, schools were permitted to choose traditional paper-and-pencil examinations, as Portland did.

The test, like the Common Core State Standards (2012), was new to the Portland teachers. During the 2014-2015 school year, there was much uncertainty regarding both the test content and the format. As a result, teachers did not initially have very high
expectations for their students’ test results. For the purposes of this study, the spring 2015 test scores—finally made available to teachers a few days before the 2015 December break—were not a measure of teacher or student success. The focus is rather on how teachers’ reactions to the scores affected their orientation toward their curriculum work. Here I briefly lay the groundwork for exploring this by detailing the testing results.

Teachers received results in two formats. The first was a list of students with their scores, scaled from 650 to 850. For Portland’s seventh graders, the high score was 776, the low score was 683, with a median of 725 and an interquartile range of 25 points. The mean of the scores was 728, compared to the state mean of 736 and the national mean across all PARCC states of 734.

The second format was a chart-like report dividing both the school’s and the state’s seventh grade mathematics scores into five color-coded bands, labeled Did Not Meet, Partially Met, Approached, Met, and Exceeded. The cut scores for the five bands were determined at the 27–state consortium level by PARCC, but each state was left free to apply its local accountability levels to the score bands. In Portland’s state, the level marked Approached was mapped to the local designation of Proficient, the level at which a student is considered to have “passed” for accountability purposes. In Portland’s seventh grade, 54% of students reached that level, compared to the 62.5% who had reached Proficient on the previous test in 2014, and the mean of 58.5% proficient over the previous five years.

This second report also provided four three-band scales (Below, Nearly Meets, and Meets or Exceeds) for four subscores: Major Content, Supporting Content,
Reasoning, and Modeling. No indication was given on the reporting form for mapping these subscores to specific mathematics standards or practices, though this information could be found at the time on the PARCC website (PARCC, 2014, 2015). At the time of the interviews, the teachers did not have a clear idea of their meaning.

Table 4.7

Portland: Percent of Students Reaching PARCC Proficiency Levels, by Subscore

<table>
<thead>
<tr>
<th>Subscore:</th>
<th>Below</th>
<th>Nearly Meets</th>
<th>Meets/Exceeds</th>
</tr>
</thead>
<tbody>
<tr>
<td>Major Content</td>
<td>39 (33)</td>
<td>46 (35)</td>
<td>15 (33)</td>
</tr>
<tr>
<td>Supporting Content</td>
<td>26 (24)</td>
<td>44 (33)</td>
<td>29 (43)</td>
</tr>
<tr>
<td>Reasoning</td>
<td>50 (32)</td>
<td>32 (31)</td>
<td>18 (37)</td>
</tr>
<tr>
<td>Modeling</td>
<td>58 (43)</td>
<td>15 (22)</td>
<td>26 (35)</td>
</tr>
</tbody>
</table>

Note: Numbers in parentheses are state Grade 7 percentages.

*Major Content* for Grade 7 was defined by the PARCC consortium as consisting of all ten standards (with their sub-standards) for *Ratio & Proportional Relationships* (7.RP, three standards), *The Number System* (7.NS, three standards), and *Expressions & Equations* (7.EE, four standards). *Supporting Content* was defined to include two of the three stems (including six of the eight standards) under *Statistics & Probability* (7.SP): “Use random sampling to draw inferences about a population” (Standards 7.SP.1-2) and “Investigate chance processes and develop, use, and evaluate probability models” (Standards 7.SP.5-8) (Common Core State Standards, 2012, pp. 48–51; PARCC, 2014,
pp. 33–34). The Reasoning subscale assessed Mathematical Practices MP3, “Construct viable arguments, and critique the arguments of others,” and MP6, “Attend to precision” (Common Core State Standards, 2012). The Modeling subscale, while it addressed Mathematical Practice MP4, “Model with mathematics,” was defined to include all six of the Mathematical Practices not addressed by the Reasoning subscale (PARCC, 2014, p. 38). Neither Mrs. Porter nor Ms. Miller was aware of these definitions. Table 4.7 shows the results for all four subscores. Numbers in parentheses are the comparable percentages for all seventh graders in the state.

**Portland Planning Meetings and Interviews**

**The planning and interview data.** The recording of Mrs. Porter’s planning sessions with Ms. Miller did not go well. In the period before the December holiday, a combination of technical issues with the recorder and external demands on their time (their common planning period was also the only time allotted for grade level meetings, IEP meetings, and meetings with administrators) prevented the recording of the few, brief sessions they did have:

> We have never recorded a single session. You know, we have got this new behavior system [involving all Grade 7 teachers], and it tends to take up our entire planning. And it is, like, every time I think, “OK, today Meg and I are going to plan,” we have to go to do this, and we have got to do that—and that is what happened almost every time. (Roberta White interview, November 18, 2014)

The dilemma was exacerbated by conflicting after-school time demands: Ms. Miller’s university schedule required her to leave at dismissal on both of the days she was at
Portland in the first semester; Mrs. Porter worked in an afterschool program each day. When school resumed in January, bad weather—which forced nine closures and several two–hour delays in the first five weeks back—impacted the time free for planning.

In February, they finally recorded two planning sessions in two successive weeks. I look at a couple of exchanges from these sessions below, but they offer little useful discourse, because the two teachers were self-consciously speaking to the microphone, narrating their actions as they turned pages, looked in file cabinets, or searched online. This was perhaps inevitable when first recording. I had hoped that, as the novelty wore off, they would relax into speaking less self-consciously, and perhaps that would have been the case. However, by the end of February the first round of state testing had begun, other demands on their common planning time had not abated, and there were no more recording attempts. That did not mean that no time was spent planning. As Ms. Miller described their shared planning period in the second semester,

We met almost every day during planning, so we would sit there and just talk. I think that is why we do not have a lot of recordings, because it would just happen that we would start planning, but then we would get so into it that we would not be recording? ... We did look at the book, and see, like, what standards we were going to meet, and where we were going to go next. I had my computer open, she had her computer open, and we would be looking through stuff, and then if we could not find anything, we would be, “OK, well, we need to have a lesson on this for Wednesday, let me know what you find next day.” (Meg Miller interview, May 6, 2015)
I refer to the recordings of these two sessions along with the interview transcripts below, but the interview data became by far the more important source in identifying and articulating the two teachers’ curriculum strategies.

The original plan, as detailed in Chapter 3, was to collect a pair of semi-structured interviews for each teacher, one at the beginning of the school year, the other after the state test scores had been reported. Because of the difficulty in getting recordings of planning sessions, the two meetings with teachers in November and February, which had been meant to clarify and discuss the planning, became extended interviews focused on the assigned work and how assignment decisions were made. Mrs. Porter and Ms. Miller were interviewed separately each time. In addition, when it became obvious in the spring of 2015 that there would be a long delay in reporting the results of testing that had concluded in mid-April, I split the final semi-structured interview into two parts. The first of these, focused on the experience of the year, and first impressions of the state testing, I moved up to early May, as the school year was ending (and a week after Ms. Miller had graduated). The second took place in mid-February of 2016, the earliest interview dates I could arrange after test scores were released to teachers the preceding December. In Ms. Miller’s case, the final interview was further split into two parts. I had wanted her reaction to the performance of individual students she had taught, but was unable to provide her with the student data in advance of our interview. When she had had a chance to review the scores, she responded to written questions, and I appended that document to the transcript of her May 6 interview.
In summary, this part of the data consists of the transcripts of ten recorded interviews and two planning sessions, totaling nearly six and a half hours. All interviews were transcribed and checked for accuracy against the digital recordings. I did not code the transcripts in the usual sense in which that term is applied to text analysis. Instead, each transcript was examined for rhetorical patterns using an approach based on the rhetorical theories of Kenneth Burke, as discussed in Chapter 3. Along with the resulting patterns, and the interpretation I give them, I provide excerpts from the transcripts for context in the following discussion.

**Textbook problems and student engagement.** The most striking feature in the assignment data is the abrupt shift after October 16 in the use of the new textbook Mrs. Porter was using. Here is how she describes the change:

Well, quite honestly, my principal was in here, and he told me that we were relying far too heavily on the textbook. And we have used it very little since.

(Roberta Porter interview, November 18, 2014)

Ms. Miller recalled the shift in a similar way three months later:

I think Mr. Roberts came in at the beginning of the year and decided that he did not like the way the classroom was structured around just bookwork? And so Roberta has been trying to incorporate different activities in there, so they are not just learning from bookwork. (Meg Miller interview, February 13, 2015)

I will return to Ms. Miller’s opposition of (good) “activities” to (bad) “bookwork” below, as this was a key attitude early in her internship (although, as I will show, a conflicted one). The move away from the textbook, however, was not a simple matter of
an administrator “not liking” the teacher’s use of the textbook. The textbook itself had just been purchased, and new texts from the same publisher, aligned with the Common Core standards, were newly in use in grades 7-12 at Portland. And, as the alacrity with which she made the shift suggests, Mrs. Porter was not wedded to the use of a textbook:

I hop in and out [of the textbook] all the time ... If I go, “I do not like the way the textbook does that,” I look to the resources I have on my shelf. If I don’t find anything that matches with the new Common Core, I go online. (Roberta Porter interview, September 3, 2014)

Although the shift was initiated at Mr. Roberts’ request, it was made to bring classroom instruction more in line with the Portland district’s new standards for teaching and learning, as Mrs. Porter explained a month after the switch:

It is all about helping kids connect with the material at their level, and finding more authentic ways of having them engage with the curriculum. And going through the textbook just does not do that. I am not sure there is a textbook out there that would be able to do that. Now I do use a lot of hands-on labs that are in there, because I think they are really pretty well set up. But I am just not sure that it gets to the principle. We have new standards and principles, operating standards, for our district, and it is all about being child-centered, and engaging the child. And using a textbook just does not do that. (Roberta Porter interview, November 18, 2014)

To understand what Mrs. Porter meant by “helping kids connect with the material at their level,” it is helpful to look at one of her classroom routines: the weekly “rich
problem.” Every Monday, she introduced a problem with no obvious solution path, such as the Egg Problem:

A man accidentally bumped into a woman at the market, causing her to spill her basket of eggs. “I’ll replace them,” he offered. “How many were there?” The woman replied, “I don’t recall. But I know that if I took them out of the basket in groups of 2, 3, 4, 5, or 6, there was always one left over. But when I took them out in groups of 7, the basket was empty.” What is the smallest number of eggs that could have been in the basket? (Assignment for October 20–24, 2014)

Students were given ten minutes in pairs to think about ways of approaching the problem on Monday, and on each subsequent day. On Friday, students were asked to turn in individual attempts at solutions: they received five points for an attempt showing work, and an additional five for a successful solution. In some weeks, as with this problem, no solutions were found, and work on the problem was continued for a second week. Mrs. Porter chose these problems because there are multiple entry points, no matter where a kid is they should be able to come up with a starting point. And for most of them, they can come up with a solution that doesn’t work, and you can kind of steer them into a kind of direction that meshes with the way they learn and the way they think, and help them connect with what they know and can do, so they can solve the problem. (Roberta Porter interview, September 3, 2014)
What makes the problem “rich” for Mrs. Porter is not the kinds of mathematical thinking it leads to, but where that thinking begins: any student “should be able to come up with a starting point.”

**Teacher attitudes and student learning: Mrs. Porter.** Mrs. Porter’s use of “rich problems” was a curriculum strategy expressing related attitudes toward her students and her role as their teacher. Asked how well she expected the Portland district to perform on the upcoming state tests, she observed:

> We have a large poverty—and we’re all—there’s a lot of kids that do well, or kids that do not do well in school, based on the educational level of the parents, especially the mother. And we’re also dealing with children who are not fortunate enough to be in print-rich environments when they are young, so they are not reading, they are not read to. So we know that these kids pretty much start out behind the eight-ball. And they are not all in that classification, but many, many of them are. So we know that our students are not going to perform well. (Roberta Porter interview, February 13, 2015)

For Mrs. Porter, “performing well” as measured by the state’s resting program is rooted in life experiences many of her students do not have: they are “behind the eight-ball.” That they will not do well is simply a part of her “instructional reality” (McClain, Zhao, Visnovska, & Bowen, 2009), something “we know.” Confronting this expectation, she described her own role this way:

> That is my job over the next couple of weeks, saying, “Look at this, we have got this, we are so prepared for this!” Knowing full well that going into this, they are
not going to do well on it. Our students historically do not do well on standardized tests. (Roberta Porter interview, February 13, 2015)

In the context of the state test, her strategic focus was on building her students’ confidence, rather than their competence.

It is important to underscore that this focus was in the particular context of the run-up to the state tests, which were not seen as important at Portland:

Our district has never been all about the test. In fact, our leadership doesn’t believe that those tests—one snapshot is a true measure of what our kids are capable of doing, so that has never been a real focus for us. (Roberta Porter interview, May 8, 2015)

This attitude—as—strategy, which can be summarized by the proverb “confidence before competence,” was both a way of “naming” and of responding to this context.

By February 2015, Mrs. Porter could see that the Portland district’s plan to transition to the new standards was benefitting her:

Since the elementaries did a better job, actually, of transitioning to the Common Core, [students] are a little more ready for the rigors of what we expect than I thought they would be. We still see a lot of them expecting you to feed them things, to kind of spoon feed it to them. But they were easier to wean off that expectation this year. (Roberta Porter interview, February 13, 2015)

As we have seen, the “rigors of what we expect” are not focused on the state test scores. Mrs. Porter has a clear idea of what she wants her students to learn to do: she wants them to learn to “grapple” with problems.
They come to me, and they have a math phobia, or a total disdain for it. And I’m hoping that the way we approach math, and help each kid find some success, is that I help them to dislike math a little less, and enjoy it a little more, and be intrigued by it, because sometimes I think our kids have lost their sense of wonder. They live in a society where immediate gratification is what they are seeking, and they’re really not good at grappling with things. So when you watch a kid grapple—that’s the word we like to use—and they finally click, you get excited. (Roberta Porter interview, September 3, 2014)

This grappling is what she had enjoyed as an undergraduate, debugging her computer programs, and what made the local Math Circle meetings rewarding for her. In our February interview, she identified it with the Common Core’s (2012, p. 6) first Mathematical Practice: “Make sense of problems and persevere in solving them.”

She had instituted a variety of class activities to help her students be successful at grappling: her weekly “rich problems”; her “flipped classroom” assignments; projects that required students to explain to the class how a procedure worked or a problem was solved. Most of these had a group aspect: She wanted her students working together, though she found groups larger than three unproductive. Ms. Miller observed Mrs. Porter’s facility at getting groups to work:

She does a great job of pairing the students, I feel like? At each table she would give, like, a really exceptional [student], like probably just fly through it, but she knows this kid will help another student if they are struggling? And there is, like—she will kind of pair them together, and really work with, like thinking
about the groupings that they have at each table. (Meg Miller interview, November 19, 2014)

We see here one reason for grouping: to create more opportunities for student talk related to the problem at hand. A second reason is apparent in this anecdote from September:

I had a young man come up to me and say, “Mrs. Porter, I don’t get this one at all!” And he is one of my identified kids, and one of my lower identified kids. And I said, “You know what, sir? Let’s not worry about this today. Tomorrow, you come to study table during afternoon Home Base, and we will talk about it, and you can bring a buddy with you.” Because these kids don’t like to be singled out, they don’t like people seeing, “Well, I don’t know how to do it.” So for extra help, bring a buddy, we’ll just make it a group of us. (Roberta Porter interview, September 3, 2014)

Groups provide “cover”: the “group of us” can grapple where an individual might be embarrassed or overwhelmed.

When we looked at the cognitive demand of assigned problems, we saw that once the textbook was reduced to one among several sources of problems, Mrs. Porter and Ms. Miller chose to assign high-demand (3B3 or higher) problems at comparable rates of between 14% and 15% of all problems assigned. But Mrs. Porter, who assigned only 21% of problems from the textbook during that period, assigned high-demand textbook problems at a much higher rate—53 of 151 assigned textbook problems were high-demand, or 35%—than did Ms. Miller, who assigned seven high-demand problems out of 451 textbook problems, a rate of 1.6%.
One source of the discrepancy came from Mrs. Porter’s assignment of “text activity guides”: pre-formatted worksheets that provided scaffolding for students’ note-taking, sometimes in class, and sometimes as a “flipped” assignment (though these, too were ordinarily begun in class). These assignments, in addition to requiring students to define vocabulary and identify major ideas in the lesson, usually included answering the reflective questions the textbook provided. These were often questions with high cognitive demand, requiring explanations, or extensions of patterns. In other words, even though she was willing to depart from it in order to provide exercises and activities, she found the textbook useful for requiring her students to “grapple,” at least a little, with the lesson’s conceptual content.

The text activity guides were not the only scaffolding Mrs. Porter supplied to assist students’ grappling. For example, she used an extended problem requiring students to find a “best pizza deal” (Walch, 2012, pp. 1–7) by calculating unit rates for toppings on pizzas of several sizes as one of her measures for the Student Learning Objectives that were a part of the teacher evaluation program at Portland. The first time she assigned it, at the beginning of the school year, she found that students were too confused by the organizational challenges of the problem to focus on the computations they would need in the first of its two parts: it took two days for the class to be successful on the first, more computational part of the problem, so they did not get to grapple with the more challenging second part. Mrs. Porter addressed that in December, when they tackled the problem a second time, by providing a tabular organizer for the unit rate calculations of the first part. This time the class got through both parts successfully: “So creating that
kind of organizer helped them significantly with that” (Roberta Porter interview, February 13, 2015). This kind of scaffolding was important if students were to struggle with problems: “confidence before competence”

When Mrs. Porter’s teaching did focus on competence, she had a particular attitude toward her work as a teacher. “I really do enjoy the process of working with a kid, and finding out where that one little piece is missing” (Roberta Porter interview, September 3, 2014). She echoes this language later in talking about Ms. Miller’s development in leading the class:

[Sometimes] I will kind of take over, but just the little pieces that you learn from being in the classroom for ten or fifteen years, that you know they are going to need, and they probably are not going to get. And that will come with time for her. (Roberta Porter interview, February 13, 2015)

These “little pieces” are what she listens for as she works with students (and her student teacher):

It is really giving me the opportunity to say, “OK, I see a few issues here, let’s talk this through.” And rather than me saying, “This is what you need to do,” I have them explain to me how they approached it. Because usually, they start out OK, and then somewhere down around here they turn left when they should have turned right. So it is just a matter of fixing little things.” (Roberta Porter interview, February 13, 2015)

This talk of finding and fixing “little things” also suggests the “debugging” work she recalled enjoying so much in her undergraduate computer science work.
A third way that her attitude toward student learning impacts her curriculum choices involves timing. Some of her decisions about when a topic is studied are influenced by factors external to the classroom. For example, she does not like to introduce geometry in January:

I try to avoid something so in-depth in January, February, because we have such a sporadic schedule, due to weather. And in the past, they have not received a formula sheet in geometry [for use on the state test], they have had to know the formulas. So I have always wanted that freshest on their minds. (Roberta Porter interview, February 13, 2015)

What made geometry so “in-depth” was that the testing of it involved memorization of many formulas (“they have not received a formula sheet”): formulas she wanted to be “freshest” when test time came.

The strategy of “refreshing” came up for Mrs. Porter at many places in the interview: with the geometry, as we have just seen; with the constructed-response questions used for practice before the PARCC testing sessions; with the return in the last weeks, when testing was done, to integer operations that she wanted “refreshed” before they moved on to eighth grade.

An image of mathematical learning emerges: students become engaged by “grappling” with mathematical tasks. In order for students to maintain the confidence needed to grapple with the problem, tasks must have multiple ways in, and students’ grappling may need scaffolding to simplify some aspects of the problem (as the blank table scaffolded the organization of data in the pizza problem) in order to maintain
confidence in grappling with other aspects. The problems that teachers supply are “typical”; within each type is a pattern of linked relations of quantities, in which one wrong or missing relation obscures the whole pattern. A teacher’s work is to attend to the student’s articulation of the pattern, and to “put her finger” on that one relation, as a part of supporting students’ persistence. What a student achieves through this process of solving a problem, beyond increased confidence in his or her own ability to grapple, is the recognition of a problem type: “I have been here before. I know my way through this.”

**Student learning and curriculum: Ms. Miller.** This contrasts with Ms. Miller’s nascent attitude in February 2015 of her teaching in relation to student understanding:

It seems as if, if they get confused, they kind of shut down. So it is making sure that I explain it well enough that everybody will understand it. (Meg Miller interview, February 13, 2015)

Ms. Miller understood that students learn differently. She expanded on “explain it well enough” by substituting “explain it in different ways, so they all can get it” (Meg Miller interview, February 13, 2015). But the underlying image is of teaching as transmitting: students do not know until they receive an explanation they can understand, and the role of the teacher is to come up with a variety of effective explanations.

