

Linking Ideas to Practice:
How administrators connect new ideas about learning, teaching, and mathematics to the
actions and decisions that constitute administrative practice¹

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Introduction

The current standards-based education reform effort in mathematics is one aspect of the emergence into ordinary educational practice of ideas about learning, teaching, and the nature of mathematical knowledge that are familiar to the research community but are quite different from the ideas that have long informed prevailing school practice in this country (c.f. Cohen, 1995; Dow, 1991). Mathematics education reform, in particular, rests on a socio-constructivist view of knowledge as the dynamic and conditional product of individuals working in intellectual communities, in which learning proceeds through the individual's construction of understanding and teaching is the facilitation of such knowledge construction. Reformers want mathematics classrooms to function as mathematical communities, in which students have opportunities to reason mathematically, communicate about mathematical ideas, and make connections among mathematical ideas and between mathematics and their own daily lives (NCTM, 1989;

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NCTM, 1991; NCTM, 1998). This contrasts with the prevailing, “transmission” view, in which mathematical knowledge is viewed as a fixed body of immutable facts and procedures, learning as a matter of absorbing and practicing what is set out by teacher or text, and teaching as the delivery of information or the provision of opportunities for practice (Romberg, 1983). The practical task ahead is to develop a form of mathematics instruction that rests on the best research on children’s learning, is theoretically coherent, and merges attention to mathematical facts and procedures with the development of conceptual knowledge.

A growing body of research on teachers’ implementation of the NCTM Standards suggests that their translation into practice requires teachers to change how they think about the nature of mathematics and mathematics instruction (Cohen & Ball, 1990). Researchers are learning what is entailed for both teachers and children to reconstruct their sense of the learning and teaching enterprise and, consequently, what their work together is. The nature of these shifts of meaning and practice has been well documented for teachers (c.f. Fennema & Nelson, 1997; Franke et al, 1997; Schifter & Fosnot, 1993) and for children (Cobb et al., 1992; Lester, 1996; Soucy-McCrone, 1997).

School and district administrators, too, are important actors in this piece. Scholars have long been aware that a critical aspect of a district’s capacity to make the kind of changes in curriculum, instruction, and assessment required by the mathematics education reform effort are the views and inclinations of building and district administrators (Elmore & McLaughlin, 1988). Administrators’ responsibilities — managing schools, supervising teachers, setting district-level professional development

policy, selecting curricula and assessment instruments, communicating with parents and other stakeholders, etc. — put them in positions where they can either help or hinder reform efforts in mathematics and other subjects by the way they see and understand the issues and by the practical decisions they make.

The possibility that changes in belief and practice similar to those that teachers are making are also indicated for school and district administrators is beginning to be investigated (Nelson, 1998; Spillane & Thompson, 1997; Spillane & Halverson, 1998). There is an emerging body of research on the ideas that administrators construct about the reforms (Nelson, 1998; Nelson & Sassi, 1998; Spillane, 1998; Stein, D’Amico & Israel, 1998) and there are education programs for administrators that provide support as they work to understand reform ideas (Grant et al, in press a & b; Nelson & Sassi, 1998; Nelson, Davidson & Sassi, 1998; Rothman, 1996). However, as yet, little work has been done to explore the impact of new ideas about learning, teaching, and mathematics on administrative practice itself. This paper reports on early results from a study of how administrators connect new ideas about mathematics, learning, and teaching with the decisions and actions that constitute administrative practice. While the focus of this research is on the ideas that underlie elementary mathematics education reform, we regard mathematics as a case through which to explore issues that underlie similar reforms underway in other school subjects at the elementary level.

Theoretical Framework

There is an uneven fit between ideas about learning and teaching, and ideas of school administration. While the transmission view of learning and teaching has long been

dominant in American education, theories of administration have floated into education from many quarters, creating an eclectic mix of administrative ideas and practices, some with underlying assumptions consonant with the transmission view, others that rest on quite different assumptions.² For example, bureaucratic forms of management and control assume, with transmission views of teaching and learning, that students are sufficiently standardized that they will respond to instruction in predictable ways, that teaching tasks are routine enough to be converted to procedures, and that classrooms can be viewed as similar, self-contained units to be organized by a common schedule and common rules (Campbell et al., 1987; Rowan, 1990). Entire lines of research and practice in the management of instruction have been built on the transmission view of learning and teaching: direct instruction in basic skills as one of the hallmarks of effective schools (Edmonds, 1979); process-product research on teaching (Brophy & Good, 1986); and the consequent processes of teacher supervision (Darling-Hammond & Sclan, 1992). Other administrative practices, such as those deriving from human relations and human resources theories of management, are more likely to emphasize the growth of individuals than the standardized delivery of instructional services.

Administrative practices in this genre would include listening carefully to teachers, parents and other stakeholders to take account of and show respect for their perspectives; viewing teachers as whole people rather than simply as the deliverers of instruction; or seeing management as the assembling of a variety of resources — money, equipment,

²Lack of connection between what is being managed and the models available for management may contribute to the sense that schools are “loosely coupled” systems (Weick, 1976).

space — to support the work of teachers, regarded as self-directed professionals (Sergiovanni & Starret, 1998).

When fundamental ideas about learning and teaching that form the center of the enterprise of schooling begin to shift, as now, the eclectic array of existing management ideas and practices is thrown into relief. Inconsistencies between what is being managed and the nature of the management become more apparent, and consideration of what administrative practices are now most appropriate becomes relevant (Rowan, 1995; Sykes, 1995). The work that we and our colleagues are engaged in focuses on the connection between administrators' ideas about learning, teaching, and mathematics, and their administrative practice, with the underlying hypothesis that new ideas about the nature of mathematics, learning, and teaching may align differently with the array of conventional administrative practices than did earlier ideas about learning and teaching. Further, they may prompt the development of new administrative practices that are more consistent with the new instructional principles and values. We use the construct of practical judgment to mediate between administrators' ideas and their action.

