

Using Teacher Narrative to Understand Teachers' Uses of Curriculum Materials

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Abstract: In this paper, teachers' mathematics stories – narratives of their prior and current experiences with mathematics – are used to identify and understand patterns in teachers' uses of curriculum materials. In particular, interview and observation data from twenty urban elementary teachers piloting a reform-oriented curriculum are used to link patterns in teachers' mathematics stories to patterns in teachers' curriculum interactions and enactments. The paper concludes with a discussion of the implications of these findings for the design of curriculum materials as vehicles for the large-scale implementation of mathematics education reform.

With the introduction of the NCTM Standards (NCTM, 2000) for mathematics education and the subsequent development of "reform-oriented" and "standards-based" curriculum materials, researchers (along with teachers, administrators, professional developers, and curriculum designers) have sought to understand the ways in which teachers interpret and implement reform-oriented curriculum materials. These studies are related to efforts to realize the potential of curriculum materials as large-scale vehicles for supporting mathematics education reform (Ball & Cohen, 1996; Davis & Krajcik, 2005). What has become clear from this research is that there is not a direct or uncomplicated connection between the practices envisioned by curriculum designers and those seen in elementary classrooms (Remillard, 2005). What is less clear is how the connections between curriculum materials and classroom practices can be viewed not simply as idiosyncratic connections dependent on the whims of particular individuals, but as patterned and predictable connections related to particular characteristics of groups of teachers.

In this paper, I claim that teachers' mathematics stories frame their use of reform-oriented curriculum materials and, consequently, patterns across the stories of different teachers can help us identify and understand patterns in teachers' interpretations and uses of the materials. In the sections that follow, I first outline the theoretical and methodological framework within which I have situated the collection and analysis of teachers' mathematics stories. I then present two kinds of results from analyses of teachers' stories and their understanding and use of a reform-oriented mathematics curriculum. Finally, I conclude with implications for future curriculum design.

Theoretical Framework

Narrative and Sense-Making

Work in psychology, anthropology, and, more recently, education has suggested that narrative is a key form through which individuals come to know themselves and, as such, a key framework within which individuals make sense of new information. Studies from a variety of fields have converged around the claim that narrative can provide important insight into individuals' sense-making processes. Although their studies utilize very different methodologies, theoretical frameworks, and disciplinary backgrounds, researchers as diverse as Bruner (2002), Clandinin & Connelly (2000), McAdams (1993) and Weick (1995), among many others, all make quite similar claims. As Clandinin and Connelly (2000) say, "...if we understand the world narratively, as we do, then it makes sense to study the world narratively." (p. 17). For the past several years, I have been applying this central claim - that sense-making is situated in the narratives of individuals – to my work with teachers implementing elementary mathematics education reform curriculum materials.

Teachers' Curriculum Use

In the past decade, several studies – in mathematics education (e.g., Drake, 2000; Drake & Sherin, in press; Remillard, 1999, 2000, 2005; Remillard & Bryans, 2004), science education (e.g., Brown &

Edelson, 2003; Schneider, Krajcik & Blumenfeld, 2005), and education policy (e.g., Coburn, 2005; Spillane & Zeuli, 1999) – have worked to conceptualize the processes through which written curriculum materials and standards become instantiated in classroom practice. In particular, these studies have focused on two key sets of processes (though they have used a variety of terms and classifications for these constructs) – *interactions* between the teacher and the curriculum materials and *enactments* of the curriculum materials with students in classrooms. Curriculum interactions include activities such as reading, evaluating, and noticing, while classroom enactments include such activities as adaptations and modifications during instruction. In the study presented here, I use both the concept and methodology of narrative to identify and understand patterns in teachers’ curriculum interactions and enactments.

Methods and Data Sources

Participants

Twenty K-3 teachers from a large urban area participated in this study designed to understand teachers’ experiences piloting a reform-oriented curriculum. The teachers ranged in age from their 20s to their 50s and in teaching experience from one year to thirty years. While their levels of participation in the project varied, all of the teachers participated in mathematics story interviews (described below) as well as multiple (between 5 and 30) classroom observations and post-observation interviews.

Mathematics Story Interview Protocol

The mathematics story interview protocol was adapted from a more general life story interview protocol developed for use in personality psychology research (McAdams 1993). In the interview, teachers are asked to consider all of their experiences learning, teaching, and using mathematics (both in and out of school) as a story and to identify several key events within that story. These events include the high point, low point, and any turning points in the story. Teachers are also asked to describe significant challenges in their story and how those challenges were overcome, influential characters in the stories, and possible positive and negative futures, or next chapters, for their stories. Finally, teachers are asked about their strengths and weaknesses as mathematics teachers and their goals in teaching mathematics. These interviews lasted between 45 and 90 minutes and were audiotaped and transcribed.