The contrast between Mrs. Porter’s “listen for that little piece” and Ms. Miller’s “explain it different ways” is not between a right and a wrong, or a novice and an expert, attitude toward student knowledge and the role of the teacher. Both attitudes encapsulate “equipments for teaching,” to adapt a central phrase of Burke’s: both are attitudes-as-
strategies that come into play in effective classroom teaching. What distinguishes the more expert teacher’s attitudes is that they are more appropriately bound to contexts: she recognizes which situations call for “listening for that little piece,” and which for “explaining it different ways.” Both attitudes are a part of the experienced teacher’s “equipment.” But the novice, despite her skill at explaining, may find herself explaining one more way, when it would be more effective to be “listening for that little piece.”

To summarize what I have been doing here: according to Burke (1954, 1969a), attitudes are strategies, ways of addressing particular situations that arise in the classroom. And attitudes “name” the situations they address: in “listening for that little piece,” Mrs. Porter is recognizing a particular situation. The recognition and the response are two sides of the same attitude. A skilled teacher’s “equipment for teaching” is made up of the multiple attitudes that come into play as she works. It is not the number of available of attitudes-as-strategies that distinguishes the expert, but the aptness of each attitude to its situation: the teacher’s strategies, and her discerning of the situation to which each applies, are, again, the two sides of the same attitude. To say what a situation is, is to say how to deal with it successfully: to the extent I do not know how to respond effectively, I do not know what the situation is. This understanding of attitude and action is squarely in the pragmatist tradition (e.g. Dewey, 1983; Mead, 1956).

However, the attitudes with which I have so far concerned myself belong to the context of instruction, rather than that of curriculum. The two contexts are intimately related: my attitude toward instruction will shape (and be shaped by) my attitudes toward
choosing instructional materials. I illustrate the relation by turning to an apparent conflict in Ms. Miller’s attitudes at the beginning of the school year.

The assignment data I reviewed earlier shows that Mrs. Porter averaged 46.3 minutes a day on assigned problems sets averaging 15.5 problems, while Ms. Miller averaged 57.1 minutes a day on assigned problem sets averaging 18.2 problems, almost a quarter more time (23.3%), and a sixth more problems (17.4%) than her mentor. This does not mean that Ms. Miller’s attitude toward “seat work” was more favorable than Mrs. Porter’s. In September, as her internship began, she described her attitude to student work this way:

Every time I’ve ever planned a lesson, I’ve always tried to do something where they’re not just sitting there? I’d open the lesson with something that relates to their lives, then give them an activity to do in little groups, or one-on-one, and have them do an activity with the mathematics? Because a lot of students, they just don’t see—they kind of sit there and do problem after problem, and so I’ve kind of—I’d like to—that’s going to be impossible for every lesson, but for maybe a few times a week, for the lessons to get them out of their seats and get them doing something exciting, so that they really do enjoy mathematics. (Meg Miler interview, September 3, 2014)

Ms. Miller wanted her lessons to “excite” her students, to “relate to their lives,” to be something they can “enjoy,” and she cast “sitting there” and “doing problem after problem” as the opposite of that. But she also said that teaching like that “is going to be impossible for every lesson.” Why it should be impossible she did not yet clearly
articulate. In Burke’s (1954) terms, this is a paradox of the “essential”: for Ms. Miller, good learning situations are *essentially* active, which, translated, means both that they *are* active, the opposite of “seat work,” and that they are *not* (cannot always be in fact) active. Such paradoxes, Burke argues, point to places where the vocabulary of an attitude “ceases to have the basis which is claimed for it” (Burke, 1969a, p. 59). Otherwise put, Ms. Miller, at this early stage, had an attitude toward learning situations that did not quite fit her own experiences of them. As with “listening for little pieces” and “varying explanations,” beneath the apparent conflict is a variation in context, to which Ms. Miller was not yet sensitive. By November, she had planned and taught more often, and her attitude had shifted somewhat:

> It is kind of fun to be able to really work with these real-life problems that they can relate to. Like, I did a lesson the other day, it was a “Who likes to go shopping?” And everybody raised their hand. And it was a lesson, basically—I think she might have showed it to you—where there are all these different items, and it was everybody’s birthday, and they got $240, but they could not go over it. So they had to—like, each item had a percentage, it was like 20% off, 45% off each item, so they had to find the discounted price, and basically go shopping. And everybody’s was different. So, like, I think that is a lot better than going, “OK, 20% of 45, 30% of 50.” Like in the book. Over and over. (Meg Miller interview, November 19, 2014)

There was still the attitude that the activity should be exciting—“everybody raised their hand”—but we notice that what the students were actually asked to do was to solve sets
of straightforward “percent problems,” the kind of “book work” that was earlier boring (“Like in the book. Over and over”). What made this work exciting was that “everybody’s was different.” The result was “a lot better” than just assigning percent problems: “They are kind of secretly learning” (Meg Miller interview, November 19, 2014).

The “secret,” if we consider this image, was that students were learning. Learning, as Ms. Miller sees it, is work, and the work involves a certain amount of unavoidable repetition, which learners find boring. But the repetition can be disguised if the context for doing the work engages students, as the shopping exercise did: they will practice without feeling bored, and so “secretly” learn. This was a new attitude toward the task of the teacher that resolved the earlier conflict. It was no longer that “good lessons are exciting” (because they engage students) and at the same time “good lessons cannot always be exciting” (because students need to practice new skills): now “good lessons engage students in practice.” The textbook itself, as context (“just the book. Over and over”) was now deprecated, while the teacher could make the set of percent problems, which had earlier been cast as boring, “engaging in practice” by making room for student choices within the problem set. In addition to “varying explanations” so students understand, she has added “engaging students in practice” to her equipment.

While that resolved the naive paradox of good lessons as both essentially active and not always active, there was another apparent conflict to resolve. Mrs. Porter, using the new Common Core–aligned textbook, began the year drawing 85% of the problems she assigned from the text. She shifted abruptly after mid–October, using it for only 21%
of assigned problems, in order to better fit instruction to the Portland district’s new principles for teaching and learning. Ms. Miller, on the other hand, despite an attitude toward teaching and learning that deprecated the assignment of sets of textbook problems, drew on the textbook for somewhat over half (57%) of her assigned problems from January through April, when she was in charge of daily instruction.

To understand why Ms. Miller, whose attitude predisposed her *not* to use textbook problem sets, nevertheless used them at nearly three times the rate of her mentor—why, that is, her curricular strategy seems at odds with her instructional strategy—it is useful to observe her changing understandings of both curriculum and planning. Prior to her clinical internship, she had participated in an optional program, which placed her in Portland classrooms for two years as an observer and occasional student teacher.

I was in the Portland high school [in the 2013–2014 school year], then there were so many of us in [the program] and so we all wanted to be with an individual teacher who we wanted to student teach and do our internship with. And so I was, “Oh, I’ll just try seventh grade,” because everybody else already had their placements? So I sat through that classroom for a few weeks and decided, “So this is what I want to do.” (Meg Miller interview, September 3, 2014)

The classroom she had chosen was Mrs. Porter’s, where another student teacher was already doing her clinical internship.

By choosing the program, Ms. Miller was allowed to take alternatives to some mid-level education courses, including the one devoted to curriculum and planning. She saw this as an advantage:
I’ve heard lots of stuff from the normal program, the 2000-level block. It was just a lot of busywork: twenty-page lesson plans, and—I’ve never written a twenty-page lesson plan. My main thought of it is, you’re not going to have time every day to write a twenty-page lesson plan. So I had the experience in the classroom while they were all writing twenty-page lesson plans. So I feel like I kind of had the better end of the stick. (Meg Miller interview, September 3, 2014)

What Ms. Miller had missed in terms of her ability to think about curriculum or planning was obvious in her first interview. I had asked about planning, and she observed that having a plan was good, but that it would inevitably change in response to the day’s classroom events:

JT: All right, so given that it continuously changes, there’s still some preparation that goes on, either mentally, or running things off, writing things down before you go into class. How do you see that working?

Ms. Miller: What do you mean? Like on Sunday, or—?

JT: Well, in a year you’ll be out, you’ll be hired, you’ll get a job. You will know what your textbook is, you’ll be given a set of students who you won’t meet until the first day of school, and there won’t be anybody to ask questions of. You’ll just have to do it. So, how will you decide what to do, the first day, the second day, the third day?

Ms. Miller: [long pause] I guess, using the book as a guideline. And using the standards just to narrow down on each topic.
JT: OK, so you’ve got a textbook, let’s say your current textbook, and the lesson is on exponents, which is what you’re doing now in seventh grade. How do you decide how to present that material? How do you decide what activities to give the students to practice with? What do you do?

Ms. Miller: I don’t want to say use experience, but if I was in seventh grade teaching, I’d probably use the experience I’ve had to structure lessons based on their—based on them, even though I wouldn’t know them, but I think like, maybe just getting up there and, like, talking for a while, and then go, “Hey, let’s do some group work.” And then letting them, like, just go off and see how their minds work. (Meg Miller interview, September 3, 2014)

What was most before Ms. Miller’s mind in this exchange was her relationship to her hypothetical students, an important consideration. But my questions had been directed to planning, and she seemed, at that early phase of her work, to have no idea of the kind of curricular thinking she would be called upon to do, other than just “using the book as a guideline.”

I am not suggesting that for Ms. Miller, a course in writing 20–page lesson plans would have given her “the better end of the stick.” Even novice teachers further along in their careers are not infrequently “lost at sea” (Kauffman, Johnson, Kardos, Liu, & Peske, 2002) in learning how to think about planning and curriculum. But she clearly began her internship year with little understanding of curriculum work, and as one result, did find the teacher’s edition of the textbook useful in providing guidelines for planning her work with students:
It said, “This is how to ask them questions.” It even gave you questions to ask, like “Start the lesson by asking them this.” And it said to get them involved, so you are not just saying, “OK, today we are learning about this,” and this is the only thing. So it would add questions relating to their lives, and “Think about bowling,” or—I don’t know, there were some good questions that would engage them more, and I do not think that I—I mean, I wish that I could think about it that way, it was just kind of nice to have that in the margin, and ask them those questions. (Meg Miller interview, May 6, 2015)

As we saw earlier in the description of their planning sessions, the textbook was the starting-point for their talks about what to do next:

We did look at the book, and see, like, what standards we were going to meet, and where we were going to go next. I had my computer open, she had her computer open, and we would be looking through stuff, and then if we could not find anything, we would be, “OK, well, we need to have a lesson on this for Wednesday, let me know what you find next day.” (Meg Miller interview, May 6, 2015)

Although Mrs. Porter claimed that “we have pretty much scrapped the book at this point,” the “scrapping” really only applied to problem sets: “we are still looking at what they are covering, and how they are covering it” (Roberta Porter interview, February 13, 2015). The textbook was the authority on what was to be covered, though how and in what sequence were decisions the teachers reserved for themselves.
The decisions as to how the textbook’s units should be sequenced remained largely in Mrs. Porter’s hands rather than in Ms. Miller’s:

I am still pretty much driving it, because when we were told that we had to test at the end of February I kind of panicked, actually, because last year we did not even do our tests until the first week of May. We are doing it in February and March now. So I really started looking at the sample items that were out there for the Performance-Based Assessment on the PARCC, and what we still had to cover. But I feel like I have been driving it pretty strongly. Just to make sure that I feel like we have covered what we need to cover before we have to do the test.

(Roberta Porter interview, February 13, 2015)

So Ms. Miller, who was in charge of the day-to-day teaching, focused on near-term, lesson-by-lesson planning, while Mrs. Porter “drove” the overall curricular strategy. As a result, Ms. Miller did her planning by starting with the guides in the teacher’s edition of the textbook:

She is looking at it for the way they address things, the way they cover things. And if she says, “Well, I am not really sure how to get this point across,” she will recognize that the textbook is not giving her everything she needs, so she will ask questions: “Well, how would you do this? How do you teach that?” (Roberta Porter interview, February 13, 2015)

The text identified the content of instruction, while Ms. Miller planned how to teach that content (which might entail using something other than the textbook lesson). Or as Ms. Miller described it:
Say we are on geometry now, we will go through the [textbook] sections and say, “OK, so section 8, section 8.2 is this,” and we will try to find an activity around that. So we are following the book. Mainly the guidelines. But not using their work in it. (Meg Miller interview, February 13, 2015)

The scaffolding in the teacher’s edition took some of the work out of thinking through a lesson, but only if the textbook’s “approach”—the vocabulary, examples, setup and activities for engaging students—“gave her everything she needs.” It is not surprising, then, that she stayed with the textbook lessons as often as she did. But she examined the textbook lessons critically, and chose to go with other materials, or a self-designed set of materials, almost half the time. There would have been, then, a developing set of attitudes-as-strategies toward lessons, which guided her decision. We can hear one at work in this exchange from a planning session:

Ms. Miller: So we’ll do an activity, and we can use problems from the book, but we put them on cards or something.

Mrs. Porter: OK. That is Monday?

Ms. Miller: Yes. Or we could have them make a poster?

Mrs. Porter: That would be good.

In this exchange, they are repurposing the textbook’s exercises (“we can use problems from the book”) by placing them on cards that can be shuffled and shared by students, to facilitate the “secret learning” that comes when review or practice is made engaging. This appears to cohere with the instructional attitude of “engaging students in practice.” The curricular strategy here appears to be to ”keep it simple”—to choose the least-effort path
to making a given (textbook) problem set an engaging activity: use the textbook problem sets, but present them to students on cardstock.

This “keep it simple” curriculum strategy appears again in Ms. Miller’s reflection at the end of the year on the proper relationship between activities and grading:

Right when I left [at the end of April], they were doing an integer story project, and it was a two-day project. And there could be multiple different answers for that integer problem, because they are making their own stories. So that is one example of, it takes them two days to get to multiple answers. So I think that when you have problems like that, it makes it sort of difficult to grade. So doing that every single day, I do not think Roberta would do it? And I do not think that I would probably plan that either, but I think we have done a lot of worksheets that they have just had one day to do it. (Meg Miller interview, May 6, 2015)

So in addition to the work required to prepare lesson materials, the “keep it simple” attitude extends to the work required to grade assignments.

A curriculum tension: Individual and group work. Another situation in which Ms. Miller’s attitudes did not quite cohere initially was the assignment of homework. In Mrs. Porter’s classroom, there were two sorts of homework in addition to work on the “rich problems” assigned on Mondays: students might be assigned sets of five to ten exercises; or they might be asked to “flip the classroom” by reading a textbook lesson, taking notes, and responding to the lesson’s prompts for reflection. Homework grades were assigned on an effort basis: so long as students showed their work, they received points.
The homework was important to Mrs. Porter, because during class time, students always worked in groups of two or three on assignments: it was only by looking at their homework that she could see what each student could do individually. In November, I asked Ms. Miller about students’ homework:

Roberta always gives them time at the end of class to do homework, and she usually has us walking around, helping them, so I feel like that’s really helpful. But I feel like in seventh grade math, it’s almost organizational, too? They need to be organized, to get their homework done, to take it home and do that, then bring it back. So, I—we don’t do that in Mrs. Porter’s class, but—because I feel that—like she does binder work? And then like, having them file it away. But I think that’s really great for the students, and I think that, like, mathematics kind of goes beyond teaching it: like, if they don’t know where their homework is? (Meg Miller interview, November 19, 2014)

There is more to teaching mathematics than the mathematics, she sees: students need “organizational” skills so they “know where their homework is.” By allowing students to begin their homework in class, with a teacher’s guidance, students lose the opportunity to be responsible for their work.

This coheres with how Ms. Miller saw herself learning mathematics. In high school, she had been “awful at taking exams.” But her grades were always acceptable “because I did my homework,” even though she had never found mathematics engaging: “It was more, like, you’re in there forty minutes and then you leave” (Meg Miller interview, September 3, 2014). At the university, when she switched her course of study,
I was behind, since I took two quarters of nursing classes, and I started off in calculus. And that went OK. I think it became more like a study, learning how to study for it, which I wasn’t used to, and obviously, being a freshman, so it was a lot at first. It was very new. I had to be tutored a few times, just to prepare myself for the exams, which were very brutal. But now that I’m done with all the math courses, I feel that it was well worth it. (Meg Miller interview, September 3, 2014)

She had worked hard, had faced “brutal” exams. Working hard on one’s own was an important aspect of learning, one that Mrs. Porter asked students to experience when she “flipped the classroom.” Ms. Miller was not sure that strategy was effective, at least for Portland Middle School students:

[We did it] during a geometry class, where they were more disciplined to go home, and take notes, and be able to like legibly read the writing, and some of the seventh graders would probably—wouldn’t—they’d just write the bold words down. But like actually outlining it, and maybe even typing it out, and then coming into class being ready to work on the problems? I feel like the way we do it now, if they don’t understand the work we did in class that day, when they go home they’re going to get even more frustrated, and they’re not going to do their homework, or they’re going to just write, like, random stuff down. (Meg Miller interview, September 3, 2014)

Homework, for these less mature students (who cannot “outline it” or “type it out” as she recalls herself doing), should be practice exercises they do on their own at home:
Let them grapple with it a little bit, then come back into class, and then if they need to redo it, let them redo it, like, “Wow! I did that totally wrong!” Because sometimes if you do one wrong, it’s all wrong. I think I would let them redo it for a grade. (Meg Miller interview, September 3, 2014)

At the time, she suggested that 25–30% of a student’s grade be based on this corrected, individual homework.

This is not a surprising attitude. It came from her own “apprenticeship of observation” (Lortie, 1975), the attribution of her own success in mathematics to individual hard work, and to homework in particular (because she was “awful at taking exams”). But at the same time, as we saw above, her attitude toward learning was that it needed to be “exciting,” that textbook practice was “boring.” This attitude, too, had roots in her recent experience, with a course in abstract algebra, a course she had found difficult—“I didn’t get the grade I wanted”—but “the best class I’ve ever taken”:

I really enjoyed that class, and I went to office hours almost every day. We formed a learning community that everybody went to office hours, and then everybody went to class, and then we studied together, so I thought that was very cool. (Meg Miller interview, September 3, 2014)

Here it is not the hard work at home, but the community work before and during class that makes the experience “the best class.” But as with Mrs. Porter’s “flipping,” even at the end of the year Ms. Miller was skeptical that such community work would be possible at Portland:
I think it is very difficult to have a learning community when there are 28 students in one class? But I think that there was a learning community within some students, that I would let them go into the workroom, the room adjacent to our classroom … And I would go in there, not telling them I was coming in, and they would be sitting there working. And, like, together. And I think they formed a community with me that the other students that—“Where is your pencil? Why do you not have a pencil in class?”—that they did not form that community, because they are still at the maturity level of a sixth grader. (Meg Miller interview, May 6, 2015)

What made this group of seventh graders a learning community was their ability to “be sitting there working,” even though the teacher was away for long stretches, “not telling them that I was coming in.” What had made her abstract algebra a learning community, on the other hand, was the teacher’s continued presence (“everybody went to office hours, then everybody went to class”).

This is an example of a “terministic screen” (Burke, 1966). An orientation, a coherent structure of attitudes, is effectively a “terminology,” a way of speaking about the world: the attitudes of which it consists also “name” regular aspects of the world it addresses. Or as Burke expressed it, “Even if any given terminology is a reflection of reality, by its very nature as a terminology it must be a selection of reality; and so to this extent it must function also as a deflection of reality” (p. 44–45). In Ms. Miller’s “terminology” there is an identity between her undergraduate learning community in abstract algebra, and the small group of seventh grade girls who can be “sitting and
working,” but the identity does not extend to the work in Mrs. Porter’s classroom, even though Mrs. Porter uses a variety of group work to organize virtually all her class time, continually varies the groups within which students work, and has students explain their results to each other. Ms. Miller does not speak of this group work as learning in community, because she does not see it that way. Using Burke’s language, I would claim that the converse is just as apt: she does not see it because she does not speak of it that way.

We all see the world through our own orientations, our own “terminology,” and so we all fail to see what other ways of dividing up the world might open up to us. What I stress here is that in the context of homework, Ms. Miller sees “struggling with a problem” as something students should do individually:

I think that what I would do is assign the homework, let them grapple with it a little bit, then come back into class and then, if they need to redo it, let them redo it, like “Wow! I did that totally wrong!” Because sometimes if you do one wrong it’s all wrong. So I think I would let them redo it for a grade, but say they only do half their homework—they have a hard time organizing, and they don’t have a good setup at home to do their homework—I feel like they could still excel in the class. Not as much as the students that did all their homework. (Meg Miller interview, September 3, 2014)

I suggest this orientation (which belonged to the very beginning of her internship) might be called the “achievement orientation” toward the classroom, in which all students are
given multiple opportunities to be graded, and those who take full advantage of all opportunities “excel.”

This was very different from Mrs. Porter’s orientation, in which attitudes toward group and individual work were in conflict. Mr. Roberts, her principal, had been encouraging her to stop assigning homework:

And I explained how everything in the classroom is not individual, it is group- or partner-based. And some kids are very good at picking a really strong partner, and the strong partner is bringing them along, but what can they do on their own?

(Roberta Porter interview, May 8, 2015)

She understood that homework is sometimes just a test of the support a child has at home: she weighted homework lightly in her grade book, and awarded points for attempting assignments regardless of correctness. She also put aside the final ten minutes of most classes so students could start (and sometimes complete) homework assignments individually, but with the scaffolding she could supply. She valued the increase in group and cooperative learning work that the Portland district promoted, but worried nonetheless that individual competence was becoming less visible.