Practical Judgment. Practical judgment is concerned with the reasoning and judgment involved in taking practical actions. While there are competing views of practical judgment and how it is (or ought) to be exercised, we draw primarily from the view articulated by Nussbaum (1991) and Wiggins (1980); specified for the context of teaching by Pendlebury (1990; 1995).³ In this work, which is based on Aristotle's

³While the work on practical judgment referenced here was done in the context of teaching, it is suggestive for our research on practical judgment on the part of administrators. Like teachers, administrators have views about the nature of learning, teaching, and mathematics that come from their own education and

writing on practical judgment, the mutability, indeterminacy, and particularity of the practical world come to the fore, and how one chooses to act rests as much on an interpretation of the particulars of the situation as on general rules of action.⁴ Therefore, how one pays attention, and to what one pays attention, are critical in the exercise of practical judgment. As Wiggins (1980) writes:

A man usually asks himself “What shall I do?” ... only in response to a particular context. This will make particular and contingent demands on his moral or practical perception, but the relevant features of the situation may not all jump to the eye. To see what they are ... may require a high order of situational appreciation, or, as Aristotle would say, perception. (233)

School administrators regularly make judgments in complex situations, where incommensurate criteria need to be balanced, the relevant facts of the matter aren't necessarily evident, or where no one option jumps out as the “best” one. For instance, in observing in classrooms administrators make subtle decisions about what it is important to attend to – which facts matter – for the purpose of making a practical judgment about the adequacy of the instruction. They interpret the significance of such things as the noise level of the classroom, which students are called on, the amount and kind of student activity, or any of a wide range of teacher behaviors. Decisions about the facts that

experience; ideas that may or may not be aligned with views embedded in current mathematics education reform efforts, but which affect their practice. However, administrative work has a different relation to ideas about learning and teaching than does teaching. Teachers' work is very close to, and intertwined with, student learning; administrators' work is distanced from the classroom and it is not well understood how aspects of administrative practice might change once administrators' ideas about the nature of mathematics, learning, and teaching begin to change. It is this question that motivates our research.

⁴ Other researchers also have explored practical reasoning or practical judgment as a construct for understanding decisionmaking among practitioners. In a long-term program of research, Fenstermacher and Richardson encourage teachers to reconstruct the reasoning that “lies behind” their practice. The formal

matter also help shape the related practical activities in which administrators engage — the notes they make about what they observe, what they say when they consult with the teacher, what recommendations for further action they make. All of this is the exercise of practical judgment.

Lipsky's (1980) construct of the street-level bureaucrat, whose daily decisions are constitutive of the implementation of public policy, is appropriate here. (See Elmore & McLaughlin, 1988, for a working out of Lipsky's idea in the context of education reform.) Lipsky has shown that public service workers (teachers, police officers, health workers, etc.) make important decisions about the provision of services, and exercise wide discretion in their work.

Policemen decide who to arrest and whose behavior to overlook. Judges decide who shall receive a suspended sentence and who shall receive maximum punishment. Teachers decide who will be suspended and who will remain in school, and they make subtle determinations of who is teachable. (p. 13)

Lipsky does not focus, as we do, on the ideas that street-level bureaucrats have about the nature of the services they provide. However, we align ourselves with Lipsky's notion that the daily decisions and actions of "street-level" administrators constitute the implementation of policy. Our study of the practical judgment exercised by school administrators is an exploration of how new ideas about mathematics, learning, and teaching may affect the enactment of administrative practice and, simultaneously, affect

characteristics of practical argument (examination of premises, adequacy of inferences, etc.) are used to help teachers uncover for inspection their own, often tacit, thinking about their instructional practice.

the implementation of the state and district policies that have derived from the NCTM's Standards for Curriculum and Evaluation.

The construct of practical judgment can be further elaborated, in order to refine it for our context, by reference to Vickers' (1965) notion of an appreciative system and Pendlebury's (1995) construct of standing commitments.

Vickers elaborated Wiggins' notion of situational appreciation, arguing that when practitioners assess a situation in order to make a practical decision, judgments of fact and value are inextricably interwoven — they notice what is related to what they value.⁵ Vickers calls such assessments "appreciations" — ways of noticing what is going on that relate the facts to what is thought to be important. Further, in Vickers' view, at any given moment in time, a person's appreciative system has a setting — "a set of readinesses to distinguish some aspects of the situation rather than others and to classify and value these in this way rather than that." (Vickers, 1965, p. 68).

Pendlebury's construct of standing commitments elaborates what Vickers meant by "valuing", and allows us to link administrators' ideas about learning, teaching, and mathematics to their situational appreciation and their exercise of practical judgment. Pendlebury, too, views practical judgment as contextually embedded and situation-

5. Vickers was working to analyze the nature of the judgments entailed in corporate and governmental policy-making. He was very knowledgeable about information theory of the time, and was persuaded that cybernetic feedback loops do characterize some aspects of practical decision making. That is, decision makers do sometimes monitor situations to assure that things remain within pre-determined parameters, and do make adjustments along the way to assure that the predetermined path is actually followed. He uses the examples of the helmsman following a course at sea or the buyer in a large corporation keeping track of the future need for supplies and the current state of inventories. But Vickers was concerned to understand the limits of such a construct for understanding practical decision making where, in his view, the setting of the parameters, and checking to see if they are still viable, was a complex task that required judgments of both fact and value. He took such judgments of fact and value to be the inseparable constituents of the act of appreciation.

specific. But she takes on the question of how such judgment could be other than chaotic and responsive only to the particulars of the situation. She argues that practical judgment also requires a coherent set of principles or “standing commitments” that are brought to bear in making judgments in a particular instance (Pendlebury, 1995). Standing commitments permit the practitioner to be attentive and responsive to the particulars of the situation, but not so captured by them that a larger agenda of importance cannot be attended to. We interpret Pendlebury’s standing commitments as a specification of Vickers’ “readiness to appreciate.”