Classroom Observations

As mentioned above, all of the teachers were observed between five and thirty times teaching lessons “using” the reform-oriented curriculum materials. Field notes were taken during all observations, and most observations were videotaped and transcribed.

Coding Teachers’ Mathematics Stories

Key events in the mathematics stories, as well as teachers’ descriptions of their strengths and weaknesses as mathematics teachers, were coded for overall tone (positive, negative, or neutral). Each of these passages was also coded for the specificity (non-specific, moderately specific, fairly specific, and specific) of teachers’ descriptions of the event (What happened?), timing (When did it happen?), and mathematical content (What mathematics was involved?). All twenty stories were coded by two researchers. Interrater reliability was 84.6% for tone and 72.2% for specificity. Any differences between the two coders were resolved through consensus.

After all twenty stories had been coded for tone and specificity, they were then categorized based on the nature (i.e., tone, specificity, and content) of their descriptions of early (college years and earlier) events and their descriptions of current events. Teachers’ descriptions of their early experiences with mathematics fell into two categories: *specific failure* and *mixed positive/negative*. The early *specific failure* stories included the following features: specific descriptions of failing in mathematics, consistently strong and negative language in descriptions of pre-teaching experiences, non-specific high point, and early and specific low point. By contrast, the early *mixed positive/negative* stories included a mixture of positive and negative tone throughout the story, no specific failing incident, and equally specific high point and low point (or more specific high point than low point).

Teachers' current perceptions of themselves and their mathematics experiences were categorized into three types. Those that were categorized as *recent positive/teaching and learning* included recent and specific turning points that often referred to their own learning as well as their students' learning. These stories also included specific strengths and weaknesses that focused on implementing what had been learned through the turning point experience. *Recent positive/teaching only* stories contained turning points that were either early in the story or only related to teaching and not to learning. In these stories, strengths are greater in number and/or specificity than weaknesses and are attributed to factors beyond the teacher's control (e.g., time, class size, etc.). Finally, *recent negative* stories are those in which there is no recent or specific turning point or high point. In addition, the weaknesses are greater in number and/or specificity than the strengths and the strengths are attributed to someone or something other than the teacher (e.g., abilities of students, characteristics of the school, etc.).

This combination of two possible types of early stories and three possible current stories yielded six overall story types. These story types, along with the number of teachers who told each type, are displayed in Table 1.

Table 1. Distribution of Teachers' Mathematics Stories

	Current: Positive Teaching and Learning	Current: Positive Teaching Only	Current: Negative
Early: Specific Failure	Turning Point (N=6)	Foreclosed (N=3)	Frustration (N=1)
Early: Mixed Positive/Negative	Roller Coaster (N=3)	Satisfied (N=6)	Resignation (N=1)

Coding Teachers' Curriculum Understandings and Practices

Observations of teachers' practices were coded using a "Levels of Practice" framework (Drake, accepted) that focuses on three key aspects of teachers' reform-oriented instruction – content, discourse, and curriculum use. For each teacher, a researcher familiar with all of the observations of the teacher's practice selected the two observations that reflected the teacher's typical best instruction – i.e., the most reform-oriented instruction observed on a regular basis. These two observations were then coded by a team of researchers.

In this paper, I focus in particular on teachers' levels of curriculum use. For each teacher, curriculum use was coded from Level 0 (most traditional) to Level 3 (most reform-oriented). These levels reflect the extent to which teachers' use and adaptation of the reform-oriented curriculum materials supported the intended goals of the lesson. At Level 0, teachers either do not use the materials at all, or use selected elements of the materials without regard to their conceptual importance. At Level 1, teachers use many elements of the curriculum, but also drop key elements. Level 1 curriculum use is often quite rigid, with the curriculum materials being followed literally even when the students and/or teacher are having difficulty with the materials. When adaptations are made, they tend to make the materials easier and/or less reform-oriented. At Level 2, teachers are mostly using the reform-oriented materials and any changes that are made are small and in support of the intended goals of the lesson. Finally, at Level 3, the reform-oriented curriculum materials guide most of the teacher's practice *and* teachers make changes in light of students' needs that support and extend the intended goals of the lesson. These changes might include taking a different path to reach curricular goals, creating new materials, or following students' leads in discussions while maintaining the central goals of the lesson.

Data from each teacher were also analyzed to determine their curriculum focus – the elements of the curriculum teachers paid most attention to in both their talk about the curriculum materials and their practices using the materials. In the two sections that follow, I describe two kinds of results that have emerged from these analyses – the first concerns teachers' curriculum foci, or what teachers focused on in their curriculum interactions. The second concerns teachers' curriculum enactments – or the kinds of adaptations teachers made to the materials in planning and implementing instruction. In both of these sections, I present results for the four story types told by more than one teacher.