What Burke’s perspective teaches us is that such conflicts are sites of change, of learning. They are a symptom that a terminology, an orientation, no longer quite “fits the facts,” where by “fit” we mean “fitting us to act effectively upon the situation.” Such conflicts rupture the fluent performance of the experienced teacher: Mrs. Porter has “doubts,” she “goes back and forth,” she will try various strategies. Here, I can only indicate it. Within the 2014–2015 school year, this conflict was not resolved.
Looking Back: Portland Teachers Reflect on Test Scores

Asked how the scores compared to her expectations, Mrs. Porter acknowledged that she and the Portland school’s staff had expected low scores:

My math coach, also my department head—who is a high school math teacher—read the test [as an accommodation] for one of the identified students, and when she took it back to our guidance counselor, she said “I would not expect that the students will perform really well on this.” She said, “This is material that my sophomores, even some of my juniors, would struggle with.” So the testing wasn’t—and when you look at the standards, we all talked about how some of them were not developmentally appropriate when we are dealing with twelve- and thirteen-year olds. So it did not—It was not really surprising that she felt that way about it. (Roberta Porter interview, February 15, 2016)

She nevertheless went on to share anecdotes of individual student successes:

There was a young man [who] has a sister, a twin sister, who is multiple-handicapped. And there were times when we wondered if he would be considered borderline for that as well, but it appeared that this was a young man who was never expected to perform at grade level? And this past year, we worked with him—the special educator and I worked very closely with him, and he showed thirty points improvement on his alternative assessment in the area of mathematics. And I have been talking with his eighth grade math teacher, and he is owning the class. ... I would really love to see what he could have done with this [the regular test], because I really believe that he could have performed
admirably on this one. There was a young man who scored seven fifty as “Met [expectations]”. And here we are dealing with a kid who is in foster care, who has had an IEP all of his life, who performs about at grade level. But I was delighted to see that he met, so when he got his report card that said he met the standard for seventh grade, I know what that did to that young man’s self-esteem. So I mentioned it to him at the beginning of the year, and he just beamed. It was so exciting to see. (Roberta Porter interview, February 15, 2016)

Her focus on individual positives did not blind her to the relatively low percent of students “meeting expectations” at Portland Middle School. It was, however, frustrating to her that scores were not broken down by standard, but rather by the four subscores:

If we had more usable data—Really, all I have to look at is this, where it breaks it out into Major Content, Supporting Content, Reasoning, and Modeling. When I look at this, I see my kids are really weak at modeling. So that is something I need to step up. They are really weak in reasoning, so that is something I have been working on. (Roberta Porter interview, February 15, 2016)

What the low percent of students meeting standards in Modeling and Reasoning indicated was actually that they were not exhibiting in their work the eight Mathematical Practices of the standards, at least as these were assessed by PARCC. This misunderstanding was particularly acute for Reasoning:

And this really—this one did surprise me a little bit. Because through the math coaching process, our math coach encouraged us to use rich problems, where there are many jumping-into points, depending on the student’s level of
proficiency, how well do they understand the content? You know, some kids might write an equation, some kids might write a proportion, other kids might just fiddle around with it until they arrive at an answer, not even be able to explain to you how they got there. And we did a lot of that, I am still doing a lot of that. So that score did surprise me somewhat. (Roberta Porter interview, February 15, 2016)

What Mrs. Porter cultivated in her students was their willingness to “grapple” with problems, to stay with them even when no solution path was obvious. While that directly addressed Mathematical Practice MP1—“Make sense of problems and persevere in solving them” (Common Core State Standards, 2012, p. 6)—the ways in which she cultivated that grappling (“some kids might write an equation, some kids might write a proportion, other kids might just fiddle around with it until they arrive at an answer, not even be able to explain to you how they got there”) worked against exactly those practices—MP3, “Construct viable arguments, and critique the arguments of others,” and MP6, “Attend to precision” (Common Core State Standards, 2012)—measured by the Reasoning subscore. To indicate this is not to criticize Mrs. Porter’s teaching, but to underscore the curriculum work teachers must do. There can be no construction of arguments or attention to precision without a prior willingness to grapple with difficulty, and she had worked diligently to cultivate that in her students. Unfortunately, the assessment results she received communicated precisely the wrong message to her. By suggesting that her students did not do well at “reasoning,” she was led to conclude that more of her work with “rich problems” was needed, when in fact the real challenge was
to develop students’ facility with argument and precision, both strongly language-related skill sets that her method of “rich problem” work did not do enough to cultivate.

A similar misunderstanding appeared in interpreting the *Supporting Standards* subscale:

I was pretty pleased to see that sixty-four percent were meeting, or nearly meeting the major content, because I know that that was a huge area of my focus. And even better with the supporting content. So I always feel like when they come to me, they do not have any of these foundational skills, I have got to fill in those blanks before I bring them up to current level. So—and that is something I have been encouraged to let go of. I have been told to just jump right into the content, and “you can not save them all”, and fill in the blanks for some of them, and some of them just will not get it. And I have a real problem with that. (Roberta Porter interview, February 15, 2016)

She understood *Supporting Content* to correspond to the “fundamentals” developed through the work she did to identify and “fill in the blanks” for each of her students: what supported their learning of the major content in the standards. In fact, the relatively strong showing on *Supporting Content* was entirely due to students’ success on questions addressing six of the eight standards for *Statistics & Probability* (7.SP.1-2 and 5-8).

As I will argue in Chapter 6, despite these misunderstandings of the test results, Mrs. Porter’s understanding of the curriculum work required by the new standards did increase. The state test, however, was not a good source of evidence, and her state was, in any case, abandoning the PARCC consortium for the following academic year. In 2016,
once again, teachers and students would be facing a newly-designed test, about which
(halfway through the 2015–2016 school year) they knew next to nothing:

I think we are infamous for doing that kind of stuff in education. We try
something, and we really do not give it a chance to see if it was going to work or
not. “Oh, that is too much, it was too chaotic,” we just scrap it and start over. And
we are still using the Common Core standards, but what is that going to look like
in terms of assessment? We do not know. (Robert Porter interview, February 15,
2016)

Meg Miller, Mrs. Porter’s intern in the 2014-15 school year, was a teaching
Fellow in an Educational Administration masters program, taking graduate courses while
teaching precalculus and quantitative reasoning classes at a small high school in a
different district, by the time the Portland Middle School test scores were released. In
Chapter 6 I will discuss her developing curriculum practice. But because she did not have
to teach Grade 7 mathematics at Portland Middle School again, her responses to
questions about the 2015 test scores (delivered in writing, as explained above) were
retrospective rather than prospective. Asked about students who did much better or worse
than expected, she mentioned one of the same students as her mentor, though in a
different way:

He is on an IEP and was offered an aide during the test. His score of a 750 is very
high and it would be interesting to discover if he had too much help during the
test. (Meg Miller, written response, February 25, 2016)
Mrs. Porter, of course, had the advantage of being able to see the student’s continued success in eighth grade mathematics. But Ms. Miller’s attitude here is in line with the high value she placed on students’ succeeding through their own efforts, as we saw in her attitude toward homework and group work.

Ms. Miller was not surprised by the scores overall: like Mrs. Porter, she felt that between them they had “hit each and every standard” in the course of the year. And she provided a reasonably clear-eyed view of the poor performance on the *Reasoning* subscale, though once again, one that misunderstood what was being measured:

Their ability to reason with mathematics is at a beginning level. These students are in an area where the culture does not stress the importance of mathematical reasoning. I believe the lower performance is their ability to relate mathematics to the real world and their lives due to their lack of experience in the world. This, once again, can be referred to the culture of the school. This also can relate to their experience in writing. (Meg Miller, written response, February 25, 2016)
Chapter 5: Two Second-Year Grade 8 Teachers at Packersfield Middle School

Introduction

In this chapter, I describe the data collected from the Packersfield Middle School site, and use those results to articulate curriculum work as practiced by eighth grade mathematics teachers Lorrain Johnson and June Harris. The data, as outlined in Chapter 3, consist of

- The 20 completed text logs and 10 text log substitutes, covering 30 of the 32 weeks of instruction studied;
- The 383 assignment sets, consisting of 4,198 mathematical tasks, each individually encoded for cognitive demand;
- Anonymized individual scores on the 2015 PARCC test for Packersfield Middle School’s eighth grade, along with the state’s five-band scoring of the results;
- Transcripts of six interviews, two apiece with each teacher individually, and an additional two joint interviews, recorded between the beginning of the study in September 2014 and its conclusion in February 2016.

Each of these data sources will be examined in turn below. I will then provide a critical summary of the ways teacher orientation, as revealed in the transcripts, related to the selection of mathematical tasks for students, and to the state’s assessment of student mathematical achievement.
Packersfield Middle School and Teachers

**Packersfield Middle School.** At the time of the research, the Packersfield school district served about 2000 students from its three-county area. The high school, middle school, and one of the district’s three elementary schools shared a campus on the main street of the town, which was the only population center in the district. Because there was limited classroom space in the elementary building on the Packersfield campus, students from that building were sent to the outlying two elementary schools for their fifth grade year, after which all district sixth graders attended the middle school in town. At the middle school, the sixth grade was divided into six self-contained classes, where in each, all subjects were taught by a single teacher with a generalist certificate. The seventh and eighth grades were also divided into six classes, but assigned to teacher teams, each teacher certified to teach one or two subjects. A grade level consisted of from 140 to 170 students, so class sizes could vary from year to year between 23 and 28 students. In response to consistently low scores on state tests, the language arts classes had been extended to 90 min. Beginning in the 2014–2015 year, the mathematics class sections were also to be 90 min. long, while other subjects continued to be taught in 45-min. sections. The high school staff included four mathematics teachers, and three of the four seventh and eighth grade mathematics teachers, all new hires in 2013, had begun to join them for department meetings.

Just over 70% of students in the Packersfield district received free or reduced-price lunches, and the district was coded by the state as high-poverty. The five-year
graduation rate varied between 84% and 90.5% in the five years preceding the research, averaging 87.4% with no clear up or down trend (STATE, 2015).

The eighth grade mathematics teachers do not see high expectations for academic achievement in the community:

The community has a big pride in the school because of its historical—it is a historical monument, or it is on the historical trail for the state. It was donated, it is like a museum on the inside of the high school. And they have a lot of pride in that. But at the same time, they don’t have a lot of pride in whether the kids can read. So it’s a struggle. (June Harris interview, September 2, 2014)

This perception of low expectations extends to the teaching staff at the middle school:

What we found was that some of our other content area teachers, they might say that math is important, but they really do not want anything to do with it. And they are more than happy to say that to their kids. It has gotten better this year, because we have kind of commented about the comments we were getting, and I think that they have recognized that we do not appreciate it, and we do not do it to them, so we would appreciate it if they do not do it to us, because they kind of back us into a corner when they do that? And a lot of the teachers have responded to that, and have started watching how they are about it? But some of them still just could care less. (Lorene Johnson interview, September 2, 2014)

On top of this lack of support from teachers of other subjects in the building, there was ongoing feuding among the mathematics teachers at different levels:
We are not really known for being advanced in math in our district at all, and that is one area where we struggle with, district–wide? But what has happened over the last few years is that there has been a lot of blame between the buildings: “It is your fault!” “It is your fault!” So we are trying, trying to be more cooperative than finger-pointing. (Lorene Johnson interview, September 2, 2014)

Packersfield eighth graders’ mathematics scores had indeed been lower than the overall state average, though not always by much. In the five years before the research began, an average of 65.2% of the school’s eighth graders were rated proficient or better in mathematics, compared to an average of 75.9% for all state eighth graders: a difference of nearly 11 percentage points. But in 2011 and again in 2012, Packersfield was below the state average by just 4.6% and 4.0% respectively (STATE, 2015).

The district had done no work to transition to the new mathematics standards, because they believed the state tests remained aligned with the older standards, and they were focused on improving test scores. In the year before the research began, there was a complete turnover in the seventh and eighth grade mathematics staff, with four new teachers joining the school. For the 2014–2015 school year, the administration shuffled several teaching assignments in the building: the perception of the eighth grade mathematics teachers was that this was to break up some dysfunctional cliques that had formed over the years. From the point of view of the research participants, “there has been a lot of support. Last year at the beginning it was a little bit rough, but as the year progressed and they saw that we were making positive changes, we were not just doing it for no reason, they were a lot better at helping us along with that” (Lorene Johnson
The Packersfield district had no math coaches, and no curriculum director the year of the research. Indeed, there was no district or grade-level curriculum other than the Common Core standards themselves, and a new textbook that was chosen because it aligned with those standards.

**Packersfield teachers: Lorene Johnson.** Ms. Johnson was raised in a mid-sized city not far from the state capital, in a county with an active agricultural economy where “country kids” joined “city kids” at the 1,600-student high school. Although she is a third-generation teacher, she had never planned on a career in education, or in mathematics. As a biology major in college, she was inspired by a charismatic teacher to add mathematics, first as a minor, then as a second major, to her program. While trying to decide between pursuing further schooling in medicine or actuarial science after graduation, a family member led her to an opportunity to teach science and mathematics at an English-language missionary school in Kosovo for several months. She found the work challenging but engaging, and on her return to the United States she enrolled in an accelerated masters degree program at a state university that was recruiting individuals with STEM (science, technology, engineering, and mathematics) degrees to become certified teachers. It was as a researcher on the internal evaluation team for that program that I first met Ms. Johnson. A little over a year later, at the end of the summer in 2013, she was certified as a 7–12 teacher of mathematics, and newly-hired to teach at Packersfield’s middle school.
Because Ms. Johnson and Mrs. Harris shared a common experience in their first year at Packersfield, and had set themselves a common curricular task for the year of the research, I will describe their teaching situation after introducing Mrs. Harris.

**Packersfield teachers: June Harris.** Mrs. Harris, like Lorene Johnson, came from a family of teachers: her parents were both teaching in the town in which she had been raised: Kingston, in Lenape County, a bit over 100 miles north of Packersfield. The two communities had some similarities: both were villages of about 4000 people, and both were located at the edge of rural counties where agriculture was still a major economic activity: Lenape County’s nearly 600 farms had average revenues of $332,000 (STATE, 2015). But for Mrs. Harris, it was the differences that stood out:

I come from a small town, so I knew that background. But there’s small town issues here that I didn’t grow up with. I mean, Kingston was a hard-knocks town, we had our own share of low economic, but we didn’t have the sort of drug issues, and quite the number of low income that we have here. (June Harris interview, September 2, 2014)

The median family income for Lenape County was $44,400, about 14% higher than Paley County’s, and although in both counties 60% of the working-age population had a high school degree or less, the poverty rate in the Kingston school district was less than half the rate in Packersfield: only 30% of Kingston students qualified for free or reduced-price lunches, compared to Packersfield’s rate of 70%. And Kingston schools outperformed Packersfield on the state tests, with the percentage of students scoring at least proficient close to, and often just above, the state average (STATE, 2015).
Drug use was an ever-present issue for the teachers in Packersfield. There are frequent unannounced “drug checks—you know, they bring the dogs in through the lockers probably every couple of weeks” (June Harris interview, September 2, 2014), though actual drugs or paraphernalia are rarely found. The surrounding three-county area is known as a center of methamphetamine production:

We’re one of the highest meth-producing cities in the whole state. So there’s a lot of that, they can make more money dealing drugs, or something like that. But when you have meth as an issue, it seems like marijuana isn’t even on your radar, because it’s like, “That’s better than doing this!” And we had four kids doing—that got expelled, or suspended, for marijuana use in the bathroom last year at the middle school. (June Harris interview, September 2, 2014)

Both teachers reported having students in class they suspected of being intoxicated as a regular occurrence.

Packersfield teachers: Instructional routines. The 2013–2014 school year had been somewhat chaotic for Ms. Johnson and Mrs. Harris. Three of the four Grade 7–8 mathematics teachers, including them, were new to the district. The textbooks were more than a decade old, and not aligned to the Common Core standards, and there was no district mathematics curriculum guide. The new middle school teachers attempted to make changes, first by joining the high school mathematics department:

We made it very clear to the high school teachers that we were planning on changing things, and trying to make things better that would eventually affect them, and influence them, and it would be better for them in the long run. And
they were willing to help work with us. (Lorene Johnson interview, September 2, 2014)

But they met initial opposition at the middle school, where language arts classes had been given 90-min. blocks, but mathematics had not. They argued that

we should have the same amount of time with our kids if it was going to be considered a testing subject and it was going to be a core content. And we caught a lot of not agreeable feedback about that. (Lorene Johnson interview, September 2, 2014)

With the eventual support of the school administration, however, they prevailed: in 2014–2015, schedules had been reconfigured to allow for teaching mathematics in 90-min. blocks, though the first block of the day was actually two 45-min. periods, interrupted by a 45-min. period for arts classes. This first-block anomaly influenced the way they planned in 2014–2015:

Sometimes it is easier if I plan “first period” and then “second period” with them, so we are not in the middle of an activity when [the first block students] leave and come back. (June Harris in joint interview, February 12, 2015)

They also prevailed in their second effort, to move up the date for purchasing a new set of Common Core-aligned textbooks:

Most of last year, all of us spent supplementing everything, and our textbooks were really just an in-class, “Let’s just grab a few problems from the textbook” type of thing, whereas we were supplementing 95% of what we were teaching.
And what we wanted was the opposite of that, where we used the textbook for 80 to 90% of what we did. (Lorene Johnson interview, September 2, 2014)

New textbooks for the 2014–2015 school year were purchased for Grade 6–12. The committee that selected the new series included one Grade 6 teacher, and the entire 2013–2014 Grade 7–12 mathematics department, along with the building principal. All agreed that they wanted a series from a single publisher, aligned to the new standards. The middle school teachers were particularly interested in seeing a text that included problems that required students to explain their thinking: “Common Core-type questions” (June Harris interview, September 2, 2014). The principal focused on how new vocabulary was presented. The text they chose (Burger, Dixon, Kanold, Larson, Leinwand, & Sandoval-Martinez, 2014) satisfied all parties.

There were, then, three daily blocks for each teacher. As there were six classes of eighth graders, Ms. Johnson and Mrs. Harris taught only Grade 8 in 2014–2015. One of Ms. Johnson’s three blocks was for the algebra class, and one of Mrs. Harris’s classes was the “inclusion” class, where most of the eighth grade students with Individual Education Plans (IEPs) were concentrated, with the assistance of a special education teacher. Neither of these classes was a part of the research. Of the remaining four classes, one of Ms. Johnson’s was considered a little faster, and one of Mrs. Harris’s a little slower, than the other two. Although these two classes are occasionally mentioned in the research, the data collection focused on the remaining two classes, which were planned for in common and taught in parallel for the school year. In both of these classes, there were no additional teachers or aides.
**Packersfield: The textbook.** The text selected by the Packersfield mathematics department (Burger, Dixon, Kanold, Larson, Leinwald, & Sandoval-Martinez, 2014) was similar to a traditional text, with material organized into two- to four-page lessons showing examples of an operation or procedure, followed by two pages of about 20 exercises, the last four or five of which are labeled “H.O.T.S.” (for “higher-order thinking skills”), consisting of word problems, some of which ask for explanations. The lessons themselves are interspersed with five to ten “Reflect” and “Your Turn” prompts, probing for extensions of concepts that emerge in the lesson examples.

At the middle school, Packersfield chose to take delivery of the new texts as a “workbook subscription”: the texts came in paperback workbook form, in which students could write; new (and potentially upgraded) workbooks were to be delivered each year. The supplementary material (provided on CD) included quizzes, tests, three differentiated practice pages for each lesson, plus additional material to allow differentiating assignments for slow or accelerated learners, or for students learning English.

In addition to the textbook and supplements, the subscription included access to the publisher website, where students could access practice sets of problems for each lesson. Because Internet service in the community was considered spotty, teachers did not plan on using the web-based materials for homework. But the school had a computer lab in its library, and two classroom sets of Chromebooks. The teachers did use the publisher website in class for part of the year, but there were challenges to doing this, which I will discuss in the course of the case study.
Packersfield Textbook Logs

The Packersfield district had already begun classes for the 2014–15 school year before I first met with eighth grade mathematics teachers Lorene Johnson and June Harris on September 2, 2014 to explain how to complete the textbook logs for the research. As a result, the logs do not include the first 14 days of instruction. Ms. Johnson taught two 90-minute classes of eighth grade mathematics that year, one of which was considered by both teachers to be a little “faster” than the other. She also taught the single eighth grade algebra class, but that group was not a part of this research. Mrs. Harris taught the remaining three sections of eighth grade mathematics at Packersfield. One of these was the “inclusion” class, in which students with Individual Education Plans (IEPs) were concentrated, and another was considered to be a little “slower” than the other non-inclusion class, in part due to behavior issues. The two teachers had worked hard the previous year, their first year of teaching, to follow not only a common curriculum, but also a common set of materials. The common tasks did not always extend to the “faster” or “slower” classes, so we agreed that the logs would track the work of the middle groups, the “slower” of Ms. Johnson’s classes and the “faster” of Mrs. Harris’s.