We can illustrate these ideas of “readiness to appreciate” and “standing commitment” by extending the earlier example of an administrator observing a classroom. In earlier work we have shown that when administrators hold a transmission view of learning and teaching they notice very different things when observing a videotaped classroom than they do later when they have begun to develop a constructivist view of learning and teaching (Nelson & Sassi, 1998). When viewing a videotaped classroom, administrators at first attended to such features as the structure of the lesson, the clarity of the teacher’s explanations, the amount of time she waited for students’ responses, and whether or not the children understood the lesson. At a later viewing of the same videotape, when their views of knowledge and learning had begun to change, administrators noticed that the children in the class were exploring mathematical ideas, that those ideas emerged differently, over time, for different students, and that the teacher was supporting the students’ exploration of mathematical ideas. The videotape was exactly the same each time. But what administrators saw in it was different in each case. Their ideas about the nature of learning, mathematics, and teaching had affected what

they thought was important and, therefore, what they noticed, on the videotape. Their standing commitments about learning, teaching, and mathematics had begun to change and they had different kinds of situational appreciation.

For the purposes of the research described here we have interpreted standing commitments as administrators' ideas about learning, teaching, and mathematics. Of course, administrators also have other sorts of standing commitments; for example, a commitment to developing trusting relationships with the teachers in their schools, or a commitment to providing a sensitive and respectful learning environment for students of all ethnic backgrounds. But for the purposes of the research described here we have undertaken to identify the standing commitments in the realm of learning, teaching, and mathematics of each of the administrators in our study. Some of these ideas are based on a transmission view of learning and teaching, others on a constructivist view; still others are an amalgam of both orientations. In our research we are exploring the relationship between an administrator's standing commitments about learning, teaching, and mathematics, the nature of his situational appreciation, his practical judgment, and his action.

Methodology

This qualitative research examines the practical judgment that 5 elementary school principals exercise in the course of doing the work delineated in a "unit" of their practice (a small, focused, aspect of their administrative practice), with special attention to the nature of the ideas about mathematics, learning, and teaching that underlie their exercise of practical judgment. The central focus of this research is the connections that

administrators make between ideas about mathematics, learning, and teaching and the decisions and actions that constitute their administrative practice.

Sample Selection

Participant Selection. A purposive sampling strategy was used to select a group of participants that would best help us understand the connections between ideas about elementary mathematics, learning, and teaching and administrative practice (Patton, 1990; Becker, 1998). In order to retain sufficient focus in a small sample, we decided to focus entirely on elementary school principals rather than on a mix of principals and central office administrators. We sought principals for whom ideas about mathematics, learning, and teaching were no longer taken for granted but were under lively reconsideration, thinking that such principals would be likely to be thinking about how these ideas might affect specific aspects of their administrative practice. Four of the five principals in our study had participated in a pilot version of a course for administrators in elementary mathematics education that was offered at several sites in Eastern Massachusetts in 1998-1999.⁶ The fifth had been a long-term participant in, and then facilitator of, the Developing Mathematical Ideas course for elementary teachers.⁷ All of these administrators were interested in understanding the ideas that underlie elementary mathematics education reform and, through their participation in these courses, had

⁶ Lenses on Learning: A New Focus on Mathematics and School Leadership is a year-long course for administrators developed with support from the National Science Foundation and The Pew Charitable Trusts. Pilot versions of this course were taught in 1998-1999 by three school and district administrators who had taken previous versions of the course. See Grant, et al., in press a.

⁷ Developing Mathematical Ideas is a course for elementary teachers on mathematics and the development of children's mathematical ideas. It was developed with funding from the NSF and published by Dale Seymour. It is currently available nationally. See Schifter, Bastable & Russell, 1999 a & b.

begun to examine their own ideas about mathematics, learning, and teaching. They volunteered to participate in this research project because they saw it as an opportunity to continue to think about these new ideas and begin to connect them to their own administrative practice.

While these principals were unusual in the depth of their interest in the ideas of elementary mathematics education, they were not unusual in other ways. Four have undergraduate and masters' degrees in education; one has a doctorate in education. All had been elementary teachers for at least eight years and have been elementary school principals for at least 10 years. Two currently work in large urban districts, one in the suburb of a small city, two in suburban areas of a major East coast city. All report that they had not liked mathematics in school and took the minimal amount through high school, and college.

Sampling administrators' work. By and large, principals' workdays are fragmented: they are physically on the move in their buildings for much of the day; their contacts with teachers, students, parents, and other administrators tend to be short; discussions are about current and pressing situations (Fullan, 1991). We developed the construct of a "unit of practice" in order to generate a sample of administrative practice in which we could observe administrators' exercise of practical judgment. If we had not bounded our analytical focus, principals' exercise of judgment would have been too diffuse to observe systematically.

The notion of unit of practice emerged from our earlier practical work with school administrators. We found that in order for them to connect new ideas about mathematics,

learning, and teaching to their own practice, administrators needed opportunities to experience how the ideas played out in actual work settings. But, as we also discovered, they needed to carve out manageable pieces of work in which to start trying to use these ideas. Considering the implications of mathematics education reform for every aspect of their work at the same time was overwhelming. This situation is analogous to teachers who are working to change their instructional practice. A teacher may, for example, concentrate for a time on learning to listening to students' thinking. She may decide later on to pay attention to her own questioning strategies or revising her curriculum. While in reality she considers all of these together everyday, she may choose to break them apart in order to learn.