Mathematics Stories and Curricular Foci

Teachers in this study differed significantly in the aspects of the curriculum they focused on in their interactions with and enactments of the curriculum materials. The need to focus on particular elements is not surprising, and is, in fact, probably essential for teachers, given the overwhelming amount of new information provided in any set of curriculum materials. What is perhaps more surprising is that there were distinct patterns in the particular elements on which teachers chose to focus (Table 2). These foci served as the lens through which teachers made sense of the curriculum and its relevance to their learning and teaching practices.

Table 2. Teachers' Curricular Foci by Mathematics Story Type

Story Type	Curricular Focus
Turning Point	Manipulatives OR Students' Changing Understandings of Mathematics
Roller Coaster	Teachers' Mathematical Content
Foreclosed	Teaching Style and Ideas for Motivating Students
Satisfied	Pedagogical Techniques AND/OR New Stand-Alone Activities

Teachers were often quite explicit about these curricular foci. For example, Beth, one of the teachers who told a turning point story, related her use of the curriculum to her new learning goals for her students:

My goals for my students in math? This year they're changing... This year, I want them to branch out... it's like learning another language. It's looking at it in a different way, but the same thing.

This focus on students' understandings of mathematics is contrasted with the comments of Irene, one of the teachers who told a roller coaster story: Her focus in using the curriculum was primarily on her own learning of the mathematical content in order to better teach it to her students:

And just using this program, it's a constant challenge just for me to understand the math... 'cause constantly, you have to be thinking about it all the time in order to figure out how to teach it.

Jennifer, who told a foreclosed story, focused on the curriculum's role in making mathematics fun for her students in an effort to avoid the negative and failing experiences she remembered as a mathematics student:

So, with pages like that, you can get their mind off of the idea that they're even doing math, you know. Imagine your own cookie factory...and you're in charge of keeping track of what you sell and this and that, but they're not really realizing how much math they're doing and they're having fun with it.

Finally, Laura, a satisfied story-teller, evaluated the curriculum by identifying individual, stand-alone activities from the curriculum that she would integrate into her on-going practice:

I think, just like I stuck away the scrolls and stuck away the tens and ones from [another math program], I think I'll pretty much take labeled drawings [from the current curriculum] with me no matter what I end up doing.

These quotes are representative of both the talk and practices of the teachers as they read, evaluated, adapted, and implemented the curriculum materials. These different foci allowed the teachers to do very different things with the curriculum materials, as reflected in their levels of curriculum use, discussed in the next section.

Mathematics Stories and Levels of Curriculum Use

As can be seen in Table 3, teachers varied greatly not only in their curricular foci, but also in their levels of curriculum use – the kinds of adaptations they made when using the curriculum materials and the extent to which their practices with the curriculum were reform-oriented.

Table 3. Teachers' Levels of Curriculum Use by Mathematics Story Type

Story Type	Level of Curriculum Use
Turning Point	1.3
Roller Coaster	2.3
Foreclosed	0.7
Satisfied	1.9

Teachers who told roller coaster stories and who focused on their own learning of the mathematics content were the only ones to consistently maintain the reform orientation of the curriculum materials. Teachers who told foreclosed stories, on the other hand, very often did not use the curriculum materials at all or used them in ways that greatly simplified the task. For example, Jennifer described what she did when a lesson seemed too abstract or difficult:

I winged it. I kind-of modified it to how I interpreted it and I modified it to suit my kids. Without, see if I, I felt that if I had presented it the way it was presented in the lesson, they would've gotten totally confused.

The satisfied teachers were moderately reform-oriented in that the individual elements of the curriculum they chose to implement were often enacted in reform-oriented ways. Finally, the turning point teachers are an interesting case in that there was a distinct split between those teachers who focused on the lack of manipulatives in the curriculum (and tended to use the curriculum in traditional ways) and those who focused on new student understandings of mathematics (and tended to use the curriculum in more reform-oriented ways). (See Drake, accepted, for more discussion of this difference among the teachers who told turning point stories).

Implications for Curriculum Design

As seen in these results, teachers make sense of and use new curriculum materials in a variety of ways. While some of these ways might be more or less supportive of reform-oriented instruction, I am not claiming that only certain groups of teachers (i.e., those who tell particular kinds of stories) can undertake reform. Instead, this research supports a claim that different teachers bring very different combinations of beliefs, experiences, and practices to their interactions with curriculum materials. Further, these differences are not random or idiosyncratic, but are instead related to patterns in teachers' mathematics stories. Therefore, in order for the curriculum materials to succeed on a large scale, they must be designed with these diverse stories in mind and speak to the concerns and issues of multiple story types.