The two teachers alternated responsibility for completing and sending me the weekly text logs. Though things began well, they fell behind by mid-October: nine of the total of 11 missing logs are for the period from then until Christmas break. The teachers were, however, able to keep me updated on their weekly assignments, and to provide page references from the text, and copies of supplemental material. After Christmas, and despite almost a dozen days lost to snow, and disruptions for the first round of state
testing in February, they were able to provide an unbroken set of logs covering all but the last two weeks of school. Those two weeks were devoted to an extended project, a copy of which I received.

The data provide a reasonably complete picture of what tasks students were assigned (only 10 days’ material is missing for the period covered by the research, which included 117 instructional days). However, the 10 alternate forms, unlike the 20 collected logs, omitted times. Because the existing logs, and the descriptions of class procedure in the interviews, indicate that these teachers had a reasonably regular routine, I have roughly estimated times for the more regular types of assignments over the missing 10 weeks, but the resulting estimates of time spent doing various types of problems are necessarily of limited reliability.

I did not get even that limited level of reliability for the planning data that was to be gathered from the logs. The teachers were asked to indicate for each day how much time they had spent either reading the teachers’ edition of the textbook, or in other sources in order to prepare assignments. The Packersfield teachers stopped doing this after the first few weeks. Their reasons for the omission will be examined below in the examination of the interview data. Even more than with the Portland teachers, it turned out that most “planning” time was spent in finding, rather than in examining, materials. It is unlikely, as a result, that the time indication as requested in the log would have yielded useful information on how teachers were preparing to use them.

However, the central role of the textbook logs in this project was to permit a close examination of the actual tasks teachers selected for their students from the kinds of
material available to them from the textbook (including its supplementary materials); from trade books or online sources; and from teacher–made materials. Here, the record is nearly complete. I turn next to a description of what I found in the Packersfield assignments.

**Packersfield Mathematical Tasks**

For purposes of this study, a problem *set* is a group of problems presented to students as a single assignment, regardless of the sources of the individual problems. For example, a teacher might choose one of the textbook’s supplementary pages, but delete certain problems and add others, either of her own or from some other source. Or she might assign “even-numbered problems on page 255, plus problems 47 and 49 on page 256.” Despite the multiple sources, this is presented to the student as one assigned task, and so is one set. On the other hand, a teacher might take an online source with several challenging problems, and use each problem separately as a “Problem of the Day”: in that case, one source could lead to several “sets,” each of which might be an individual problem.

In the course of the 107 instructional days for which information on assignments was returned, students were given 4,198 individual problems (some with multiple parts) in 383 sets, including tests and quizzes. An average set, then, contained about 11 problems, and in an average class period (90 min. at Packersfield), students would see 3.56 sets, or about 39–40 problems. The actual number of problems varied somewhat, but these teachers rarely assigned single complex problems that would require an extended time to complete.
To gain further insight into the curricular reasoning (Ross–McDuffie & Mathers, 2009) of Mrs. Harris and Ms. Johnson, these 4,198 problems were coded for cognitive demand, as described in Chapter 3, and then grouped into two levels, high-demand or low-demand, based on their coding. Problems were also coded for their source: textbook (including textbook supplements), trade books, online repositories, and other sources, including those problems made by the teacher. In order to get a clearer picture of curricular alternatives facing the teacher, a subset of textbook problems not used by the teachers was also coded. As described in Chapter 3, I used the PARCC testing consortium’s identification of certain standards as Major Content for testing purposes (PARCC, 2014) and matched these to chapters in the textbook using the textbook’s alignment guide (Burger et al., 2014, pp. cc1–cc9), from which I then selected a subset of lessons addressing “major content” spread throughout the year.

To summarize, problems presented to students are coded based on date, alignment with both the Grade 8 standards and the textbook (whether they came from the textbook or not), cognitive demand (using both the eight-code system described in Chapter 3, and a high/low dichotomy), and whether or not they address “major content” as identified by the testing consortium. In addition, a subset of textbook problems and supplementary materials was also coded for cognitive demand, using the same two systems, in order to allow comparison with problems chosen by the teachers in addressing “major content.” I now take up a discussion of each of these in turn.

**Looking at problem sets across time.** There is little to say about problem variation over the school year at Packersfield. The teachers had struggled to create a
coherent curriculum the previous year using an outdated and error–riddled text. They were determined to use the new text as their main source of curriculum material for the year. They almost never went beyond the textbook in the first two chapters, but by October online materials, generally additional sets of practice problems, began to appear regularly among the assignments. In addition, their text series included an online site providing practice problems for each lesson in addition to those in the text materials. However, in the early part of the year, there was limited access to classroom sets of computers. After Christmas, when more carts of notebook computers became available, the teachers found that the online problems in the later chapters of the book usually duplicated textbook exercises, limiting their usefulness. Where they were used, these were coded as having the textbook for their source.

**Looking at problems across sources.** In Chapter 3, I described how the assignments were collected and coded. Here I examine the patterns found by examining the sources for all 383 problem sets.

The most obvious pattern in the use of sources is their routine use of two non-textbook sources of assignments for students: a daily *Math Minute* (MM: Stoffel, 2007), and a Weekly Math Review (WMR). The first is a daily set of 10 or 11 problems meant to exercise fluency across the middle grades curriculum: a single set might include problems from as many as ten different standards. The Weekly Math Reviews had been created by Ms. Johnson and Mrs. Harris the previous year: sets of 6 or 7 problems focused on concept and fluency skills that underlay the weekly lessons. This was assigned on Mondays to be worked on during the week and turned in on Fridays. As
shown in Table 5.1, textbook problems together with the Math Minute/Weekly Math Review problems accounted for 79.1% of all student assignments in the first 10 weeks of school, 68.8% of problems in the second ten weeks, and 69.9% of problems in the final 10 weeks.

Table 5.1

Packersfield: Problems from Textbook and Fluency Practice 2014–2015

<table>
<thead>
<tr>
<th>Weeks</th>
<th>Problems</th>
<th>Text</th>
<th>Text pct</th>
<th>MM/WMR</th>
<th>MM/WMR pct</th>
</tr>
</thead>
<tbody>
<tr>
<td>1–10</td>
<td>1,516</td>
<td>669</td>
<td>44.1</td>
<td>530</td>
<td>35.0</td>
</tr>
<tr>
<td>11–20</td>
<td>1,036</td>
<td>379</td>
<td>36.6</td>
<td>334</td>
<td>32.2</td>
</tr>
<tr>
<td>21–30</td>
<td>1,569</td>
<td>668</td>
<td>42.6</td>
<td>428</td>
<td>27.3</td>
</tr>
<tr>
<td>Total</td>
<td>4,121</td>
<td>1,716</td>
<td>41.6</td>
<td>1,292</td>
<td>31.4</td>
</tr>
</tbody>
</table>

The apparent decrease in the total number of problems assigned in the second 10-week period is due to the organization by weeks of the school year. The second period includes most of the school’s snow days, so many weeks have less than five days; and toward the end of the second 10-week period, test preparation activities interrupted instruction several times. Table 5.1 covers 30 of the 32 weeks of the research period: the final two weeks of the school year, which were devoted to an extended non-textbook activity, are omitted.

The source for the 1,177 problems not drawn from the textbook materials or the Math Minutes/Weekly Math Review was almost entirely the Internet. Some of these had
been located the previous year, when Mrs. Harris and Ms. Johnson struggled to create their own curriculum with no usable text. The rest were the results of searches when a particular need arose. I examine what led to that need below when I discuss the interview data.

In summary, as shown in Table 5.2, the teachers at Packersfield Middle School began the year determined to use their new textbook as their main source of problem sets. In addition, they assigned a daily *Math Minute* set (MM) for fluency practice, and a Weekly Math Review (WMR) as skills practice for the weekly lessons. After the first ten weeks, they found themselves increasing slightly their use of other materials. Where the source can be definitely identified as a website, it was coded as an online resource, otherwise the source was coded “other.” They attempted some supplementing of classwork with computer work drawn from the textbook’s companion website, but found the online material that accompanied their text unsatisfactory after the first two chapters.

Table 5.2

*Packersfield: Percent of Problems by Source*

<table>
<thead>
<tr>
<th>Period</th>
<th>Problems</th>
<th>Text</th>
<th>MM/WMR</th>
<th>Online</th>
<th>Other&lt;sup&gt;a&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weeks 1–10</td>
<td>1,516</td>
<td>44.1</td>
<td>35.0</td>
<td>9.8</td>
<td>11.1</td>
</tr>
<tr>
<td>Weeks 11–20</td>
<td>1,036</td>
<td>36.6</td>
<td>32.2</td>
<td>14.3</td>
<td>16.9</td>
</tr>
<tr>
<td>Weeks 21–30</td>
<td>1,569</td>
<td>42.6</td>
<td>27.3</td>
<td>8.4</td>
<td>21.8</td>
</tr>
<tr>
<td>TOTAL</td>
<td>4,121</td>
<td>41.6</td>
<td>31.4</td>
<td>10.4</td>
<td>16.6</td>
</tr>
</tbody>
</table>

<sup>a</sup> Includes both teacher-made material, and material with unidentified source.
Looking at problems across cognitive demand levels. The cognitive demand of individual problems was coded using the methods described in Chapter 3. Table 4.3 shows the distribution of codes for problems assigned to Packersfield eighth graders over the course of the year. The first three codes—1A1, 2A2, and 2B2, which applied to the vast majority of problems (92.2%)—indicate low-demand tasks.

Table 5.3

Packersfield: Total Problems by Cognitive Demand Code

<table>
<thead>
<tr>
<th>Teacher</th>
<th>Problems</th>
<th>1A1</th>
<th>2A2</th>
<th>2B2</th>
<th>3B3</th>
<th>3C3</th>
<th>3C4</th>
<th>4C3</th>
<th>4C4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weeks 1–10</td>
<td>1,516</td>
<td>52</td>
<td>901</td>
<td>492</td>
<td>71</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Weeks 11–20</td>
<td>1,036</td>
<td>88</td>
<td>185</td>
<td>579</td>
<td>184</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Weeks 21–30</td>
<td>1,569</td>
<td>119</td>
<td>349</td>
<td>1,028</td>
<td>69</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>TOTAL b</td>
<td>4,121</td>
<td>259</td>
<td>1,435</td>
<td>2,099</td>
<td>324</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>1</td>
</tr>
</tbody>
</table>

Note: Total omits 77 problems (2A2=4, 2B2=73) from final 2-week project.

Packersfield students were assigned very few high-demand problems during the school year: just 8.0% of problems were 3B3 or higher. Their distribution varied: they made up 17.8% of problems in the second 10-week period, but only 4.7% in the first and third periods. Almost all of the high-demand problems assigned (99.1%) were coded as 3B3, which has the descriptor “comparing, contrasting, or linking representations” (see Chapter 3 and Appendix C). In these classes, most of problems coded 3B3 were algebraic “word problems”; questions that required students to represent a situation with an
equation, and then solve the equation, using the solution to answer a question about the situation. This was a culminating standard in the eighth grade “Functions” domain of the Common Core State Standards (2012):

[8.F.4] Construct a function to model a linear relationship between two quantities. Determine the rate of change and initial value of the function from a description of a relationship or from two \((x, y)\) values, including reading these from a table or from a graph. Interpret the rate of change and the initial value of a linear function in terms of the situation it models, and in terms of its graph or a table of values.

(p. 55)

Their textbook addressed the skills and concepts leading up to this standard of work in the second of its six units (chapters 3-6), which occupied most of the second 10-week period in Ms. Johnson’s and Mrs. Harris’s sequence of instruction.

A look at the sources for high cognitive demand problems, as in Table 5.4 below, reinforces the conclusion that the textbook was their main source. The daily and weekly practice provided by the Math Minutes and Weekly Math Reviews was not intended to provide high cognitive demand, but rather to exercise fluency. And when the two teachers did look for material outside the textbook (the “Other” category in Table 5.4), they looked for high-demand problems only in order to supplement exactly those lessons in the textbook that already were providing them at the highest rate, in the chapters on linear equations and functions.
Table 5.4

Packersfield: High-demand Problems by Source

<table>
<thead>
<tr>
<th>Period</th>
<th>Source</th>
<th>Total Problems</th>
<th>High-demand Problems</th>
<th>Perent High-demand</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Total</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Problems</td>
<td>Problems</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>669</td>
<td>60</td>
<td>9.0</td>
</tr>
<tr>
<td>Weeks 1–10</td>
<td>Text</td>
<td>530</td>
<td>11</td>
<td>2.1</td>
</tr>
<tr>
<td></td>
<td>MM/WMR</td>
<td>317</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td></td>
<td>Online/other</td>
<td>379</td>
<td>106</td>
<td>28.0</td>
</tr>
<tr>
<td></td>
<td>MM/WMR</td>
<td>334</td>
<td>10</td>
<td>3.0</td>
</tr>
<tr>
<td></td>
<td>Online/other</td>
<td>323</td>
<td>68</td>
<td>21.1</td>
</tr>
<tr>
<td>Weeks 21–30</td>
<td>Text</td>
<td>668</td>
<td>58</td>
<td>8.9</td>
</tr>
<tr>
<td></td>
<td>MM/WMR</td>
<td>428</td>
<td>13</td>
<td>3.0</td>
</tr>
<tr>
<td></td>
<td>Online/other</td>
<td>473</td>
<td>2</td>
<td>0.4</td>
</tr>
<tr>
<td>32–Wk Totala</td>
<td>Text</td>
<td>1,716</td>
<td>224</td>
<td>12.9</td>
</tr>
<tr>
<td></td>
<td>MM/WMR</td>
<td>1,305</td>
<td>34</td>
<td>2.6</td>
</tr>
<tr>
<td></td>
<td>Online/other</td>
<td>1,177</td>
<td>70</td>
<td>5.9</td>
</tr>
</tbody>
</table>

*a 32-week total includes 77 “other” (2A2 = 4, 2B2 = 73) from final project.

Looking at problems across the Standards. The year this study took place was to be the first year that the state testing would be fully aligned with the Common Core State Standards for Mathematics (2012). The new textbook that Mrs. Harris and Ms. Johnson used was chosen on the assumption that it aligned with the new standards, and so would prepare students for the new tests. In this section, I compare the characteristics of
the problems students were assigned to those of the problems provided by the textbook (including its supplemental materials). This comparison does not take the entire school year into account. Instead, I used those standards identified by the PARCC testing consortium as “major content” (PARCC, 2014), which consist of all the standards for Expressions and Equations (8.EE.1-8) and Functions (8.F.1-5), and eight of the nine standards for Geometry (8.G.1-8). Altogether, these comprise 21 of the 28 standards for eighth grade mathematics. I then selected textbook lessons aligned with those standards, using the textbook’s alignment chart (Burger et al., 2014, pp. cc1–cc9), in order to determine which sections would be used by a teacher whose sole guide to teaching the standards was the textbook. From the resulting list of lessons I selected roughly half, in order to be able to sample the teaching year from September to April (the end of testing). A more detailed discussion of the method I used is in Chapter 3 above.

Table 5.5 shows how the teachers’ selection of problems matched the emphases of the textbook in each of the three domains identified as “major content.” The number of problems used to calculate the percentage of work devoted to each major standard for the textbook (1,519 problem) includes all exercises from every lesson included in the comparison, as well as the problems from the two supplementary practice pages for each lesson provided in the teacher materials. The Packersfield teachers’ problem selection (1,752 problems) excludes the routine daily and weekly exercises provided by the Math Minutes and the Weekly Math Review (828 problems over the span of these lessons), on the assumption that the Packersfield teachers would have assigned this routine fluency practice even were they to draw their curriculum material for addressing the Common
Core standards entirely from the textbook. The remaining 700 problems they assigned from non-textbook sources made up 39.9% of the 1,752 assigned problems.

Table 5.5

**Packersfield: Emphasis on Major Content Standards by Teachers and by Textbook**

<table>
<thead>
<tr>
<th></th>
<th>Expressions &amp; Equations (EE)</th>
<th>Functions (F)</th>
<th>Geometry (G)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>problems</td>
<td>EE pct</td>
<td>problems</td>
</tr>
<tr>
<td>Packersfield(^a)</td>
<td>647</td>
<td>36.9</td>
<td>385</td>
</tr>
<tr>
<td>Textbook</td>
<td>605</td>
<td>39.8</td>
<td>396</td>
</tr>
</tbody>
</table>

\(^a\) Percentages are based on 1,752 problems, exclusive of MM/WMR.

As Table 5.5 makes clear, even though 39.9% of problems assigned came from outside the textbook, this did not change the emphasis between the three domains included in the “major content.” As the interviews will make clear, however, the teachers were not following the textbook emphases as closely as these figures might suggest.

The *Math Minutes* and Weekly Math Reviews were excluded from the calculations in Table 5.5, because these were a part of the class routine that was not addressed to any specific standard. Mrs. Harris and Ms. Johnson allocated 15–20 min. daily to the *Math Minutes*, and several minutes throughout the week to student work on the Weekly Math Reviews. In effect, their 90-min. mathematics classes can be considered in two parts: a 20-min. drill session based on these routine assignments, and a 70-min. period for the lesson sequence, provided chiefly by the textbook. In making the comparison in Table
5.5, using all the problem sets provided in each chapter of the textbook and its supplementary materials is not unrealistic: Mrs. Harris and Ms. Johnson had roughly 50% more time each day than the 45–min. periods upon which the textbook sequencing is based. In fact, as the table shows, while the two teachers went outside the text materials for 39.9% of their material, they actually assigned roughly 10% more problems over this period than the textbook material alone would have permitted.

**Summary of the data on mathematical tasks.** The 383 sets of mathematical tasks, totaling 4,198 individual problems, were coded by date, teacher, source, cognitive demand, and alignment with both the textbook arrangement of topics, and the state standards that were to be tested in the late winter and early spring of 2015. There is little to say about problem variation over time at Packersfield. The teachers almost never went beyond the text materials in the first two chapters, but by October online materials, generally additional sets of practice problems, begin to appear regularly among the assignments. The textbook remained the most important source of instructional problems. In addition, the Packersfield teachers introduced a second type of problem: daily and weekly sets of practice problems that regularly took 20 of their 90 instructional minutes. These problems were not closely aligned with lesson topics, targeting fluency needs for their eighth graders instead.

The source for the 1,177 problems not drawn from the textbook materials or the *Math Minutes*/weekly math reviews (28% of all problems assigned) was almost entirely online. Some of these had been located the previous year, when Mrs. Harris and Ms. Johnson struggled to create their own curriculum with no usable text. The two teachers
kept folders of activities and problem sets they had previously used: about a quarter (24%) of student problems came from this source, while the textbook accounted for 40% and the daily and weekly routine problem sets made up the remaining 36% of problems.

Packersfield students were assigned very few high-demand problems during the school year: just 8% of problems were coded 3B3 or higher. Their distribution varied: they made up 17.8% of problems in the second 10–week period, but only 4.7% in the first and third periods. Almost all of the high–demand problems assigned (99.1%) were coded as 3B3: these were concentrated in the textbook’s second unit, where students learned to work on algebraic word problems: questions that required them to represent a situation with an equation, solve the equation, and use the solution to answer a question about the situation.

Over the course of the 32–week study, 39.9% of problems assigned by the Packersfield teachers came from outside the textbook. But this did not change the relative emphasis (as measured by number of problems assigned) between the three domains identified by the testing consortium as “major content”: the textbook and the Packersfield teachers distributed the number of problems focused on Functions, Expressions and Equations, and Geometry in a similar fashion, and the teachers actually assigned more total problems than the textbook and its supplementary material had available, in part because they had more time in their block than the textbook sequencing, based on 45-min. periods, allowed for.
Packersfield PARCC Test Scores

In 2015, the PARCC series of tests was administered in all the schools in the state, including Packersfield. The test was administered in two parts: a Performance Based Assessment (PBA) emphasizing constructed response items, given in late February and early March; and the End of Year assessment (EOY) with a mix of multiple choice and constructed response items, given in April. Because not all school districts in the state had the communication bandwidth necessary for online test administration, schools were permitted to choose traditional paper-and-pencil examinations. Packersfield chose to move immediately to the online testing system, despite some concerns about their infrastructure. The test, like the Common Core State Standards (2012), was new to the Packersfield teachers. During the 2014-2015 school year studied here, there was much uncertainty regarding both content and format of the test. As a result, teachers did not initially have very high expectations for their students’ test results.

For the purposes of this study, the spring 2015 test scores—finally made available to teachers a few days before the 2015 Christmas break—are not a measure of teacher success. My focus is rather on how teachers’ reactions to the scores affect their orientation toward their curriculum work. Here I briefly lay the groundwork for exploring those orientations by detailing the testing results.

Teachers received results in two formats. The first was a list of students with their scores, scaled from 650 to 850. For Packersfield’s eighth graders, the high score was 786, the low score was 650 (3 scores), with a median of 718 and an interquartile range of 45
The mean of the scores was 718.1, compared to the state mean of 736 and the national mean across all PARCC states of 734.