For each participant in this study a “unit of practice” was negotiated — a focussed piece of ongoing administrative practice in which practical judgment would be exercised and for which ideas about mathematics, learning, and teaching were relevant. Four criteria for the design of units of practice ensured that it would be possible to observe the connection between ideas about mathematics, learning, and teaching and the exercise of practical judgment: 1) ideas about mathematics, teaching, and learning had to be relevant (that is, while important, aspects of principals' work like getting the roof repaired or ensuring that the cafeteria was orderly would not be good units of practice for this study); 2) the practice to be studied would need to take place over a period of weeks or months and have specific occasions on which practical judgment was exercised; 3) the unit of practice work had to include making consequential decisions; and 4) the exercise of practical judgment in the unit of practice had to be observable by the researchers.

Studying units of practice, so defined, excluded from study the exercise of practical judgment that occurred as part of the ongoing flow of an administrator's day (telephone calls; hallway conversations; conversations on the margins of meetings called for another purpose; and so on). While our data is drawn from only some of the administrators' venues for the exercise of practical judgment with regard to the chosen topic, the sample generated by the unit of practice construct retains the characteristics of authenticity and consequence, while reducing the data to be analyzed to a manageable scope.

Data collection

In this study we use a variety of data collection strategies: 1) interviews; 2) field observations of 3 - 5 scheduled events in each unit of practice; and 3) artifacts produced by the administrative activity. We administered the same pre-project interview to all administrators. We took field notes and/or audiotaped each unit of practice event we observed and then interviewed the administrator for an hour about the actions he took or did not take during the course of the event. At the end of the unit of practice work we are conducting the same post-project interview with all participants and will interview two other people who participated in the principal's unit of practice. By triangulating across various data sources using different methods, we reduce the limitations of any one method (Fielding and Fielding, 1986).

Data analysis

Working with interview, field observation, and artifact data, we are doing both contextual and categorical analyses (Maxwell, 1996). Data analysis began during the first year, interwoven with data collection, and will proceed through a second year. Emergent interpretations both influence the shape of subsequent interviews and observations and are tested by them (Miles & Huberman, 1994). Disconfirming evidence for emergent interpretations is sought.

Each unit of practice is regarded as a case, and both within-case and cross-case analysis are being conducted (Stake, 1995). For each unit of practice we examine the data for evidence about: 1) the ideas about mathematics, learning, and teaching that are salient to the principal; 2) the principal's exercise of practical judgment; 3) whether or not new administrative practice occurs and, if so, what it looks like.

After the within-case analysis is complete, we will do cross-case analyses of the data from all five units of practice. We will seek evidence about whether or not the same or similar assumptions about mathematics, learning, and teaching are salient to all five administrators in regard to their practice; how administrators' ideas about mathematics, learning, and teaching appear to affect their practical judgment and their action; what similarities and differences there are between new practices developed by different administrators; and whether changes in practical judgment that occur during the unit of practice work are similar or different among the five administrators.

What we are learning about administrators' practical judgment

In this section of the paper we present some of the very early insights we are gaining about principals' practical judgment. We discuss three topics: 1) units of practice as contexts for studying practical judgment; 2) administrators' practical judgment, including data about standing commitments, situational appreciation and action; and 3) early thoughts about the development of principals' ideas about learning, teaching, and mathematics.

Units of practice as contexts for studying practical judgment.

We consider the notion of unit of practice primarily as a learning construct, which is analytical for research purposes and practical for professional development purposes. It allows us to sample administrative practice in such way that we can keep a sharp focus on the exercise of practical judgment related to mathematics, learning, and teaching differentiated from, but related to, the ongoing stream of an administrator's daily activities. It additionally provides a structure and a set of criteria by which administrators can delimit an area of their own work on which they can concentrate their attention. Thus, while we view units of practice as our units of analysis, the administrators experience them, for example, as professional development projects, special work assignments, or administrative tasks.

Interestingly, the principals in this study have had no difficulty defining units of practice for themselves. They were invited to choose some aspect of their practice that they wanted to experiment with, based on ideas in the courses they had been taking. The following five units of practice emerged:

1. Exploring how teachers can adapt their teaching to reach all the students in a heterogeneous class — those who are struggling, those who are at grade level, above grade level, and well above grade level. This principal chose to observe two teachers in each grade, separately from the annual teacher evaluation process. She is exploring whether there are open-ended questions about the lesson that she could ask before and after an observation that would make it possible for her and the teacher to explore the issue of adaptation of instruction.
2. Exploring how to help teachers attend to how children are thinking about the mathematics that is being explored in the classroom. This principal believed that the classroom observations and teacher conferences associated with annual teacher evaluation provided a good context for working to help teachers bring this idea into their teaching and built her unit of practice work on the observations and conferences that she held with two teachers.
3. Helping teachers realize that children construct their own knowledge in mathematics. This principal decided that a good context for this was the monthly meetings of faculty members that would be held during the year to assess the effectiveness of the school's current curriculum and discuss the ongoing piloting of a prospective new curriculum.
4. Exploring issues of ability-grouping and classroom heterogeneity with teachers to enrich the perspectives that they would bring to discussions of prospective mathematics curricula underway in the district this year. Two regularly-scheduled faculty meetings were devoted to exploring ability grouping in mathematics classes.
5. Exploring the relationship between coaching teachers and evaluating them. This principal's question was, under what conditions could coaching become part of evaluation? This principal decided to explore this issue in the context of doing classroom observations and post-observation conferences with two teachers, as part of their annual performance evaluations.

We negotiated a memorandum of understanding with each principal, which described the unit of practice work and specified the events that would occur during the year and the arrangements for data collection.