It is important to note that the curriculum materials being piloted in this study were still under development at the time of the research. Nonetheless, there were clear patterns in what the teachers noticed, understood, and did with the curriculum that were not wholly related to the curriculum's stage of development. For instance, some teachers had only recently "discovered" manipulatives and were explicitly looking to the curriculum for ways it could scaffold them in using manipulatives with their students. These teachers closely linked their definition of "reform" with the use of manipulatives. For other teachers, their definition of "reform" focused on changing the ways they and/or their students thought about mathematics. These teachers found something very different in the curriculum than did the manipulative-centered teachers. Similarly, the teachers who told satisfied stories were not looking to change their understandings of mathematics. Instead, they were searching for new activities that would be considered "reform" activities to add to their repertoire of mathematics teaching practices.

Each group of teachers came to the curriculum with a different idea about what mathematics education “reform” meant and, therefore, about what they were looking for in the curriculum. As a result, each group of teachers followed a different “entry point” into the curriculum. From the point of view of reform curriculum design, these results point to at least two classes of design constraints for effective curriculum materials. First, materials must make salient to a prospective user easily identifiable “entry points” into reform – entry points that speak to the needs of teachers with very different mathematics stories. Second, once teachers have entered into trying to use the curriculum materials, these materials must support teachers in building on and expanding their understandings of what “reform” means. Reform-oriented curriculum materials will not be successful in bringing about large-scale change in mathematics teaching practices unless and until teachers with different story types are supported in trying to use reform curricula.

References

- Ball, D.L. & Cohen, D.K. (1996). Reform by the Book: What Is – Or Might Be – the Role of Curriculum Materials in Teacher Learning and Instructional Reform? *Educational Researcher* 25(9): 6-8, 14.
- Brown, M., & Edelson, D.C. (2003). Teaching as Design: Can We Better Understand the Ways in Which Teachers Use Materials So We Can Better Design Materials to Support Their Changes in Practice? Evanston, IL: The Center for Learning Technologies in Urban Schools.
- Bruner, J. (2002). *Making Stories: Law, Literature, Life*. Cambridge, MA: Harvard University Press.
- Clandinin, D.J. & Connelly, F.M. (2000). *Narrative Inquiry: Experience and Story in Qualitative Research*. San Francisco: Jossey-Bass Publishers.
- Coburn, C.E. (2005). The Role of Nonsystem Actors in the Relationship Between Policy and Practice: The Case of Reading Instruction in California. *Educational Evaluation and Policy Analysis* 27(1): 23-52.
- Davis, E.A. & Krajcik, J.S. (2005). Designing Educative Curriculum Materials to Promote Teacher Learning. *Educational Researcher* 34(3): 3-14.
- Drake, C. (2000). Stories and Stages: Teacher Development and Mathematics Education Reform. Unpublished doctoral dissertation: Northwestern University.
- Drake, C. (accepted). Turning Points: Using Mathematics Life Stories to Understand the Implementation of Mathematics Education Reform. *Journal of Mathematics Teacher Education*.
- Drake, C. & Sherin, M.G. (in press). Practicing Change: Curriculum Adaptation and Teacher Narrative in the Context of Mathematics Education Reform. *Curriculum Inquiry*.
- McAdams, D.P. (1993). *The Stories We Live By: Personal Myths and the Making of Self*. New York: The Guilford Press.
- National Council of Teachers of Mathematics (2000). *Principles and Standards for School Mathematics*. Reston, VA: Author.
- Remillard, J.T. (2005). Examining Key Concepts in Research on Teachers’ Use of Mathematics Curricula. *Review of Educational Research*.
- Remillard, J.T. (2000). Can Curriculum Materials Support Teachers’ Learning? Two Fourth-Grade Teachers’ Use of a New Mathematics Text. *Elementary School Journal* 100(4): 331-350.
- Remillard, J.T. (1999). Curriculum Materials in Mathematics Education Reform: A Framework for Examining Teachers’ Curriculum Development. *Curriculum Inquiry* 29(3): 315-342.
- Remillard, J.T. & Bryans, M.B. (2004). Teachers’ Orientations Toward Mathematics Curriculum Materials: Implications for Teacher Learning. *Journal for Research in Mathematics Education* 35(5): 352-388.
- Schneider, R.M., Krajcik, J., & Blumenfeld, P. (2005). Enacting Reform-Based Science Materials: The Range of Teacher Enactments in Reform Classrooms. *Journal of Research in Science Teaching* 42(3): 283-312.
- Spillane, J.P. & Zeuli, J.S. (1999). Reform and teaching: Exploring patterns of practice in the context of national and state mathematics reforms. *Educational Evaluation and Policy Analysis* 21(1): 1-27.
- Weick, K. (1995). *Sensemaking in Organizations*. Thousand Oaks, CA: Sage Publications.