The second format was a chart-like report dividing both the school’s and the state’s seventh grade mathematics scores into five color-coded bands. The cut scores for the five bands were determined at the 27-state consortium level by PARCC, but each state was left free to apply its local accountability levels to the score bands. In Packersfield’s state, the third level was mapped to the level at which a student is considered to have “passed” for accountability purposes. In Packersfield’s Grade 8, 45.9% of students reached at least that level, compared to 63.5% who had reached or exceeded it on the previous test in 2014, and the mean of 63.8% who had reached or exceeded it over the previous five years (STATE, 2015).

This second report also provided four three-band scales (Below, Nearly Meets, and Meets or Exceeds) for four subscores: Major Content, Supporting Content, Reasoning, and Modeling. No indication was given on the reporting form for mapping these subscores to specific mathematics standards or practices, though it was possible at the time to find this information in documents available on the PARCC website (PARCC, 2014; PARCC, 2015). At the time of the interviews, the teachers did not have a clear idea of their meaning.

Major Content for Grade 8 was defined by the PARCC consortium as consisting of 21 standards (with their sub-standards) for: Expressions & Equations (8.EE, all eight standards); Functions (8.F, all five standards); and Geometry (8.G, eight of the nine standards). Supporting Content was defined to include six of the standards for: Number
Sense (8.NS, two standards), and Statistics & Probability (8.SP, four standards) (Common Core State Standards, 2012, pp. 54–56; PARCC, 2014, p. 38). The Reasoning subscore assessed Mathematical Practices MP3, “Construct viable arguments, and critique the arguments of others,” and MP6, “Attend to precision” (Common Core State Standards, 2012). The Modeling subscore, while it addressed Mathematical Practice MP4, “Model with mathematics,” was defined to include all six of the Mathematical Practices not addressed by the Reasoning subscore. Table 5.6 shows the results for each of the four subscores. Percentages in parentheses are for all Grade 8 students in the state.

Table 5.6

Packersfield: Percent of Students Reaching PARCC Proficiency Levels, by Subscore

<table>
<thead>
<tr>
<th>Subscale</th>
<th>Below</th>
<th>Nearly Meets</th>
<th>Meets/Exceeds</th>
</tr>
</thead>
<tbody>
<tr>
<td>Major content</td>
<td>39 (33)</td>
<td>46 (35)</td>
<td>15 (33)</td>
</tr>
<tr>
<td>Supporting content</td>
<td>26 (24)</td>
<td>44 (33)</td>
<td>29 (43)</td>
</tr>
<tr>
<td>Reasoning</td>
<td>50 (32)</td>
<td>32 (31)</td>
<td>18 (37)</td>
</tr>
<tr>
<td>Modeling</td>
<td>58 (43)</td>
<td>15 (22)</td>
<td>26 (35)</td>
</tr>
</tbody>
</table>

Note: Numbers in parentheses are state Grade 8 percentages.

Packersfield Planning Meetings and Interviews

The planning and interview data. There are no recordings of Mrs. Harris and Ms. Johnson planning. In the period before the December holiday, a combination of technical issues with the recorder and external demands on their time (their common
planning period was also the only time allotted for grade level meetings, IEP meetings, and meetings with administrators) prevented the recording of the sessions they did have:

Mrs. Harris: It has just been one thing after another. There just are like—I plan it out on like a calendar, and this is what we are doing, and I write it all out. But it changes so quick, so like, “Oh, I did not get to that,” so it has just been—there have been a lot of additional things dumped on us this year by—

Ms. Johnson: And it is not so much that it has been dumped on is, it has been dumped on us with, like, “Do it now!” So I have a list of—I like to plan things out, to an extent, and when I keep getting stuff dumped on me—

Mrs. Harris: So we both have our, like Resident Educator program that we are in, so we also have our licensure stuff that we have not done anything with, because we are—because of everything else that has been dumped on us. (Joint interview, February 12, 2015)

In fact their planning, as they described it, was reactive more than pro-active, and with a very day-by-day focus:

It is hard to plan ahead of time. It is hard to have the week planned out. Lorene and I will talk about, we want to hit this subject each day, but we don’t necessarily have the activities done. Because it all depends on what we got done that day, how much we got through, on what we can get to the next day. (June Harris, joint interview, February 12, 2015)

This is a theme I will return to in discussing the interview data.
The original plan, as detailed in Chapter 3, was to collect a pair of semi-structured interviews for each teacher, one at the beginning of the school year, the other after the state test scores had been reported. Because of the difficulty in getting recordings of planning sessions, the three meetings with teachers in November, February, and May, which had been meant to clarify and discuss the planning, became extended interviews focused on the assigned work and how assignment decisions were made. Mrs. Harris and Ms. Johnson were interviewed together on these occasions, due to time constraints. A technical error with recording equipment caused the loss of the November interview. When it became obvious in the spring of 2015 that there would be a long delay before the report of results of the testing, I split the final semi-structured interview into two parts: the first part was used at the May interview, and focused on the experience of the year and impressions of the state testing; the second, in mid-February of 2016, focused on the newly-released test results, and on this occasion I interviewed each teacher separately, Ms. Johnson in person and Mrs. Harris by videoconference.

In summary, this part of the data consists of the transcripts of six recorded interviews, totaling nearly seven hours. All interviews were transcribed and checked for accuracy against the digital recordings. I did not code the transcripts in the usual sense in which that term is applied to text analysis. Instead, each transcript was examined for rhetorical patterns using an approach based on the work of Kenneth Burke, as discussed in detail in Chapter 3. I accompany the resulting patterns, and the interpretation I give them, with excerpts from the transcripts in the following discussion.
Community culture and school change. When I first interviewed Ms. Johnson and Mrs. Harris in September 2014, each emphasized how much Packersfield was “its own little world”:

It is a different culture that takes getting used to, but it is perfect. There is a different mindset about people here. Like, for instance, this week we have Fair Week off. So we have been in school two weeks, and then we have a whole week off. (Lorene Johnson interview, September 2, 2014)

Mrs. Harris, who had grown up in a rural county, was less enthusiastic about the culture, and about Fair Week:

My understanding is, if you were going to pick a fair to have off, the Paley County wouldn’t be where the bulk of our students go. But that’s the one that happens during school, so they take the week. Most of the teachers would prefer not to. I know we have a new superintendent as of last year, so that could be something that’s phased out, because they had the same superintendent for quite a few years before that. (June Harris interview, September 2, 2014)

Two themes expressed in these first interviews—the cultural difference of the Packersfield community, exemplified here by “Fair Week”; and the new administration that might “phase out” old practices—were regular refrains over the course of the school year:

When the principal who hired us brought us in, he basically told us, “I am glad you’re from outside of the district, because you’ll raise expectations, and you’re
not going to mold into what’s already here.” (Lorene Johnson in joint interview, February 12, 2015)

One aspect of the cultural difference the two teachers observed was the relatively high rate of poverty in Packersfield, and the pervasiveness of drug-related problems, especially with methamphetamine, compared to what the two teachers had experienced growing up elsewhere. Mrs. Harris said that compared to Packersfield, her home town, Kingston, “was a hard-knocks town, we had our own share of low economic, but we didn’t have the sort of drug issues, and quite the number of low-income that we have here” (June Harris interview, September 2, 2014). But there was another aspect to the cultural difference they observed in Packersfield:

They are open to new people but they are very cliquish, and the fact that they know who has always been here. And if you have not always been here, they are willing to listen to you and hear about things, but when push comes to shove, they are very close-knit and they are going to stick with their own people. (Lorene Johnson interview, September 2, 2014)

This sense of a “close-knit” and “cliquish” community extended to the way the school staff was hired:

When I was hired last year, there were about three or four people who were coming back from [state A], or northern [state B], or some other place, where they had graduated from Packersfield and wanted to come home to raise their kids. That is what they were doing. But the majority of staff at Packersfield are hometown people. What they told me when I accepted the job is, they really like
people who are going to stick around and become part of the community. And, like, they like to hire for a lifetime. (Lorene Johnson interview, September 2, 2014)

Those new hires were in addition to Ms. Johnson, Mrs. Harris, and Mr. Donald, the newly-hired seventh grade mathematics teacher, none of whom were from Packersfield.

Despite this preference for “hometown people”—or because of it, given that the superintendent was hired the same year as the new middle school math teachers—the 2014–2015 school year began with a reshuffling of the staff:

Ms. Johnson: One thing that has really shifted this year is that we have—they have mixed up all of the teachers and all of the grade levels, because they saw that there were some cliques forming with older teachers kind of like stuck—

Mrs. Harris: —just teachers that had got kind of comfortable in their ways.

Mrs. Johnson: They wanted to mix up some positives and negatives, kind of, like, re-energize the building as a whole? And—

Mrs. Harris: —I have seen a huge difference on our eighth grade team. Like even some people that maybe would have been construed as negative before, you see a different side of them when they are not, like, having that person pulling them down, that clique? (Joint interview, February 12, 2015)

The new teachers had been successful their first year in getting new textbooks selected a year earlier than planned, and in getting the next year’s schedule altered to allow 90-min. blocks for Grade 7–8 mathematics classes. They drew a lesson from those successes:
Mrs. Harris: It is hard to make change, because they are used to a way of things being done, and the only way for things to improve is for us to push for certain types of change.

Ms. Johnson: And some of that is pushing with the administration, pushing, you know—

Mrs. Harris: —pushing in our classrooms—

Mrs. Johnson: —pushing at the high school, pushing the elementary—

Mrs. Harris: —pushing each other as teachers—

Mrs. Johnson: —as colleagues. And some people are not willing to do the work to get the change to happen, and that is why they are jumping ship. (Lorene Johnson and June Harris joint interview, February 12, 2015)

The “close-knit community” and an administration that can make change happen both needed to be pushed, and these teachers saw that pushing as a significant part of their role in the school.

Their aim in pushing at the administration and culture was to improve mathematics performance in a particular way:

Packersfield is in the lowest 5% of the state in terms of its test scores, and from my understanding, at least in terms of the eighth grade test—that’s what I deal with as the eighth grade math teacher—it’s been ten plus years since they’ve passed it. So it has been a long time that the math has really struggled, and that the whole school system has struggled. And we are trying to turn that around. (June Harris interview, September 2, 2014)
The state test score was cast in the role of authority: teaching mathematics well meant improving the eighth grade test scores, or more precisely, the percentage of students who scored at least at the state’s *Proficient* benchmark.

The teachers pushed for a new textbook and an extended instructional period as resources for reaching this goal. I will take up the textbook further on, but first I examine their 90-min. instructional block as a curriculum resource, and how their attitude of “pushing” shaped their classroom experience.

**Class time as curriculum resource.** Curriculum does not implement itself (Davis, Choppin, Drake, & Roth–McDuffie, 2014). Just as teachers must learn how to make the textbook (or any other content resource) an instrument of instruction (Brown, 2009; Drijvers & Trouche, 2008; Pepin, 2014), they must learn how to articulate the time in which that instruction is to take place. At Packersfield, these were not separate processes. The teachers had already taken one step to structure their use of time, by deciding to use the daily *Math Minutes* and their weekly math review sheets as a part of classroom routine. In the classes I focused on (the “mid-level” class of each teacher), these two problem sets took 15–20 min. of daily time, leaving 70–75 min. for what they planned to be textbook-centered instruction. But this was still roughly 40% more class time than they had had available the previous year. In September, they were exploring ways of keeping the students working for that extended time:

I try to do something where they are either getting up, or sometimes I’ll do stations, where I’ll have five stations, and then desks pushed together, and I might have a time when we are going on the [individual] whiteboards for eight minutes
at each station. Then they get up and go to the next one, and go to the next one. So they are working in groups on those things, they work with the people at their table, but it is a little more focused, they did not get to pick who they are working with, it is not just partners. I get a little less gabbing when I assign them to the groups. So it might be something like that, it might be a silent work on your own worksheet, “We have been doing the same thing for three days, I want you to do it on your own this time.” Which, that gets the most groans and complaints because some of those low kids can’t—they really struggle. (June Harris interview, September 2, 2014)

The attitude-as-strategy at this point was “use problem sets to keep them working,” which meant not just having a lot of work for them to do, but varying the work several times over the period, and over the week. Selection of student work, then, was partly in response to this need: problem sets, and the classroom activities in which they were to be embedded, had to both “keep them working” and “let them move.” In February, finding the right variety of activities remained a challenge, but the focus had shifted from “keeping them working” to the challenges of meeting different needs in the classroom:

Mrs. Harris: You are doing all the examples, and [the faster students] are done with the examples, and starting on the part you want them to do on their own. And they are done with that before you have even got the kids working on their own. And then it is like, “What do I give them now?”

Ms. Johnson: Yeah, push them without punishing them with more work.
Mrs. Harris: Because a lot of our higher kids, we have higher kids, but none of them want extra work. And that is the challenge, of trying to give them different work, and coming up with that work, to keep them busy but still have enough time to work with the low kids. (Joint interview, February 12, 2015)

One student, able in arithmetic but who failed to qualify for Ms. Johnson’s algebra class, was working out of the algebra book in Mrs. Harris’s room; another student would work on operations with mixed numbers while the class was doing operations with proper fractions. In September, the attitude had been “use problem sets to keep them working.” By February, the attitude had been inflected, to “keep each student working”: the teachers were responding to the students’ distinction of “work” from “busywork,” though attitude and action were not yet perfectly matched.

By the end of the year, they had become more flexible in their attitude toward time. They spoke about it as an “ebb and flow”:

And really, the ebb and flow is a lot about—based on what we see them able to accomplish, not just necessarily, like, getting work done, but like truly understanding about what the work is trying to get across. And so I may not care if they got the last ten problems done, if I already see in the first ten problems that they have got—they get the difference. (Lorene Johnson in joint interview, May 6, 2015)

They were able to see past the work itself, which had become a means of learning, to the object of their instruction, which was now the mathematics: if the students mastered material more quickly than expected, the teachers were now ready to move on to the next
element of the curriculum. They no longer attended to how time got filled, but rather with how it got used: the 90–min. period has been “instrumentalized” (Drijvers & Trouche, 2008) for (and by) Mrs. Harris and Ms. Johnson.

Pushing for change: An outsider orientation. The two teachers saw themselves as pushing for change. They had to push at their “cliquish” community and colleagues, who had no expectations for students’ mathematics achievement, and at their administration, whose support was required for change but not always forthcoming without pushing. They also found that in their first year they had to push their students:

One of the first things we did was sit down, and make it very clear to ourselves and to our kids that we were going to have high expectations, and they were going to meet them. And that was met with some serious, serious issues at first, because they are not used to being held to those high standards in our content area. They are used to kind of getting by, pushing at the—whining and complaining. (Lorene Johnson interview, September 2, 2014)

Their first battle was over the use of calculators. Students were used to having them, and a majority had little fluency with elementary arithmetic. The teachers decided to ban calculators from the classroom for the first two months:

That was a learning curve for me, on how to teach some of this stuff, because I know calculators aren’t going to be there on the PARCC test, I know they can’t just put the fraction in there and simplify it, and then I’m trying to teach them basic algebra, and they don’t know two times four, or one times zero, I mean they
have to plug those things into their calculator. So that was eye opening for me.

(June Harris interview, September 2, 2014)

The teachers saw this as a part of their push for change: they would raise expectations. It is unlikely that the students, who were accustomed to calculator access as part of mathematics class, saw it the same way. The teachers were, in effect, unilaterally changing the “didactical contract” (Brousseau, 1997, p. 31), the implicit understanding about the mutual obligations of teacher and student in the classroom. The wave of whining subsided—“Hey, I have been whining for seven days straight and I have not got my calculator back; I am probably not going to get it back, I have got to learn to do this without it” (Lorene Johnson interview, September 2, 2014)—but by November, calculators had quietly returned to the classroom.

The clash of expectations the teachers experienced in the classroom had its roots, as they saw it, in the community, as well as in an administration that was over-willing to accommodate community values. “Part of the problem with this community is, they have never been taught how the real world works,” as Lorene Johnson put it:

Mrs. Harris: A lot of parents do not live in the real world. I mean, to the extent that they do not have jobs, they are on welfare—

Ms. Johnson: —and so the kids do not have that connection—

Mrs. Harris: —they do not have to do anything to get their money, so why should my kids do anything to get their grades?

When the teachers nevertheless pushed their high expectations, insisting that incomplete homework would get a zero, for example,
Mrs. Harris: We are not backed up in that. We try to really push that, but then our administration might say, “Well, they turned in that assignment, so you have to give them 50% on it.” Like, how does that teach them anything? Because then, that’s all they’re ever going to do: “I can get 50% in there without doing anything.”

Ms. Johnson: And that goes back to a problem with, like, the community, the culture, in the school that we are a part of right now, and the fact that there has been allowed to exist a culture of just getting by and floating along.

Mrs. Harris: Because, like what they will say is, those kids are still failing, right? So what does it matter if they just have 50% or 2%? (Joint interview, February, 2015)

The school, as they saw it, simply “pushed kids along.” It was district policy that all eighth graders moved up to the high school, regardless of their performance:

Ms. Johnson: We have so many kids that, their parents barely made it through their sophomore year of high school, and their thing is, “If I can make it to sophomore year, then that is great and I am dropping out.” And we are trying to push them—

Mrs. Harris: —push them to want more.

Mrs. Johnson: —to achieve, at least trying to make it to junior year: “Push yourself!”
The orientation of the teachers toward Packersfield’s culture during their first year was that of missionaries: their effort was directed to changing the culture, rather than to understanding it, or becoming, like some of their colleagues, a part of it.

This culture they pushed against appeared in their talk as a kind of laxness (“just getting by and floating along”) that had resulted from an absence of authority (it “has been allowed to exist”—though the passive grammar masks who has allowed this): an authority that would have made community members face the “real world” where people work to earn their living. The teachers “pushed” in order to instill in their students an attitude that, were it internalized, would be likely to take them away from their community (Carr & Kefalas, 2009; Corbett, 2006). If Mrs. Harris and Ms. Johnson were, as they put it, “trying to help benefit them and their kids, for the way the world is going” (Lorene Johnson interview, September 2, 2014), they were nevertheless “coming to liberate you from this type of life,” as one of Corbett’s (2006, p. 128) rural informants explained. “Those who don’t make it, well maybe you can go fishing.”

The teachers’ missionary orientation did not cast them as “liberating” their students from “this kind of life.” They cast themselves as preventing the local culture of laxness from pulling their students away from “the real world.” The culture of laxness included the older teachers at the school, among whom even most of those who had not grown up in Packersfield had come to share its culture:

There are so many who are members of the community for a while, that they know different families, and they say, “Oh well, everyone in their family is like
that. They are just going to be like that, and there is nothing you can do to change it.”

In response, Ms. Johnson did not ask former teachers about her incoming students in 2014:

I am trying to get to know them for myself first, just because I think that part of the problem with having—there is a lot of criticism of them just from, like, family connections, and things that I don’t think they should have to carry, at twelve or thirteen? And that is kind of hard to see, right from the start? (Lorene Johnson interview, September 2, 2014)

The students were here cast as imperfectly acculturated: their nurture was not yet their destiny. They were still in the “real world” where “high expectations”—working, learning, “pushing themselves to want more”—might more firmly root them. The classroom was to be a model of this real, more rigorous culture, in which “coming to school is the same as going to a job”: a culture that Packersfield, through its laxness, denied its young people.

But at other times, those same students were cast as carriers of that same pervasive lax culture:

When you have kids that are coming from homes or backgrounds where mom or dad may not work, “Why do I need to do anything? Why do I need to go to school? I can sit on the couch and get money, with—” So they’ll tell you that. So how do you get them to do any work? (Mrs. Harris interview, September 2, 2014)
In Burke’s (1969, p.9) terms, an orientation that stresses the relation of social actors to their setting (the “agent-scene ratio”) in order to “indict” the setting by its effect on the actors, runs the risk of indicting those actors as well. Whereas attitudes-as-strategies are tightly bound by their aptness to the particular situations they recognize, orientations, as grammars of these attitudes, are necessarily open to similar ironies.

**Expectations in the classroom: Mathematical tasks.** Ms. Johnson and Mrs. Harris began their second year determined to continue their “push” for high expectations, but with the benefit now of a new textbook. This textbook appealed to them in part because

  a lot of the questions are higher order. They focus a lot more on not just a single question that you plug it in, find the answer, and there’s the answer, but going through step by step and showing how you found your answer, why you did that. Then using that answer to answer another part of the question: “OK, now you did that, now answer this.” (June Harris interview, September 2, 2016)

Both teachers had ambitions for introducing extended, open-ended problems in their classes, but were still somewhat intimidated by the management challenge of sustaining group work with their students in the face of other demands on their attention:

  Inevitably, you hit that wall, where it is like there are 500 different things expected of me right now? And I am going to revert back to what I am comfortable with, I am going to do a worksheet today. (June Harris in joint interview, February 12, 2015)
So these types of extended activities were at first only ambitions, thoughts for which no effective attitude-as-strategy had developed. Or if there was an incipient attitude, it was “not now”: Mrs. Johnson described having a “mini heart attack” whenever she considered undertaking such a project with one particular class.