These units of practice were designed according to the principals' understanding of the issues of mathematics education reform at the time. As such, the definition of the unit of practice, itself, has provided data about how these principals' understanding of

mathematics, learning, and teaching led them to connect new ideas to practice. For example, in the units of practice described above we can see three different views of the nature of teacher learning in the three units of practice that focus on classroom observation and teacher supervision. The first principal described above understood that teachers as well as students were constructors of knowledge and, therefore, focused her work on identifying open-ended questions that might direct teachers' thought to issues of instructional adaptation. She deliberately chose to work with teachers who were not undergoing their annual performance review, so that her agenda of teacher learning would not be confounded with performance evaluation. The second principal described above, on the other hand, felt that it was during the annual evaluation process that she could get the attention of teachers sufficiently to try to direct their attention to their students' mathematical thinking. During the evaluation process both she and they would have the time to focus on their teaching. She did not view teacher learning as a complex process of transformation of belief and practice, for which a "risk-free" zone for experimentation would be desirable. The fifth principal described above saw "coaching" as a process in which she and the teacher would learn together about the mathematical thinking of the children in the room. That is, she assumed that children's mathematical thinking was the central focus in a classroom, that both she and the teacher would be curious about it, and she wanted to establish a norm of shared learning between herself and the teachers. She wondered if such mutual inquiry could be accomplished in the evaluation context; i.e. whether evaluation could be transmuted into coaching. For this exploration she deliberately chose to work with teachers who were not in danger of

receiving poor evaluations, so that the teachers' anxiety about evaluation would not sabotage the coaching, or mutual learning, agenda.

These units of practice have the advantage of authenticity — each was designed by the principal to explore an issue that he or she found compelling. Their very identification provides data about the arenas in which these principals see connections between new ideas about mathematics, learning, and teaching and their administrative practice — teacher supervision and curriculum selection, in this sample. And while they are focussed, the units of practice are not isolated from the larger context of school life. While one principal's unit of practice focuses on her supervision of two teachers, she notes that her work with all the teachers in her school, in the contexts of teacher supervision and staff development meetings, has been shifting in ways similar to what is happening in her unit of practice work. Teacher contract issues have entered the picture in one unit of practice; the district's decision to postpone curriculum adoption has affected another. And all units of practice are subject to the complexities of school scheduling, busy schedules, and the daily urgencies of school life. The realities of schooling permeate all of our data.

Administrators' Practical Judgment

In order to tease out the relationships between standing commitments, situational appreciation, practical judgment about what to do, and administrative action, we describe some of our preliminary interpretations about the interconnections between standing

commitments, situational appreciation, practical judgment and action as they are emerging for two of our principals — here called Ms. West and Ms. O’Brien.⁸

Ms. West has been an elementary principal for 14 years. She has been a principal in two different districts before her current assignment, one of which used a quite progressive elementary mathematics curriculum. Therefore, for several years before she took the course for administrators where we got to know her, she had been aware of the ideas about learning, teaching, and mathematics embedded in mathematics education reform. For her unit of practice work, she decided that she would observe mathematics lessons of two teachers in each grade in her school, exploring how she might develop open-ended questions about the learning of children who were below grade level in mathematics, at grade level, above, and substantially above grade level, in order to encourage the teachers to attend to and reflect on these children’s instructional needs. The design of her unit of practice work indicated an awareness that teachers, too, reflect on experiences and construct new knowledge. She is a new principal in this school this year and, since she wanted to establish a norm for continual reflection and learning for the school as a whole, she told the teachers that this opportunity to learn about mathematics instruction was a professional development project she was undertaking for her own continued learning.

Ms. West views children’s learning as the individual process of filling in gaps in an ever-evolving lattice — a process through which personal meaning is built. She says:

I used to think ... that you started with certain bits of information and, like layers on a layer cake, you just kept on adding new layers.

⁸ The names of principals are pseudonyms.

And that if you mastered layer one and then you added layer two. ... Along the way ... this huge cube would emerge that was [the person's] knowledge. And it seemed that [with] some people you could build the cake faster than others because they were acquiring the knowledge at a more rapid pace.

But now I think it is more like a lattice work with a whole bunch of gaps. And people construct knowledge based on a lot of things. Not just what their parents tell them or what the teacher tells them, but their experiences in the world. And so they're building a framework all the time. Trying to make connections. ... But I think that children when they learn, they're just sort of ... filling in the spaces [in the lattice] with information. ... adding to what it is that makes meaning for [them].

Ms. West believes that learning is a highly individuated process. Children are continually building their knowledge from a wide range of experiences — connecting pieces of knowledge to one another and filling in gaps. In her view, children need to experience a sense of “ownership” of their ideas, taking pleasure in their own way of thinking and knowing.

Her situational appreciation — what she notices about a classroom — is consistent with these standing commitments. For example, she described a reading class that she had observed the previous week as follows:

The teacher, rather than taking the story and reading the story first, and then talking about the vocabulary, or talking about the vocabulary in a very mundane way — you know, these are the five words you need to know in order to understand the story. She had the children make a sentence on a sentence strip, using a word, for instance ‘pod’ was one of the words that they needed to know to understand the story. But the kids got so excited about their sentences because they were making meaning out of that word. It wasn't ‘Let's look it up in the dictionary,’ or ‘Let's memorize the definition ‘ or any of that. ... They worked in little groups of two or three. And when she read the story to them they got excited about those words. It wasn't ‘Oh, there's that word again.’ It was, ‘Oh, did you hear that? That's ‘pod.’ They got excited about those words.

For Ms. West, the facts that mattered about the reading class were the children's excitement about words and the fact that the teacher arranged for the children to explore their own understanding of the words before they read the story. The attention to individuated building of meaning exhibited in this situational appreciation is consistent with her lattice-building conception of learning. Other observable facts that were not included in Ms. West's situational appreciation were such things as the number of children in the room, the amount of time the lesson took, the existence of a lesson plan, whether the topic was appropriate for the grade level and time of year, the presence or use of particular teaching artifacts, and so on. The children's excitement and the opportunity they had to extend their own, personal, meanings for words like "pod" were the facts that mattered about this class, for this principal.

Analysis of our field notes indicates that when she observes mathematics instruction Ms. West attends to the ways in which different children in the room are engaged with the mathematical ideas, consistent with her description of what she attends to in the reading class. For example, when observing a 1st grade class Ms. West attended carefully to the children's mathematical activity. She noticed with concern that the children, who had been asked to identify how many small tiles were in a bag they had been given (the number of tiles in the bag was between 80 and 100), all put the tiles in groups of ten, counting out the ten tiles in the same way, rather than assembling groups of ten tiles in different ways, as she would have expected:

I would have expected that there would have been more ways of expressing ten. It could be 2, 2, 2, 2, 2; it could be 3, 3, 3, 1; or 5 and 5; or somebody could have said, 'Oh, well, let's skip count.' Or 'Let's just line them up and we don't have to count a second time

because if this is ten then we'll just line them up and line them up [again].'. I've seen children come up with multiple strategies like that.. I didn't see any of that in this particular activity.

Again, Ms. West expected that children would have individual ways of counting the tiles into groups of ten, consistent with her view of meaning making as individualized.

As we analyze the data in our study, we trace the relationship between principals' standing commitments and situational appreciation, and their exercise of practical judgment — what they think they should do. For her unit of practice work Ms. West is exploring how to talk with teachers in her school after she has observed their classes. She is particularly interested in encouraging them to adapt their instruction so that it supports mathematics learning on the part of the diversity of students in the class.

Her approach to action with teachers indicates that she is applying her notion of learning to the planning and practice of her work with teachers. She describes what she plans to do to help teachers attend to diversity:

... [I want to] come with ... some different types of questions that have to do with meeting the multiple needs of the classroom, and get teachers to think about [the fact that] ... that all the children's needs need to be met. ... Just like the student, the teacher needs to embrace the solution. They have their own lattices too. ... If it's a good open-ended question it gives room for multiple possibilities. And then you learn more about what the teacher's thinking is from what the response is, and then you go from there. ...

Ms. West views teachers, too, as learners who are continually filling in the gaps in their lattices. Her strategy for action is to develop open-ended questions that will raise the issue of meeting the multiple needs of students in the classroom and she expects that such

questions will prompt teachers to reflect on the issue. This, in her view, is the beginning of change. Early analysis of the field notes of this principal's post-observation conferences with teachers indicate that she is, indeed, exploring the effectiveness of a variety of open-ended questions in making it possible for the teacher to talk about the mathematical understanding of the range of children that she saw in the class she had just observed. She began with a list of eight questions that she asked each teacher before the observation, and discussed again after she had observed in the classroom. After one or two observations Ms. West added a question about mathematical exploration — “What opportunities for math exploration will you provide during this lesson?” She had not seen much mathematical exploration in the classes she observed and she wanted teachers to begin to think about this. And she amended a question that inquired about the range of mathematics ability in the classroom. Originally she had asked, “Describe the math levels which are found in your class, including below level, at level, above level, and well above level.” Later she added the question, “How do you know?” This change was prompted by her judgment that in gauging students' mathematical levels teachers were not focusing on the nature of individual students' mathematical thinking but were basing their assessments on a general sense of where the students stood in the cohort. She wanted them to begin to think about the students as individuals, and therefore decided to raise the issue of how one would know where a student placed.

Ms. O'Brien has different standing commitments, situational appreciation, practical judgment, and action from Ms. West. She has been a principal for ten years. Her first substantial introduction to the ideas about mathematics, learning, and teaching embedded in mathematics education reform was in the course for administrators that she

took the year before this study began. She was quite struck by the images she saw of children's mathematical thinking — on videotapes, in students' written work, in teachers' written descriptions of the mathematical thinking of children in their classrooms. She was especially taken with the variation in children's problem-solving strategies and approaches, and connected this to her memory of having had difficulty as a child in conforming her thought to the way the teacher wanted her to solve mathematics problems. She wrote the following journal entry while taking the course:

Intriguing, that math does not have to be one way. That's probably why I always hated it — you couldn't be a divergent thinker.

She became persuaded that mathematics instruction in her school would improve if children had more opportunity to articulate their mathematical ideas and teachers paid more attention to the mathematical thinking of the students in their classes. For her unit of practice work she decided to work with two teachers in the context of their annual performance reviews, feeling that in this context she could get their attention directed toward their own teaching.

Ms. O'Brien's standing commitments are similar to Ms. West's. She, too, believes that children construct their knowledge in individuated ways, but expresses that belief very differently than Ms. West does. She says:

... children have different ways of thinking and they construct their knowledge based on how they interpret materials and how it makes sense to them. And how they go about solving situations. Taking their own tried and true strategies.

She elaborates further about the learning of mathematics:

... math with kids does not have to be about one right answer. And when you are learning something about math you can use concrete objects to construct in your mind a meaning for it. When I took that course last year, it helped me to see that it's OK to have a sense of math that is different than what the book says or what the teacher says. And that there are a lot of different ways to think. ... and I think that we have to accept all those things, but also to get at children's thinking at a young age and explore that, because that's going to help them think about other things, rather than stifle it and say this is the way you have to approach a problem.

Ms. O'Brien shares with Ms. West the notion that children think in very individual ways but she expressed that belief much more simply than Ms. West did — children “have different ways of thinking.” And, as Ms. O'Brien understands it, children bring meaning into situations — “they construct their knowledge based on ... how it makes sense to them.”— but she does not articulate a sense of internal, mental structure, as Ms. West does. Ms. O'Brien also vividly articulates the sense that teaching students “one right way” can stifle their thinking.