The teachers used a three-level classification for the kinds of problems they were comfortable assigning. At the lowest level were “knowledge” problems: exercises that required students to execute an algorithm or procedure when presented with a standard form, such as adding two given fractions, solving an equation, graphing a coordinate pair. These problems could vary widely in difficulty for students (Mrs. Harris: “They don’t know two times four!”), but what made them “knowledge” problems was, that students were understood to either know the preferred, mechanical procedure for responding, or not. These were problems of recall, of “mechanics,” in which mathematical thinking was not taken to play a role.

At the middle level were “applications,” problems involving an unknown quantity stated in a sentence or two. These required students to read the problem for meaning; to determine how quantities in the problem were related to each other, and to the quantity to be determined; to determine whether those relationships required an algorithm or an equation to express them; and finally, to execute the algorithm or solve the equation. Applications, like the knowledge problems, could range in difficulty, but all were considered to require thinking beyond recall of knowledge-problem procedures, beyond “plug and chug.”
Finally there were the “higher order” questions for which the textbook had been chosen. These were usually described as problems with multiple stages, where a solution at one stage would be used in a later stage. When talked of this way they were sometimes called “PARCC-type problems,” because they resembled the problems Ms. Johnson had seen on a PARCC practice test during a professional development workshop. Higher order problems could also be those that required students to explain how or why something worked. They appreciated questions of that sort embedded in the textbook:

Ms. Johnson: The inquiry activities, they show them how to do it, while also explaining why it works. And making it—It is like—

Mrs. Harris: —on how to do it—

Ms. Johnson: —while making them reflect on it. “OK, like here is an example,” and then there is always a reflect piece. Like, “So, what does it mean?” And they have to come up with the generalization of what they just saw happen. So those are good things, because sometimes I feel like [pause] I want them to know that, but I forget to ask them. (Joint interview, February 12, 2015)

If we consider these teachers and their textbook in terms of agency—“having authority over both the mathematics that is taught and the sequencing and presentation of that content” (McClain, Zhao, Visnovska, & Bowen, 2009)—we find them in a kind of halfway house: assuming tentative agency (“I want them to know that”), but with the textbook ready to step in (“I forget to ask them”).

The “knowledge problems”—or more properly, their students’ inability to execute algorithms with rational numbers that the teachers considered to be at sixth- and seventh-
grade levels—were the focus of the daily Math Minutes: “It really focuses on skills they need to remember and that they need to see again and again to cement it. When they are done, we don’t want them not to see it again until the [state test]” (Mrs. Harris interview, September 2, 2014). The Math Minute problem sets, together with the Weekly Math Review’s six or seven knowledge problems, accounted for 31% of the problems students were assigned over the 30 weeks before the final two-week project.

To better understand how Ms. Johnson and Mrs. Harris were choosing problems for students, I take a closer look at their work in the second and third units of the textbook, which consisted of six chapters. The first four chapters began with proportional relationships in simple graphs and charts, then advanced to the concept of slope, the introduction of non-proportional linear relationships and the slope-intercept equation form, and culminated with a brief introduction to the concept of function. The next two chapters began with solving equations in multiple forms, and finished with the solution of systems of linear equations. According to the textbook’s alignment chart, this material covered all the standards for the Functions domain, and nearly all the standards for Equations and Expressions, two of the three domains designated as “major content” for the PARCC testing (PARCC, 2014). As Table 5.5 shows, the teachers provided students with problems in these two domains in roughly the same proportion as the textbook, and actually provided a few more total problems than the textbook alone would have. But as they proceeded through these six chapters, they rearranged the textbook’s sequence for the first time.
The textbook sequence began with the relationship of two-value tables to graphs of proportional relations, but the teachers did not believe their students were ready for the graphing work initially:

We kind of went to the Internet a lot, just doing a search for, like, what are some great things for practicing graphing on? So we did that first. Then we kind of went back to the textbook and looked through, you know, which sections did practice the mechanics? And we would say, “OK, do questions three through five on this page, and six through ten on this.” And we would have a day of doing the textbook questions, but still doing only the ones that were focused on mechanics. But then we definitely went back to the textbook when it got to the unit-rate problems, or rate-of-change problems, or story problems. Because there were so many of them that most of the chapters were made up of. So once they had the mechanics, we were able to go through those chapters much quicker. (Mrs. Harris in joint interview, February 12, 2015)

Their textbook (Burger et al., 2014), though traditional in its overall approach as compared to the “reform” middle school text series of the 1990s, mixed application problems with symbolic skill drills throughout the four-chapter sequence of Unit 2. The Packersfield teachers, however, shared an implicit “symbol-precedence” view of algebra learning (Nathan & Koedinger, 2000; McCrory, Floden, Ferrini-Mundy, Reckase, & Senk, 2012): they acted on the unspoken assumption that in order to deal effectively with “applications,” students first needed extensive practice with symbolic manipulation, to “cement in” the “mechanics” that underlay the work of solving application problems.
Acting on this understanding, they unsorted the textbook’s problems in order to isolate problems exercising the symbol manipulation “mechanics” of algebra first, before having students “apply” their skill to situational problems.

Although Mrs. Harris believed this had prepared students “to go through those chapters much quicker,” both teachers believed that, of all the units in the textbook, these four chapters required the most reorganizing before they taught it again:

We kind of basically figured out, chapters three through six all deal with slope. And we really did follow them, but it kind of seemed like we spent nine weeks on slope, and it was just, like, it kept coming back to that. So we know for next year we are definitely going to work on condensing those chapters, because it just—we spent a lot of time on it, and there is other stuff we have got to hit. (June Harris in joint interview, February 12, 2015)

The textbook work in these four chapters on proportional and non-proportional linear relations, their relations to ratios, unit rates, and the slope of a graphed line, and their expression in bivariate tables, graphs, and equations, felt repetitive to these teachers, as well as to their students:

Essentially it is the same thing. But they showed it as a unit rate, or rate of change, and then they showed it as slope, and then they showed it as proportional and non-proportional relationships, and it really is all the same thing, and the kids were like “Are we ever going to be done with slope?” and I am, like “I do not know!” We actually ended up skipping Chapter 6, because it was more of the
same, and we needed to move on. (June Harris in joint interview, February 12, 2015)

What was “essentially the same thing” was “slope,” the calculation of a constant from the ratio of the changes in the related variables. As the teachers understood it, this calculation was the mathematics being taught. Embedding it in situational contexts, as the textbook did, only served to make the practicing of the calculation less accessible for students.

This led the teachers to reorganize the work in the first three of the four chapters—mechanics before applications. It also led them to skip over the last of the four, Chapter 6, which used those linear relations to introduce the concept of function: from the teachers’ symbol-precedence view, that was just “more of the same.”

The nine weeks spent working on linear relations took them to mid-January, with the first round of PARCC testing to come in less than six weeks, so they were under time pressure in teaching Unit 3, the two chapters on equations (solving linear equations in one variable, then solving linear systems of equations) that followed:

Ms. Johnson: Our thing with equations was, with a lot of the material in the book, so far a lot of it has been good material, but there has not been enough of it for us to use just the textbook material. Because our kids have a lot of holes?

Mrs. Harris: Yeah, a lot of times it starts at like, higher than their level is, so we have got to, like, backfill before we can use the book.

Ms. Johnson: So our textbook for equations, we did not even use the first three [of the four] sections of the chapter of the textbook because they did not—they started with, um, multistep equations, and our kids—most of them cannot even do
one- or two-step equations. And so we had to go back and find materials for one- and two-step equations, and slowly build them up? (Joint interview, February 12, 2015)

They spent 17.5 instructional periods working on equations, and for the first time in the school year spent the majority of those days outside the textbook. The first five periods of work on equations were built around problem sets and guided note activities they either prepared themselves or found online; of the remaining 10 periods spent with the first of the two chapters, only four used the textbook for more than a handful of problems, and one of these four was the chapter test, taken from the textbook’s supplementary material. They spent only 2.5 instructional periods on the second of the two chapters, devoted to solving systems of equations, during which they taught only the graphical method of solution, drawing about equally on the textbook and problem sets found online; the final half-period was a quiz.

The six chapters, of which they taught just over four, coincide roughly with the second 10-week period in Table 5.3, during which over half (56%) of the high cognitive demand tasks students saw during the year were assigned. Over 90% of these were the “application” problems, coded 3B3, and these were present at a slightly higher rate in the textbook assignments (28%) than in the materials with which the teachers supplemented their lessons (21%). Although there were questions within the lessons that asked the students to explain or generalize, no questions of this type were assigned to students as independent work, and so none show up in the textbook use logs.
From the point of view of the standards-based mathematics educator, these teachers appeared to have lowered the cognitive demands placed on their students, thereby depriving them of significant opportunities to “do mathematics” (Stein, Smith, Henningsen, & Silver, 2009). But the orientation of the Packersfield teachers was toward procedural competence as foundational. When they tested the chapter on solving linear equations in one unknown, they modified the test supplied by the textbook:

We used the front page, because it had a lot of applications, and being able to read story problems and write the equation and apply it, but then we needed to just see, can they just solve the equation? And that test did not have a lot of that? (Mrs. Harris in joint interview, February 12, 2015)

Solving the equation was the basic, the foundational mathematics; applying it was more challenging, but less fundamental. The important mathematics was procedural, and so required considerable rehearsal; and this was best accomplished by separating the procedural work from its context in applications.

The applications, seen through their orientation, seemed beyond the capabilities of some students in Packersfield:

Ms. Johnson: Part of the issue with us, in getting to those upper level thinking, application-type problems is, sometimes we struggle just to get our kids to understand the basic—

Mrs. Harris: —the basics—

Ms. Johnson: —conceptual knowledge part of it. And for some of our kids, it is really reaching to get them to the application. (Joint interview, February 12, 2016)
Again, the “conceptual knowledge” they “struggle” to teach is best revealed by student work on the “knowledge problems” they added to the test. The abstractness of the symbolic procedures is what makes knowing how to carry them out “conceptual knowledge.” This orientation toward the mathematics they teach—that it is a set of abstract operations that can be applied to concrete situations—led them to express some doubts about the curriculum implied by the new standards:

I did not love these standards. And I still do not love parts of them. I think they have pushed a little bit too high, or too low too fast, like some of these kids, they are just not ready to reason through these things yet, you know, like they haven’t matured enough. Their brains are all unformed and everything. So there’s still some things that I think are above the abilities of the standard eighth grader. And they do not really need to know. (June Harris in joint interview, May 6, 2015)

Algebra was one area where the curriculum was being “pushed too low too fast” for their students, by

putting in more of this abstract stuff, that they cannot see, or—and it is really hard to do algebra with manipulatives, there are only so many activities you can do with that. So that is the other part that I am kind of, like—and I mean, that is on the same hand, because they want to push algebra and so they have to take something away. And I do not know that that is going to benefit them tomorrow, in the long run. (Lorene Johnson in joint interview, May 6, 2015)

Or as Mrs. Harris put it later in the same interview, “It is really hard to justify to them why they need to know it. Because I could not tell you when you would ever use this.”
**Backfilling and the essential curriculum.** It was not just that some of the curriculum standards seemed to the Packersfield teachers to be above the level of their students: gauging the work needed to close the gap—to “backfill,” as Mrs. Harris put it (February 12, 2015)—was also a challenge for them.

Lorene and I will talk about, we want to hit this subject each day, but we don’t necessarily have the activities done. Because it all depends on what we get done that day, how much we get through, on what we can get to the next day. Because they’ll surprise us, one day on things we think they will struggle with, they have no problem, and they are done in five minutes. And then the next thing that you thought was going to be a no-brainer, that was an addition-subtraction worksheet, it had seven questions on it—and it was adding and subtracting, and it had decimals, or it might be three numbers that they were adding together—they didn’t get done in forty-five minutes. Seven questions! (June Harris, joint interview, February 12, 2015)

What at first may sound like a purely instructional issue—estimating in advance the level of difficulty of an assignment—goes in fact to the heart of the present study’s focus, *curriculum strategy:* “the consistent patterns in the ways that teachers read, evaluate, and adapt curriculum materials before, during, and after instruction” (Drake & Sherin, 2009, p. 321).

As novice mathematics teachers, implementing a new curriculum with a new textbook, the Packersfield teachers had, at this stage, only a very rudimentary set of strategies. Among these was “backfilling,” which as an attitude-as-strategy might be
summarized as “when you find a hole, fill it.” An immediate consequence of this strategy is evident in the interview excerpt above: curriculum plans were frequently derailed when unexpected holes appeared, or expected holes failed to appear, in student understanding.

Two additional factors contributed to backfilling as a curriculum strategy. One was the uncertainty surrounding the test their students would face in March and April of 2015.

We are running into this time crunch now, with the PARCC being in March, and basically them saying all the standards are fair game. I do not think every standard is going to be on there, but we do not know which ones are not. So we are kind of like, “We introduced it, the high kids are going to get it, the low kids can try something, we have got to move on to the next topic.” And then hopefully, we will be able to come back and fill in again, some more of those applications after we can at least touch on geometry. Because we have not started geometry yet.

(June Harris in joint interview, February 12, 2015)

The demands of the testing allow no time for backfilling: each curriculum topic must be “introduced,” but just sufficiently that they have time to “move on” to all the others. There is no way to determine which might be tested, which should be emphasized. This will disclose many holes that require backfilling, and the work of filling them—so that more than just “the high kids are going to get it”—must be postponed until the testing has ended.

The second factor contributing to reliance on backfilling as a strategy is institutional:
We have waited till the majority of our classes have shown mastery, so even if they did not have mastery yet, we have gone back and retaught, and then gone forward when about seventy-five percent, eighty percent of our classes had mastery? Because that is kind of the way that our district has decided we want to move forward. We do not want to keep teaching and “Nope, nobody has got it.”

(Lorene Johnson in joint interview, February 15, 2015)

At Packersfield Middle School, there is an expectation that teachers will assure that the majority of students (“about seventy-five percent, eighty percent”) have “mastered” the current skill or concept before instruction proceeds to the next topic. While not what Bloom (1968) intended by “mastery learning” (which requires individualizing the time each student spends learning a skill), this expectation assures that significant class time in the middle grades will be spent “filling holes” for students.

The long-range consequence of backfilling as a strategy was to create a kind of cognitive dissonance for the teachers around curriculum. On the one hand, they had committed at the beginning to using their new textbook as their curriculum for the year, and by year’s end were satisfied that they had succeeded:

We really came out pretty good, in the end, as far as, like, getting everything covered by the end of the year? Now by PARCC—by the time that we PARCC tested, there are some things we can adjust, but as far as getting through the chapters we needed, from talking to the Algebra teachers, they said “Get through chapter fourteen, fifteen, and do not worry about it. We will cover it, that is not something they need to know before they come.” And we are doing chapter
fourteen right now. (June Harris in joint interview, May 6, 2015))

But as the teachers were well aware, they had often substituted for the textbook’s lessons their own lessons, emphasizing mechanics, and their own “knowledge problems.” Here again we find Burke’s paradox of the essential: what they taught that year was essentially the Common Core curriculum (in the sense that they followed the sequence of the standards and addressed them all), while being actually rather different from the Common Core (in the sense that they spent significant curricular time and resources addressing skills and understandings different from those in the eighth grade standards). In the case of the Packersfield teachers, the appearance of the paradox, rather than implying an incoherence in their attitudes, comes as irony: they were acutely aware that what was taught and what the standards demanded did not align, that they addressed the standards as aspirational rather than as actual targets for learning in their first year with the new textbook.

There are things that I know that I want to do, things that are going to work better for these kids than what I am doing now? It is just, like, getting there. Because inevitably you hit that wall, where it is like there are five hundred different things expected of me right now? And I am going to revert back to what I am comfortable with, I am going to do a worksheet today, because I just do not have time to create or come up with anything else. And I am completely spent and exhausted in what I am trying to do, so, like, “we are just going to go with it as best we can today. And then next week, hopefully I will have another good lesson for you.” So like hopefully, you know, like I mean it will happen the more we are
here, we are starting to build that bank of, like, good projects, and like really rich activities, where it is not coming up with it all—like, we are never going to be able to spend every lesson on it, like we are always going to be coming up with new things. But, like next year, I already have one for each lesson, so I can come up with a second one for each lesson. And eventually we will have three for each topic. And really trying to build it, in that way. (June Harris in joint interview, May 6, 2015)

On the one hand, the irony is evident as contradiction. They chose a new textbook (after a chaotic first year with no official curriculum) because it had problems demanding student reflection and conceptual elaboration. They then spent the bulk of their first year with the text substituting exactly those “plug and chug” mechanical problems they had wanted to get beyond. On the other hand, however, their awareness of the irony, as I will discuss in Chapter 6, led them to the development of new curriculum resources and strategies, as their curriculum reasoning advanced.

**Looking Back: Packersfield Teachers Reflect on Test Scores**

Asked about the test in May of 2015, just after they had completed its second part, the response was blunt:

Honestly, it was ridiculous. That is the best thing I can think of, the word *ridiculous*. The questions were unrealistically difficult. (Lorene Johnson, joint interview, May 6, 2015)

Perhaps as a result of such low expectations, the scores, when released, seemed by comparison reasonable:
To be completely honest, for the most part, they did exactly kind of how they would have done in class. So my higher kids were able to get a passing score, or, like, almost a passing score? And my lower kids, who did not normally put much effort in class in were predictably much lower. (Lorene Johnson interview, February 18, 2016)

There were a few kids who maybe surprised me by being lower—that I would have thought did better on their math scores than the PARCC test represented. But they were not my top students, and they were kind of the ones that some days they would come in and give you really good effort, and you would get an honest reading of how they did; and then the next day if they did not buy into it, it would drop. (June Harris interview, March 19, 2016)

But other than the relief that student scores were not worse than in previous years, the Packersfield teachers had little interest in the test results. When I interviewed them, between two and three months after the score release date, each had only vague recollections of the report with subscores. What those scores measured was opaque, and in any case, the PARCC test would not be repeated: neither saw any reason to draw lessons from its results.

What occupied their minds was, rather, the experience of teaching the standards through their new textbook for the first time. In May, 2015 they had much to say about what they intended to do differently in the next academic year. And by February of 2016, they were able to assess the relative successes and failures of those plans. The same process was happening at Portland Middle School with Mrs. Roberts. Meg Miller,
meanwhile, was attempting to re-fashion her curriculum strategies in the context of a small rural high school.
Chapter 6: Analysis & Conclusions

Introduction

The case studies of curriculum work at Portland and Packersfield middle schools presented in Chapters 4 and 5 above were undertaken to explore the development of those teacher attitudes I have called curriculum strategies, guided by the set of questions raised in Chapter 1:

1. In what ways do curricular resources (textbook, supplemental materials, teacher-designed activities, assessments) get deployed in teacher and intern curriculum strategies?
2. How did teachers’, interns’, and others’ expressions of Schwab’s four commonplaces of curriculum in their orientations affect the development of curriculum strategies? How did the strategies developed, and the results of their enactment, affect those orientations?
3. Did other categories of orientation or attitude come into play in developing curricular strategies? Which ones, and whose? How did they affect orientation toward (a) mathematics, (b) students as learners, (c) the practice of teaching, and (d) the values, expectations, and culture of the local community?

After assessing the data in light of these guiding questions, I conclude by suggesting both possible extensions of these answers as a guide for future research, and by indicating the limitations on any such extension that follow from the nature of the methods I have employed, and the character of the specific people and sites that have here been my focus here.
How Curricular Resources Get Deployed in Curriculum Strategies

In both schools studied, when the 2014-2015 school year began the major curriculum resource at each was a newly adopted textbook, chosen because each appeared to align with the new Common Core standards that were to be tested in the spring. At Portland Middle School, after the first 8 weeks of instruction, a conscious decision was made to work “outside” the textbook. At Packersfield Middle School, after the previous year with an out-of-date textbook and no curriculum, a conscious decision was made to “stick with the text.” And yet, looking at the work actually assigned at each school, we see that at Portland, 40.1% of problems assigned after the decision to move out of the textbook nevertheless came from the text; while at Packersfield, 41.6% of problems all year came from the text. It would appear that opposite strategies for using the textbook led to nearly identical rates of textbook usage. But a closer examination yields a different story.

The case of Portland Middle School. Mrs. Porter, the experienced teacher at Portland, was what might be called “textbook–agnostic”:

I hop in and out [of the textbook] all the time ... If I go, “I do not like the way the textbook does that,” I look to the resources I have on my shelf. If I don’t find anything that matches with the new Common Core, I go online. (Roberta Porter interview, September 3, 2014)

She began the school year using the textbook as her main resource: she understood her assignment to include piloting the new material. But when, eight weeks into the term, she was asked to move away from the text, she was both ready and able to do so, as she had a
rich accumulation of alternative resources in her files, and in trade books she had acquired over the years.

But she had no aversion to “book work,” as her intern, Meg Miller, initially did. We examined that contrast in Chapter 4: Mrs. Porter, who appeared to see the text as just another resource, chose assignments from it much less frequently (21% of assigned problems) than her intern. Ms. Miller, who initially deprecated “bookwork” as boring, nevertheless used the textbook as the source of more than half (57%) of the problems she assigned. And we saw that, while she assigned textbook work less frequently, Mrs. Porter’s textbook assignments were much more likely than Ms. Miller’s to be higher-order tasks (35% of tasks to 1.6%).