When observing a mathematics class, Ms. O'Brien's situational appreciation is consistent with her standing commitments about how children learn. She attended to how adept the students were at doing mathematical thinking in their heads and explaining what they had done. As she described it:

...in the groups that I was looking at, they were able to do things in their head[s], and then when one group came up with their word of how they did it, they would [inaudible]. I was thinking, oh, that's their strategy. But I asked them to explain it and then it fell short and so they started over again. And, but they had, they were able to think through things. ... And I don't know how you can get around that except more practice doing it.

As with Ms. West, Ms. O'Brien focused on the student thinking that was going on in the class, not on the size of the class, its orderliness, or other surface characteristics. She noted that the students were able to "do things in their heads," but her appreciation of the situation did not include attention to the content of what the students were talking about — what it was that they understood. She was interested, rather, in the fact that they could do math in their heads, that they had identifiable strategies. She noticed the difficulties the students had in explaining their thought, but did not interpret that as a natural part of the struggle to get ideas and words together. Rather, she noticed how explanations fell short and concluded that more practice was needed.

For her unit of practice project, Ms. O'Brien chose to explore how to help teachers attend to how children are thinking about the mathematics that is being explored in the classroom. In this regard, her standing commitments are inconsistent. With respect to children's learning, she is quite certain that children construct their knowledge. However, her ideas about teacher learning are in the transmission mode. In her view, teachers need to absorb the information that she tells them — that students need to talk more and teachers need to listen more — and her job is to figure out how to get them to believe her about this. Analysis of the transcripts of her discussions with one of the teachers she is working with shows that her way of helping this teacher listen to the students more was to tell him that he was talking too much, he should listen more. As she said to the interviewer:

Well, he knows he's part of this project. He's very eager to do well. But, as I keep on trying to tell him, he needs to stop talking. He needs to talk less and listen more. And it's a hard pattern to get out of. ... He wants to have that role of the teacher, but he's got to be on the listening end a little bit more, because that way he's going to learn more about how to be a better teacher.

Our field notes indicate that she acts on this assessment of the teacher's behavior — she talks to him in the pre-observation conference about the need to talk less, she videotapes every lesson that she observes and calls his attention to places on the video which show him “talking too much,” and she compliments him after lessons she observes in which he talks less. But Ms. O'Brien understands that teachers may not give credence to her words, alone, unless they have seen that the new method works for students like theirs. In the pre-interview she said that teachers needed to experience listening to children's mathematical thinking:

Because I could say a hundred thousand times that we need to listen to children's thinking and we need to, but it's only through [teachers] going through that process with the kids in that type of situation that they're going to actually see that it does make a difference.

So on occasion, when observing in a classroom, Ms O'Brien enters the discussion with the students, trying to make it successful so that the teacher will believe that what she has been saying is true, and will have the confidence to try listening to children's mathematical thinking himself.

Ms. O'Brien has the idea that, in reformed classrooms, teachers listen to children's mathematical thinking, and she wants the teacher she is working with to develop this aspect of instructional practice. However, her ideas about teacher learning are in the transmission, rather than the constructivist, mode. While she understands that her talking to teachers about listening to children may need to be supplemented by confirming first-hand experience, her fundamental idea about how to help the teacher we

observed change his practice is to “keep on trying to tell him, he needs to stop talking... he needs to talk less and listen more.”

This very preliminary analysis of the data about Ms. West and Ms. O’Brien gives us different pictures in each case of the relationship between a principal’s standing commitments, situational appreciation, practical judgment about what to do, and action. In the case of Ms. West, standing commitments, situational appreciation, practical judgment and action are all consistent. Ms. West believes children construct knowledge, filling in gaps in a lattice, and she observes children working to extend their own, individual, ideas in classrooms. Her standing commitments about teacher learning are consistent with her standing commitments about children’s learning, and her practical judgment and action in the realm of teacher learning are consistent with her standing commitments. Ms. O’Brien does not exhibit the same kind of consistency. She believes that children construct knowledge in individual ways and, in observing classrooms, focuses on the fact that children are working on mathematical ideas and struggling to articulate them. Her standing commitments about children’s learning and her situational appreciation in classrooms are consistent. However, Ms. O’Brien’s views of teacher learning are in a transmission mode, and her practical judgment and action in the realm of teacher supervision are consistent with the transmission mode.

The development of understanding and action

The interpretations we have provided in the previous section of this paper come from very preliminary analyses of the data. It is likely that our understanding of the ideas and actions of these two principals, and our understanding of the relationships between

standing commitments, situational appreciation, practical judgment and action will evolve considerably during the next year of data analysis. However, even at this point, the data suggests certain revealing characteristics of administrators' understanding and action.

Studies of teachers who are in the process of changing their beliefs about the nature of mathematics and learning in order to transform their teaching, indicate that such changes do not happen all at once but gradually, over a considerable period of time. Further, such changes are dynamic, with new beliefs moving in and out of focus at different times, and the relationship between change in belief and the development of new instructional practices emerging slowly over time (Franke et al, 1998; Schifter & Simon, 1992; Thompson, 1992). While it is premature to make general statements about the development of administrators' understanding of new ideas about learning, teaching, and mathematics, we can see some interesting comparisons between statements made by Ms. West, who has been familiar with these ideas about mathematics, learning, and teaching for a number of years and statements made by Ms. O'Brien, who encountered these ideas just a year ago.

First, the level of detail and elaboration that these two principals provide is different. Ms. West's explanations of what learning is, what she sees in the reading classroom, and what she wants to do with teachers are much more detailed than those of M.. O'Brien. Ms. West provides a very elaborated description of the lattice-like structure of knowledge, her description of the reading classroom is quite detailed, and her goals for asking questions of teachers are clearly delineated. On the whole, her familiarity with the ideas of mathematics education reform is greater, and these ideas are connected to each

other and to aspects of her practice in a variety of ways, allowing her to move fluidly around in this conceptual space. Ms. O'Brien, while equally articulate in general, is still working to understand the ideas of mathematics education reform and to find words to express them. Her explanations are simpler and less elaborated; the connections among her ideas and between her ideas and her practice are more sparse.

Second, there are differences in what these two principals attend to when observing classrooms. When she observes in a classroom or has a conversation with a teacher Ms. O'Brien is not looking at, or talking about, the mathematics itself. Rather, for the most part, she focuses on the outer forms of reformed mathematics instruction. For example, she wants teachers to listen to children's mathematical thinking but, as we analyze the data, we see that she does not notice or talk with the teacher about the mathematical content of what the children are saying. She is content to note that the children are talking about their problem-solving strategies (or are having difficulty expressing themselves), without mentioning the content of those strategies and their accuracy or validity. She wants the teacher to talk less and listen more, but never says what the teacher should be listening for. After observing classes she might compliment the teacher on talking less than previously and listening more, but she does not ask him what mathematical ideas he heard the children discussing and what he thinks about their mathematical understanding. She is clear that if teachers listen to children more they will be able to assess what the children understand, but her own situational appreciation in classrooms and her practical judgment about what to talk to the teacher about somehow float above the mathematical content itself. Ms. West, on the other hand, clearly attends to the content of what the children are saying and wants teachers to do the same. She

notices whether the children in a classroom are counting to ten in different ways or the same way, and feels that a classroom that encourages counting in a variety of ways is better. She is adapting her pre- and post-observations questions in such way that they direct the teachers' attention more clearly to the mathematical content of what their students have been saying and doing, and to the similarities and differences among the students' mathematical thinking.

These principals' ideas about the nature of teacher learning are also different. Ms. West believes that teachers, too, construct their knowledge and she intends to develop a range of open-ended questions that can prompt teachers' reflection and construction of knowledge about the levels of mathematical thinking among the children in their classrooms. Ms. O'Brien, on the other hand, believes that teachers will learn if she can just find the right way to tell them, including providing evidence that the new methods will work with students like theirs. She chooses the occasion of the annual evaluation for her project work, which suggests she does not appreciate how vulnerable teachers are when they try to transform their practice, and she proceeds by telling the teacher, again and again, that he needs to listen more. She does not appear to have considered what is involved in teachers' constructing their own knowledge, nor to have thought through the implications of that for her own behavior.

Fluidity and detail of explanation, focus on the central issues, and consistency of beliefs and between beliefs and action characterize Ms. West's more developed understanding. Ms. O'Brien is working hard to understand the ideas about mathematics, learning, and teaching embedded in standards-based mathematics education and is committed to helping the teachers in her school begin to change their instruction. She is

simply at an earlier point in the process. Ms. O'Brien inhabits that fluid, in-between, place where old ideas have come under question but newer ideas are not yet firmly in place. We see this often in teachers who are learning to view mathematics, learning, and teaching differently. It is not surprising that administrators would experience similar conceptual inconsistencies.

Noting this leads us to point to the utility of the construct of standing commitments for the phenomenon we are observing. Pendlebury describes standing commitments as “coherent principles” that inform practical judgment, implying that they are internally consistent and stable over time. In Ms. O'Brien we see both an older set of standing commitments and an emerging newer set, at work simultaneously. The subjective feel, to Ms. O'Brien, may well be that all of these are important principles to which she is committed. That is, she may feel her standing commitments to be coherent and principled. It is the outside observer who can see the tectonic plates shifting, so to speak. The construct of standing commitments was particularly useful in the case of Ms. O'Brien, since it called our attention to the inconsistencies in her beliefs. This raises the possibility that the construct of standing commitments may be particularly useful in coming to understand principals whose ideas are in a transitional state. As our research proceeds we will continue to explore the utility of the construct of standing commitments for explaining what principals value and how their ideas about mathematics, learning, and teaching link to their action.

Conclusions

Administrators' responsibilities — managing schools, supervising teachers, setting district-level professional development policy, selecting curricula and assessment

instruments, etc. — put them in positions where they can either help or hinder reform efforts in mathematics and other subjects by the way they see and understand the practical issues before them, and by the practical judgments they make. The research described here is designed to help us better understand what is entailed for administrators to take action to support these reform efforts.

We have suggested that administrators' capacity to support standards-based mathematics education is affected by their understanding of its basic principles — i.e. the ideas they have about nature of mathematics itself, the nature of learning, and the nature of teaching. In this paper we have proposed a theoretical framework that specifies the relationship between administrators' ideas about mathematics, learning, and teaching (standing commitments), the way they interpret the professional situations they are in (situational appreciation), what they think they should do in those situations (practical judgment), and what they actually do. Tracing the relationships between standing commitments, situational appreciation, practical judgment and action for two principals in the context of their work in classroom observation and teacher supervision, we could see that their ideas about the nature of children's learning, their sense of what to attend to in the classroom, and their views of teacher learning, affected what they saw and what they did. Moreover, these principals thought about classrooms and teacher learning in subtly different ways, and, in the case of the principal for whom many of the ideas embedded in standards-based mathematics education were newer, there was less consistency among her ideas and less consistency between ideas, practical judgment, and action.

As our analysis of these data progresses, we anticipate that we will have a rich opportunity to continue to explore the ways in which principals link ideas about mathematics, learning, and teaching to the decisions and actions that constitute their administrative practice. We also expect to be able to identify administrative practices that align well with the underlying norms and values of standards-based mathematics instruction, those that do not, and new administrative practices developed by the principals we are studying to bring their ideas and their administrative practice into alignment.

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