The textbook was a very different resource—almost a different book—for each teacher. What Mrs. Porter looked for were the book’s exploration activities, and the reflective questions that accompanied the lesson texts. What Ms. Miller initially saw, and what she used most often, were the sets of practice exercises that followed each lesson. This is not surprising, given the difference in their experience. Ms. Miller was still focused on the giving of each lesson (recall her early emphasis on “explaining it clearly”): shifting to seat work from the textbook after a lesson both gave her a break from being the focus of attention, and allowed her to see, in students’ practice, how a lesson had gone. Mrs. Porter, more experienced at instruction, was more focused on getting students to “grapple,” and chose tasks that were more open ended and less well defined.
Ms. Miller did assign many higher-order tasks over the course of her internship, at a rate (16% of tasks) somewhat greater than her mentor’s (11% of tasks). But (perhaps because of her initial textbook aversion) she rarely chose such activities from the textbook: she found most of them in online sources. This has continued in 2015-16 for her course in “Real-world Math”:

Well, there is a book. And I have an online version of it, so I make worksheets from that, too? I look at Yummy Math, that Roberta used, I do—I try to do other online courses. I just try to think of things? Like, my parents are real estate agents, so we did a whole unit on housing, and so I just really kind of—anything I can think of, “Oh, that is mathematical, let us do it.” And I just research and research. It is an experience, for sure. (Meg Miller interview, February 16, 2016)

Her precalculus course was more text-centric, but she has re-invented the “secret learning” she discovered in Mrs. Porter’s classroom:

I was having trouble, at the beginning, finding stuff for the kids to do, because they do not like working from the book. So I do not ever have them touch the book. I type everything up, and then give it to them, as if they do not know it is from the book. So it is like a mental thing, they think it is a lot better, it is more interactive. (Meg Miller interview, February 16, 2016)

Like her former mentor at Portland Middle School, Ms. Miller is becoming “textbook–agnostic”: a textbook is just another collection of curriculum resources from which one chooses learning activities:
Everything is made by me. I kind of pick and choose, like, what I know they will really need, and like, if this is going to take too long, I will not pick that. Because I know it will strain them too much, and then they will be kind of checked out, they will not be interested in it anymore. (Meg Miller interview, February 16, 2016)

A part of Mrs. Porter’s curriculum work in 2014-2015 was to document her path through the Grade 7 standards by creating a curriculum binder of daily lessons. The purpose of the binder was twofold: both to document the district’s mathematics curriculum (a similar binder was being prepared at each grade level), and to serve as a guide for others who might teach seventh grade mathematics at Portland Middle School. That is precisely what happened in 2015-2016: the matriculation of a larger-than-usual class of seventh graders required four sections of mathematics, and a teacher was hired for the extra section, plus two sections of Grade 8 mathematics. I asked Mrs. Porter if the new teacher was using the binder:

He uses it primarily as his reference. He is a new teacher, but he was in the building last year as a student teacher. And he is great, he has his own ideas and if he sees something he can approach a different way, he jumps off and does it. He does not have to ask, “Is this OK?” He just does it. As long as he covers the same content, it does not have to happen the same way. (Roberta Porter interview, February 15, 2016)

The binder, like the textbook, is a collection of resources to be used as each teacher sees fit. But it also replaces the textbook as the standard for what is to be studied in seventh
grade mathematics. And it codifies, for now, Mrs. Roberts’ choice to emphasize Number Sense tasks—which she saw as a necessary foundation—much more than the textbook, and consequently to de-emphasize tasks for Equations & Expressions.

The case of Packersfield Middle School. The teachers at Packersfield, who intended from the start to make their new textbook their major curriculum resource, almost never went beyond the text materials in the first two chapters, other than for their fluency-building Math Minutes and Weekly Math Reviews. But by October online materials began to appear regularly among the assignments. Overall, 41.6% of all problems assigned were chosen from the textbook. But nearly a third of all problems were the Math Minutes and Weekly Math Reviews, the former confined to the first 15 min. of their 90-min. block, the second averaging five min. a day of class time. If we eliminate these, 60.7% of the remaining 2,829 problems were from the textbook (including supplementary materials).

But where the Portland teachers had moved out of the text to allow for more problems that required students to “grapple,” at Packersfield the problem sets chosen (largely from online sources) were meant to supplement the number of “knowledge problems”—practice with mechanics—available in the textbook. In part, this was a reflection of their inexperience managing instruction, combined with their extended class periods. The attitude-as-strategy at this point was “use problem sets to keep them working,” which meant not just having a lot of work for them to do, but varying the work several times over the period, and over the week. By February, the attitude had been inflected, to “keep each student working”: the teachers were responding to the students’
distinction of “work” from “busywork,” though attitude and action were not yet perfectly matched.

By the end of the year, they had become more flexible in their attitude toward time. They spoke about it as an “ebb and flow.” They were able to see past the work itself, which had become a means of learning, to the object of their instruction, which was now the mathematics: if the students mastered material more quickly than expected, the teachers were now ready to move on to the next element of the curriculum. They no longer attended to how time got filled, but rather with how it got used.

From the point of view of the standards-based mathematics educator, these teachers appear to have lowered the cognitive demands placed on their students, thereby depriving them of significant opportunities to “do mathematics” (Stein, Smith, Henningsen, & Silver, 2009). Only 8% of assigned problems were higher order, and these were almost entirely the algebra word problems addressing *Equations & Expressions* standards. But the orientation of the Packersfield teachers was toward procedural competence as foundational. They acted out the attitude-as-strategy that, in order to deal effectively with applications, students first needed extensive practice with symbolic manipulation, to rehearse the mechanics that underlay the work of solving application problems. And they had, at this stage, only a very rudimentary set of additional curriculum strategies, among which was backfilling. As an attitude-as-strategy, this might be summarized as “when you find a hole, fill it.” An immediate consequence of this strategy was that curriculum plans were frequently derailed when unexpected “holes” in student skills or knowledge appeared.
There was an ironic aspect to this effort to supplement the textbook with more mechanical practice. Both teachers had ambitions for introducing extended, open-ended problems in their classes. The textbook had been selected because it had more high-order problems. But these teachers still had their hands full with the management challenge of sustaining group work with their students in the face of other demands on their attention. They were acutely aware, even as they assigned one more page of drills, that they were not where they wanted to be.

Their ironic awareness was not merely aspirational: It motivated curriculum work. Reflecting on the study year in May 2015 one major concern was mathematical vocabulary,

which we talked a lot about, like accurate mathematical vocabulary, and stressing specific math terms that we have not done, did not do [this] last year as much, but we did not spend as much time talking about different—we mentioned testing-type vocabulary, but they [the PARCC test] would use words that were more—that were above and beyond, I think, what eighth grade kids are used to seeing in a test situation, you know, I guess? (Lorene Johnson in joint interview, May 6, 2015)

Their initial idea that May was to work with other subject area teachers to introduce a vocabulary notebook that students would be required to keep and carry between classes. I asked about that notebook in our last interview.

The vocabulary notebook across subjects did not happen? But Lorene and I did sit down at the end of last year [2015], and we wrote up a vocabulary list for each
section, and then created a vocabulary sheet, where they had to, like, write the word in a sentence, and then they wrote the definition, any additional characteristics. They had to give an example, and they had to know what part of the book—like, what topic it went with. (June Harris interview, March 19, 2016)

The barrier to having the students engage in more higher-order tasks, as they saw it at the end of the study year, was not classroom management per se, but finding (or creating) rich activities that were at once engaging and manageable for them. The textbook had many “PARCC-type” (i.e., multi-part application) problems, but not nearly enough, and none that would extend into inquiry activities, in which students were engaged in open-ended problem-solving situations. They had found no other source for such problems:

That type of problem, and those types of scenarios where you want them to be leading the discussion, you want them to be doing everything, they take time to make. And you are not going to find them in a book. You have to actually go out, and sit down, and really dig in and make a situation or problem like that. (Lorene Johnson in joint interview, May 6, 2015)

Off-the-shelf (or in their case, off-the-Internet) projects could only serve as a starting point for curriculum work, because they did not take into account the particulars of their instructional reality: the need to backfill, the low levels of literacy, the cultural differences expressed in their students’ attitudes toward work and money. Nevertheless, they expressed confidence that they could continue to develop two or three such inquiry activities each year, as they had already done in their first two years: “like next year, I
already have one for each lesson, so I can come up with a second one for each lesson. And eventually we will have three for each topic. And really trying to build it, in that way” (June Harris in joint interview, May 6, 2015).

At our last interviews, the Packersfield teachers described their new teaching year as different from the study year in the way they used the textbook:

We have not used our textbook nearly as much this year as we have in the past. So I would say, almost—other than the first three units—we have done almost exclusively guided notes. And then we would use the practice problems in the book, or then have an assignment out of the practice section. (Lorene Johnson interview, February 18, 2016)

The textbook was now the source of practice rather than the source of lessons, although they did continue to follow the sequence of the textbook’s chapters (which mirrored the sequence in which the Grade 8 Common Core (2012) standards are listed). The guided notes they substituted for the textbook’s lessons solved the problem—at once instructional and behavioral—they had found with their “write-in” textbooks, in which all the computational steps in each lesson’s example problems were already filled in.

Having worked through the textbook for a year, they were more prepared to look at the supplementary materials supplied by the publisher. “You kind of like go with [the textbook], then look at it the next year and say, ‘What else does it have to offer that I can start working with?’” (June Harris in joint interview, May 6, 2015). They had already used the additional practice worksheets (two per lesson), and in fact had felt forced to find many more such worksheets, both for backfilling, and to occupy students in their 90-
min. class periods. In the 2015-2016 year, taking advantage of the additional Chromebook cart that had been added for the spring 2015 PARCC testing, they were exploring the electronic resources. They found the CD-based question bank unhelpful, because its problems were generic: the vocabulary did not match the vocabulary used in the text or in the standards. They had tried to use an online test-generating program that had the capacity to let them structure the multi-part “PARCC-type” problems they wanted their students to practice, but found it to be too cumbersome and time-consuming. But a newly-added feature of the publisher’s website, which supplemented their guided-notes lessons, seemed more promising:

It is kind of—it is not exactly what the textbook notes look like—they work along with someone that is reading them the textbook, and verbally talking them through how to do the problem, kind of like we would be doing if we were giving the notes? And they have to be typing along with it. So we have used that before, on a couple of our Chromebook days, just to get them used to the typing, and to see how they responded to it? And a lot of the kids who, like—for some reason that works for them better than us. Because it is a more one-to-one thing, even though we are not the ones giving the step-by-step. (Lorene Johnson interview, February 18, 2016)

Use of the computers was now a regular curriculum routine. Each teacher could count on having use of the 30-Chromebook cart on a specific day every week.

The textbook (and its supplements), in short, was becoming instrumentalized (Drijvers & Trouche, 2008; Pepin, 2014). Rather than presenting itself, as it did in the
study year, as a unitary artifact to be explored, the textbook’s discovered affordances were being differentially integrated into curriculum routines. This routinization freed teacher time and attention for the still-pressing issue of behavior management, and for the work of finding and developing the inquiry work the teachers realized were still missing from their curriculum.

**Schwab’s Commonplaces and the Development of Curriculum Strategies**

The second question guiding this research was, “How did teachers’, interns’, and others’ expressions of Schwab’s four commonplaces of curriculum in their orientations affect the development of curriculum strategies? And how did the strategies developed, and the results of their enactment, affect those orientations?” The four commonplaces—subject matter, learners, teachers, and milieu (Schwab, 1978, pp. 365–367)—are related, not as analytic components of curriculum or curriculum-making, but as bodies of experience, affording separate, overlapping, and sometimes competing orientations toward curriculum. In a large school system, or in a national body preparing a set of curriculum standards, these bodies of experience, these ways of naming and seeing the world, may be embodied by individual specialists: mathematicians, child development experts, learning theorists, teachers or teacher educators, parents or representatives of parent groups, businessmen or corporate lobbyists. In the small, rural schools like those studied here, the four commonplaces are more likely to compete for precedence in the individual orientations of teachers and principals.

In the original design of this study, the interplay of these commonplaces with curriculum strategies was expected to appear where those strategies were forged, in the
joint planning sessions at each school. For reasons discussed in Chapter 3, those sessions were not recorded, and so cannot be documented. As a result, I can only respond to the second guiding question in a fragmentary way, pointing out what was visible, without being able to relate these visible parts to the full play of interactions.

The case of Portland Middle School. At Portland Middle School, the interplay of commonplace and strategy was most visible for the commonplace of “the learner.” The Portland district had adopted a very specific view of the learner and learning:

We want to make sure that not only are the activities student-centered, but is there choice involved? Do students get a say in how they demonstrate their mastery of a concept? And that has been really important this year. (Roberta Porter interview, November 18, 2014)

These were Portland’s new Learning Principles, and the building principal, Mr. Roberts, and the Portland superintendent, Dr. Bosquet, were frequent classroom visitors as the teachers put the new principles into practice, according to Mrs. Porter and Ms. Miller. The visits did not appear to be felt by the teachers as enforcement. It is true that Mrs. Porter abruptly dropped textbook use when Mr. Roberts suggested it eight weeks into the school year, but it was her reliance on the text—which she felt obligated to pilot—that was unusual: as an experienced teacher, she was used to “jumping in and out of the textbook,” and she returned easily to her normal instructional mode.

Where she disagreed with her principal—over homework assignments, for example, which he deprecated, but which she felt gave her insight into individual achievement—she had not been pressured to conform. Instead, she and Mr. Roberts had
been engaged in an ongoing dialogue, including shared readings, as we saw in Chapter 4; a dialogue which was still ongoing at the time of our last interview, in 2016. The school’s learning principles (in the development of which the entire faculty was involved) were easy for her to put into practice because they supported and affirmed her own view of student learning: that what was foremost was engaging students in *grappling* with open-ended problems. She knew many of her students to be disadvantaged, and to be discouraged by mathematics:

> We know that these kids pretty much start out behind the eight ball. And they are not all in that classification, but many, many of them are. So we know that our students are not going to perform well. (Roberta Porter interview, February 13, 2015)

Getting them to grapple, to stay with difficulties, to see that success (rather than “correctness”), though elusive, was possible was to make them learners. And grappling is what she had enjoyed as an undergraduate, debugging her computer programs, what made the local Math Circle meetings rewarding for her, and what she identified with the Common Core’s (2012, p. 6) first Mathematical Practice: “Make sense of problems and persevere in solving them.” The school’s learning principles, and the school’s math coach, who worked in her room the first semester of the study year, also supported this emphasis on grappling, and the cycle of “rich problems” she built into her instruction to foster it in her students.

Ironically, it was precisely this support of her own orientation toward student learning that reinforced her misunderstanding of the *Reasoning* subscore of the PARCC
That subscore measured Mathematical Practices MP3 and MP6, constructing careful arguments and attending to precision (PARCC, 2015), though she had no simple way of knowing this. These two aspects of problem solving were exactly what her rich-problem work had downplayed, in favor of “creating multiple entry points,” so her conclusion—that what her students needed was even more grappling—was not likely to improve performance on this subscore.

This is an important point. Within our Burkean framework, attitudes are both a naming of a situation—“This is an X”—and a response to it—“When I see X, I do Y.” Behind the recognition and the response lies a judgment: “The outcome of doing Y in situation X is good.” In examining Ms. Miller’s increasingly effective attitudes-as-strategies in Chapter 4, we saw that the ability to distinguish situations and the ability to respond to them effectively were two sides of the same phenomenon of professional growth, guided by “success”: by the increasing ability to produce a desired outcome. But when the response to an action comes in the form of a proxy—as here, in the form of an opaque subscore on a remotely-designed test—the feedback that normally guides us toward increasingly effective action can be disrupted, as it might have been for Mrs. Porter. But Portland teachers have been encouraged to take such proxy feedback with a grain of salt:

Our leadership doesn’t believe that those tests, one snapshot, [are] a true measure of what our kids are capable of doing, so that has never been a real focus for us. And if it was determined that the test was driving what we do in the classroom, there would be a real problem. (Roberta Porter interview, February 13, 2015)
The case of Packersfield Middle School. At Packersfield, the interplay of commonplace and strategies was most visible in the study year for the commonplace of milieu. In a sense this is the most diverse of the four commonplaces: it includes the multiple ways that community perceptions and expectations touch the school (through parents, the media, the business community, the school board, and local, state, and national political bodies), but also the ways in which administrative actions (scheduling, discipline policies and procedures, curriculum procedures, evaluation procedures, budgeting, building maintenance), and informal but no less real social relations (school climate, staff culture, personal relations with students, colleagues, and administrators) that affect what happens—and what can happen—in classrooms.

As we saw in Chapter 5, the two novice teachers found themselves caught up in a cultural clash in Packersfield. While they felt it immediately as a clash of expectations in their classrooms, it had its roots, as they saw it, in the community, as well as in an administration that was over-willing to accommodate community values. “Part of the problem with this community is, they have never been taught how the real world works,” as Lorene Johnson put it (joint interview, February 15, 2015). The orientation of the teachers toward this Packersfield culture was that of missionaries: they wanted to change the culture, rather than to understand it. This culture they pushed against appeared in their talk as a kind of laxness (“just getting by and floating along”) that had resulted from an absence of authority that would have made community members face the “real world” where people work to earn their living. Their classrooms were to be a model of this real,
more rigorous culture, in which “coming to school is the same as going to a job”: a
culture that Packersfield, through its laxness, denied its young people.

My job is to teach them how to live their life. And yes, I am also teaching them
math, but if they do zero percent of the work, then they get zero percent. Because
in life, if they do not do anything, then they get their butt kicked out—out of the
store, or out—They are out on the street, and they do not have a job. (Lorene
Johnson, May 6, 2015)

As a consequence, they set firm, explicit expectations for work in their
classrooms. There would be no calculators before November. Papers showing no effort
would get zeroes, not the 50% the administration wanted as a minimum grade. Above all,
mathematics class, like a job, required work. As we have seen in Chapter 5, in September
the attitude-as-strategy had been “use problem sets to keep them working.” By February,
this had been inflected, to “keep each student working”: the teachers were learning to
differentiate, to respond to their students’ distinction of “work” which engaged from
“busywork” which merely filled time, though attitude and action were still not perfectly
matched. Other strategies (“backfilling,” “mechanics before application”) contributed to
the need for large numbers of worksheets, as did the institutional reality of 90 minutes to
fill each day, but one driving force through the year, re-appearing in every interview, was
the felt need to get and keep students working.

Development of curriculum strategies: Observations and conclusions. The
second guiding question for this study was, “How did teachers’, interns’, and others’
expressions of Schwab’s four commonplaces of curriculum in their orientations affect the
development of curriculum strategies, and how did the strategies developed, and the results of their enactment, affect those orientations?" The answer to this question is relatively thin. It was meant to be answered through analysis of the transcripts of 30 to 40 planning meetings at each school, but those meetings were never recorded. Analysis of the interview data, while allowing us to see the development of some curriculum strategies over time, hides for the most part the way the attitudes drawn from the commonplaces influenced, and were influenced by, curriculum strategies.

I have indicated two places where some interaction was visible. At Portland, the school’s learning principles, which encoded an attitude toward student learning that fit Mrs. Roberts’ predisposition both to cultivate grappling, and to use that grappling to engage her students with mathematics, both supported her work and were supported by her—even to the point of deprecating the results of the state testing. At Packersfield, the missionary attitude engendered by what both teachers felt as a clash of cultures, led at first to a curriculum strategy of “keeping them working.” Over time, that strategy developed toward a recognition of differentiated learning—but without ever losing its missionary edge.

**Other Categories of Orientation**

The third question guiding this research was, “Did other categories of orientation or attitude come into play in developing curricular strategies? Which ones, and whose?” In effect, this question asks us to attend to orientations or attitudes not subsumed under the four named commonplaces: subject matter, learner, teacher, and milieu. The answer here must be no, not because such additional orientations may not play a real role in the
development of curriculum strategies, but because the level of detail in the data, absent the planning discussions, does not allow us to see.

Nevertheless, there are other factors that played or may come to play such a role at the two schools studied, and indicating those here may in some measure make up for the failure of data elsewhere. The factors I have in mind are prevalent in the small, rural schools like the two in which this study was situated.

The first and most significant of these factors is what we might call the fungibility of staffing. At Portland in 2015–2016, the social studies courses for the middle grades, which had been eliminated three years previously to allow for extended periods of reading and mathematics, were re-introduced, and consequently teaching assignments had to be shuffled. Roberta Porter, whose certification is K–8, is legally qualified to teach all core academics, and was expecting to be assigned to two “humanities” (combined reading and social studies) classes, leaving her only a single mathematics class, with the remaining sections of Grade 7 mathematics to be taught by a new science teacher. In the end, the new hire took the humanities classes, but even so, a fourth section of Grade 7 mathematics was required, and was now being taught by another new teacher. At Packersfield, a larger-than-average new Grade 8 required an extra section of mathematics, which was being covered by a high school math teacher. Such re-arrangement of assignments in response to scheduling or demographic changes is more likely to happen in smaller schools (Dobson & Dobson, 1990).

We saw that at Portland, the administration had Mrs. Porter develop a curriculum binder documenting her year teaching to the new standards, and that the new teacher uses
this binder. But each new teacher who comes to a course must develop curriculum strategies appropriate to the material, and must either instrumentalize (Drijvers & Trouche, 2008) the textbook, or acquire a range of appropriate alternative materials elsewhere, all of which takes time and energy over and above the daily work of teaching. This in turn may have consequences for the enacted curriculum, and so for the curriculum as students receive it.

A second factor that may influence curriculum work in small schools within the current environment of state and national standards and assessment is the lack of intermediaries to assist teachers in understanding the kinds of proxy data they get from such accountability mechanisms as state testing. We saw one case of this at Portland, where subscores on the PARCC test suggested to the teacher an inappropriate course of action because she did not know what the scores were designed to measure. At Portland, apparently, neither the mathematics coach nor the administration knew any more than the teacher. Unlike the issue of staff fungibility, this factor could be directly addressed by making visible what score numbers claim to measure.

**Implications for Further Research**

Despite the failure to get recordings of teacher planning sessions, this study illustrates the kinds of insight into teacher attitudes achievable by bringing together careful documentation of teachers’ observable actions—in this case, their choice of materials for instruction—with careful listening for the attitudes-as-strategies to be found in their talk about those actions, using Burke’s (1954; 1966; 1969a) rhetorical framework. More case studies of the kind undertaken here would offer a more varied and nuanced
picture of what I have called curriculum strategy; and the same investigative method
could be extended to other sorts of teacher action: for example, a close “reading” of the
dialogue in a Lesson Study post-lesson discussion (Fujii, 2016), coupled with a videotape
of the lesson.

As the data here show, a teacher’s attitudes, and the orientation that binds them
together, are not static, especially for those teachers still learning their craft. In
mathematics education, the concept of a “learning trajectory” (Simon, 1995; Sztajn,
Confrey, Wilson, & Edgington, 2012) is used to identify the “path” of problem situations
and subsidiary concepts through which a learner proceeds in mastering a mathematical
idea. Some have been tempted to apply this construct to teacher learning as well (e.g.,
Huang, Gong, & Han, 2016; Stigler & Hiebert, 2016). For example, Meg Miller, the
student intern at Portland, moved from conceiving the textbook as something to be
“essentially” avoided (in Burke’s paradoxical sense of the essential), to using it as a
scaffold for instruction, to seeing it as one among many resources for finding suitable
tasks. It would be good to know how typical this movement is, and what kinds of
classroom experiences accompany each shift in the way the text is seen.

However, a caution must be observed here. What mathematics students (ideally)
develop in passing through a learning trajectory is a type of epistemic knowledge: a
concept which is logically linked to other mathematical concepts in a manner free of any
non-mathematical context. What Ms. Miller developed was a type of phronetic
knowledge, what I have called an attitude-as-strategy. This kind of practical knowledge is
always linked closely to its context, and rests at least in part on judgments of value, of
what is good to do in a classroom with real students. It is possible that the kinds of developmental pathways for such phronetic knowledge, even if typical pathways can be identified, may prove to be more varied, and more linked to social and emotional aspects of the learner, than the learning trajectories of mathematics students.

Finally, this study of the development of teacher attitudes should make researchers cautious when doing studies that treat attitude as a variable. Teacher attitudes, as a kind of phronesis, cohere with the context of their enactments in classrooms, not with some underlying logical system of ideas. As a result, it is possible for teachers to hold—and for researchers to elicit—apparently contradictory attitudes from teachers, where no contradictions in practice exist. And, as the Packersfield teachers show, it is also possible for teachers to have ironic attitudes: believing that a situation calls for one type of action, while feeling simultaneously compelled to act in a different way. Rather than seeing this irony as confusion on the part of the teacher, it may be more fruitful to see it as one spring from which curriculum strategy develops.

**Limitations of the Study**

This qualitative study of the development and deployment of curriculum strategies by four mathematics teachers at two rural middle schools is meant to add one set of portraits to a growing gallery of portraits of what mathematics teachers actually do. The focus in this study has been on curriculum strategies: the ways in which, and purposes for which, teachers choose one activity, task or problem set rather than another. It would be unwise to draw conclusions about mathematics teachers in general, or rural
mathematics teachers, or even about the actions of the four teachers studied here in some other year or some other school.

In addition, I cannot exclude the possibility that my own biases have distorted my understanding and presentation of the data. I taught mathematics at the middle school level for many years, before turning to research. My work was mostly in small rural schools—much smaller, for the most part, than the schools in which my research participants teach—in both California and northern New England, and I chose to pursue the kind of research documented here because of my orientation toward rural teaching, acquired over those many years. In this sense, I might be called a “connoisseur” of rural schools, and especially of rural middle school mathematics, with all that this designation entails: a closeness, and an appreciation, that can also be a source of blindness, one more case of Burke’s (1966) terministic screens that both reflect and deflect the world with which we deal.

The best test of the fidelity and reliability of this portrait lies in the work of creating additional portraits. Which, if any, of the patterns identified here will prove to future researchers to be of use as guiding threads is impossible to say. I have simply described, to the best of my ability, what I have seen and heard from my research participants, who undertake every day the work we are still trying to understand.
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Appendix A: Teacher Initial Interview Protocol

1. Tell me about how you came to be a teacher.
   - family/community background
   - education/course-taking
   - looking for a position, relation to rural

2. Tell me about your mathematics background.
   - course taking: methods and disciplinary
   - personal interests, mathematics “preferences”
   - mathematics professional development experiences

3. What do you find rewarding in your current work?
   - teaching-learning experiences
   - extracurricular work with students
   - work with colleagues/administration
   - community experiences

4. Tell me about this community’s expectations for mathematics learning. How do these align with your own expectations?
   - purposes/uses of mathematics
   - what makes mathematical “success” visible?
   - teacher’s idea of mathematics as discipline and as school subject

5. What kinds of challenges do you find teaching in this community?
   - social groups/group stereotypes
   - external pressures on school
   - school–community relations

6. How do you structure your lessons to help your students with the challenges of middle school mathematics?
   - typical lesson and arc of curricular year
   - differentiation: for whom and how? coteaching support?
   - student tasks: “struggle” vs scaffolding balance
   - experiential learning and “engagement”
• fluency, practice, competence

7. Tell me about curriculum development and curriculum change in this school.
   • who and how often? approval process?
   • documentation: adopt, adapt, create?
   • enforcement, mapping, evaluation?

8. How important are the annual state testing results to you, and to your school?
   • impacts on instruction and planning
   • impacts on curriculum and assessment
   • impacts on school–community relations

9. What role does a textbook play in the way you plan and deliver instruction? What other tools or materials do you normally use?
   • kinds of materials
   • selection/uses of resources in relation to didactical contract
   • selection/uses of resources in relation to mathematical goals
   • experiments with materials? war stories?

10. What are you seeing as the key differences between this year’s curriculum under the new standards, and the curriculum you have been teaching?
   • topics added/omitted/altered
   • depth of understanding
   • change in pedagogical models
   • change in review of prior learning
   • sources of information for these differences

11. What kinds of assessment do you use with your students over the course of the year? How do assessment results factor into your planning?
   • informal vs formal/variety of in-class assessments
   • school-wide “formative” assessments—how used? how useful?
   • what kinds of things do assessments show? what kinds of things do they not show?
Appendix B: Clinical Intern Initial Interview Protocol

1. Tell me about how you decided to become a teacher.
   - *family/community background*
   - *education/course-taking*
   - *relation to rural*

2. Tell me about your mathematics background.
   - *course taking: methods and disciplinary*
   - *personal interests, mathematics “preferences”*
   - *mathematics tutoring or coaching*

3. What kinds of challenges do you expect to find in the classroom?
   - *management issues: behaviors, routines, paperwork*
   - *curricular issues: standards, objectives, materials, pacing*
   - *student learning issues: diversity, culture, pedagogy, learning models*
   - *community issues: culture, parents, colleagues, state testing*

4. How will you structure your lessons to help your students with the challenges of middle school mathematics?
   - *envisioned lesson and envisioned curricular year*
   - *differentiation: for whom and how? co-teaching support?*
   - *student tasks: “struggle” vs scaffolding balance*
   - *experiential learning and “engagement”*
   - *fluency, practice, competence*

5. What roles do a textbook and teacher manual play in the way you plan and deliver instruction? What other tools or materials do you see yourself using for planning? for instruction? What additional kinds of materials would you be interested in exploring, with sufficient support? Have you tried using kinds of material you know you don’t want to use?
   - *kinds of materials and level of support*
   - *selection/uses of resources in relation to student learning*
   - *selection/uses of resources in relation to mathematical goals*
6. Tell me what you know about the new state testing program. How does the test affect your plans for what to cover? to emphasize? how you will teach?
   - familiarity with test content/format
   - impacts on instruction and planning
   - impacts on curriculum and assessment

7. What do you see as the key differences between these new standards and the previous state curriculum standards? What differences will students see?
   - topics added/omitted/altered
   - depth of understanding
   - change in pedagogical models
   - sources of information for these differences

8. What kinds of assessment do you plan to use with your students over the course of the year? How will assessment results factor into your planning?
   - informal vs formal/variety of in-class assessments
   - what kinds of things do you expect to learn from assessments? what kinds of things do these assessments not show? How else can you uncover what assessments do not?
Appendix C: Benchmarks for Coding Mathematical Tasks

1A1: Recall

<table>
<thead>
<tr>
<th>Portland Grade 7</th>
<th>Packersfield Grade 8</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Textbook: Guided Practice</strong></td>
<td><strong>Math Minute 57</strong></td>
</tr>
<tr>
<td>Given a diagram of 4 lines intersecting to form a rectangle, tell whether JL and KM are parallel, perpendicular, or skew.</td>
<td>True or False: The circumference of a circle is about 3.14 times the circle’s diameter.</td>
</tr>
<tr>
<td>Requires only recall of a definition.</td>
<td>Requires only recall of a formula.</td>
</tr>
</tbody>
</table>


<table>
<thead>
<tr>
<th>Portland Grade 7</th>
<th>Packersfield Grade 8</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Textbook: Practice A/B</strong></td>
<td><strong>Math Minute 57</strong></td>
</tr>
<tr>
<td>If you travel at a speed of 55 miles per hour, how far will you travel in 7 hours?</td>
<td>Find ( n - \frac{2}{3} ) for ( n = \frac{11}{12} ).</td>
</tr>
<tr>
<td>One-step problem without links to concepts.</td>
<td>One-step problem without links to concepts.</td>
</tr>
</tbody>
</table>


<table>
<thead>
<tr>
<th>Portland Grade 7</th>
<th>Packersfield Grade 8</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Textbook: Independent Practice</strong></td>
<td><strong>Teacher-made Drill</strong></td>
</tr>
<tr>
<td>Solve the equation: ( 3x + 5 = -7 )</td>
<td>Emma earns 120 frequent flyer miles for every $40 she spends on her credit card. Which equation could be used to graph this relationship?</td>
</tr>
</tbody>
</table>
| Practice solving simple linear equations. | a. \( 3y = 40x \)  
| | b. \( y = 40x + 120 \)  
| | c. \( y = 3x \)  
| Practice solving routine word problems. |
3B3: Comparing, Contrasting, Linking Representations of Situations

<table>
<thead>
<tr>
<th>Portland Grade 7</th>
<th>Packersfield Grade 8</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Textbook: Lesson</strong></td>
<td><strong>Textbook: Lesson</strong></td>
</tr>
<tr>
<td>[Given a graph of the relation Earnings = $7 \times 10^5 \times \text{years}, without the equation]</td>
<td>[After discussion of an example] Ken decides to change his plan by slowing the speed at which he walks. The equation for the new plan is $y = -200x + 2400$.</td>
</tr>
<tr>
<td>a. What is the constant of variation in the company’s earnings from year to year?</td>
<td>a. Graph the equation;</td>
</tr>
<tr>
<td>b. Write an equation for the relationship between the two variables.</td>
<td>b. How does the new graph compare to the old?</td>
</tr>
<tr>
<td>c. If this relationship continues, what will earnings be in 4 more years?</td>
<td>c. Will Ken have to exercise more or less to meet his goal? Explain.</td>
</tr>
<tr>
<td><em>Comparing features of graph and equation, with attention to their relations.</em></td>
<td>d. Suppose Ken decides to jog, which burns 600 calories per hour. How will this change the graph?</td>
</tr>
<tr>
<td><em>No mathematical justification required.</em></td>
<td><em>Comparing features of graph and equation, with attention to their relations.</em></td>
</tr>
<tr>
<td><em>No mathematical justification required.</em></td>
<td><em>Gr 8 had no 3C3 tasks</em></td>
</tr>
</tbody>
</table>

3C3: Strategic Problem Solving in Open Problem Situations (No Justification)

<table>
<thead>
<tr>
<th>Portland Grade 7</th>
<th>Packersfield Grade 8</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Illustrated Mathematics Task</strong></td>
<td><strong>[Gr 8 had no 3C3 tasks]</strong></td>
</tr>
<tr>
<td>The rectangular area under a small swing set measures 9x12 ft and required 40 bags of sand to raise the sand depth 3 in. How many bags of sand are needed to raise the depth 3 in. in the area under the large swing set if it is 1.5 times as long and 1.5 times as wide?</td>
<td></td>
</tr>
<tr>
<td><em>Open problem requires identifying a sequence of procedures and attention to constraints. No mathematical justification required.</em></td>
<td></td>
</tr>
</tbody>
</table>
### 3C4: Strategic Problem Solving—Modeling Open Problems

<table>
<thead>
<tr>
<th>Portland Grade 7</th>
<th>Packersfield Grade 8</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Online Task</strong></td>
<td><strong>[Gr 8 had no 3C4 tasks]</strong></td>
</tr>
<tr>
<td>Chipotle will donate proceeds of a $3 burrito sale on one night, up to a million dollars. How likely is it that they can raise that much? What information would you need to make a good estimate? [Teacher provides rough data only when requested].</td>
<td></td>
</tr>
<tr>
<td><em>Open problem requires identifying both data and procedures. No mathematical justification required.</em></td>
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</tbody>
</table>

### 4C3: Strategic Problem Solving, with Justification/Generalization

<table>
<thead>
<tr>
<th>Portland Grade 7</th>
<th>Packersfield Grade 8</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Online Task</strong></td>
<td><strong>Illuminations</strong></td>
</tr>
<tr>
<td>[Gr 7 had no 4C3 Task]</td>
<td></td>
</tr>
<tr>
<td>Popcorn Cylinder/Prism: Given a rectangular sheet of paper, make cylinders and prisms, alternating which edge of sheet is height. Looks for generalization relating diameters/heights to volumes.</td>
<td></td>
</tr>
<tr>
<td><em>Focus on regularities in patterns produced by experiment, requires generalization.</em></td>
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</tbody>
</table>
**4C4: Making Sense of Mathematical Properties and Patterns**

<table>
<thead>
<tr>
<th>Portland Grade 7</th>
<th>Packersfield Grade 8</th>
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</thead>
<tbody>
<tr>
<td><strong>Textbook</strong></td>
<td><strong>Online Task</strong></td>
</tr>
<tr>
<td>Bucky Badger: Simplified Football scoring, 7 or 3 points. Badger cheerleader</td>
<td>Gumball Machine: Given sets of constraints, mathematically justify reasonable estimates of the number of gumballs needed to fill large volumes.</td>
</tr>
<tr>
<td>does pushups equal to his team’s total score after each scoring play. If team</td>
<td><em>Open-ended focus on properties required to justify estimates.</em></td>
</tr>
<tr>
<td>scores 83 points in a game, what is the maximum total number of pushups</td>
<td></td>
</tr>
<tr>
<td>cheerleader does during game?</td>
<td></td>
</tr>
<tr>
<td>*Open-ended focus on regularities in rule-based patterns, requires mathematical</td>
<td></td>
</tr>
<tr>
<td>justification.*</td>
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</table>


## Appendix D: Textbook Use Log

<table>
<thead>
<tr>
<th>Day</th>
<th>Planning</th>
<th>Time</th>
<th>Lesson</th>
<th>int</th>
<th>Homework</th>
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<td>6-10</td>
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<td>3</td>
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<td>11+</td>
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<td>4-5</td>
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<td>4-5</td>
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<tr>
<td></td>
<td>Other Topic: describe</td>
<td>0-5</td>
<td>Other Topic: describe</td>
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<td>Other Topic: describe</td>
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<td>11+</td>
<td></td>
<td>4-5</td>
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<td>4-5</td>
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<tr>
<td>Tuesday</td>
<td>Teacher Manual pp</td>
<td>0-5</td>
<td>Student Text pp/probs</td>
<td>1-2</td>
<td>Student Text pp/probs</td>
<td>1-2</td>
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<td>Other Topic: describe</td>
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<td>Other Topic: describe</td>
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<td>11+</td>
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<td>4-5</td>
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<td>4-5</td>
</tr>
<tr>
<td>Wednesday</td>
<td>Teacher Manual pp</td>
<td>0-5</td>
<td>Student Text pp/probs</td>
<td>1-2</td>
<td>Student Text pp/probs</td>
<td>1-2</td>
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Appendix E: Teacher Final Interview Protocol

1. Now that your students’ scores on the state assessment are available, how did their performance match your expectations from the past year?
   - overall strengths and weaknesses
   - subgroup performance
   - strengths and weaknesses by domain
   - issues with the test

2. Now that you are more familiar with the way the new standards will be assessed, what changes are you contemplating in next year’s curriculum?
   - emphases and omissions
   - types or intensity of classroom tasks
   - types or intensity of homework
   - test-specific practices

3. Tell me what you have found most useful about the course text and its teacher materials
   - alignment and articulation features
   - pedagogical features
   - language, representations, and student ease of use
   - models, representations, organization and teacher ease of use

4. Tell me what problems you have with the course text and teacher materials?
   - alignment and articulation features
   - pedagogical features
   - language, representations, and student ease of use
   - models, representations, organization and teacher ease of use

5. Which of the non-text materials and activities you used last year do you think were most helpful for your students? How were they helpful?
   - differentiating
   - task demand, promoting exploration of mathematical concepts
   - rehearsal, fluency
• making the mathematics visible/accessible
• making the mathematics engaging, relevant
• letting students make connections

6. What changes in how you choose problems or plan lessons for students do you see as a result of teaching to the new standards?
• typical lesson, arc of curricular year
• differentiation: for whom and how?
• student tasks: “struggle” vs scaffolding balance
• experiential learning and “engagement”
• fluency, practice, competence

7. What changes in assessment do you see yourself making this coming year?
• formal vs informal
• formative v summative
• test rehearsal
• tasks and task intensity

8. Given class compositions typical for your school, do you see student performance—for some or all students—changing over the next few years as you teach to the new standards?
• reasons for change or no change
• subgroup differences
• commitment to change

9. How have the testing results been perceived in your community? What kinds of expectations do you think the community, or different groups in the community, have for the scores?
• importance and credibility of testing to the community
• subgroups with differing perceptions or expectations
• impacts on school program and school–community relations
Appendix F: Intern Final Interview Protocol

1. Now that your students’ scores on the state assessment are available, how did their performance match your expectations from the past year?
   • overall strengths and weaknesses
   • subgroup performance
   • strengths and weaknesses by domain
   • issues with the test

2. Now that you are more familiar with the way the new standards will be assessed, what changes are you contemplating in what and how you will teach next year?
   • emphases and omissions
   • types or intensity of classroom tasks
   • types or intensity of homework
   • test-specific practices

3. Tell me what you have found most useful about the course text and its teacher materials
   • alignment and articulation features
   • pedagogical features
   • language, representations, and student ease of use
   • models, representations, organization and teacher ease of use

4. Tell me what problems you have with the course text and teacher materials?
   • alignment and articulation features
   • pedagogical features
   • language, representations, and student ease of use
   • models, representations, organization and teacher ease of use

5. Which of the non-text materials and activities you used last year do you think were most helpful for your students? How were they helpful?
   • differentiating
   • task demand, promoting exploration of mathematical concepts
   • rehearsal, fluency
• making the mathematics visible/accessible
• making the mathematics engaging, relevant
• letting students make connections

6. How do you choose where to look for supplemental materials? How did you come across these sources?
• activities vs pedagogical models
• handouts vs adaptations
• task intensity
• domain focus

6. What changes in how you choose problems or plan lessons for students do you see as a result of teaching to the new standards?
• typical lesson, arc of curricular year
• differentiation: for whom and how?
• student tasks: “struggle” vs scaffolding balance
• experiential learning and “engagement”
• fluency, practice, competence

7. What changes in assessment do you see yourself making this coming year?
• formal vs informal
• formative v summative
• test rehearsal
• tasks and task intensity

8. How well-suited to the rural communities like the one in which you taught are the new standards? Do you expect to see scores on the state assessments rise over time? Why or why not?
• reasons for change or no change
• subgroup differences
• commitment to change