

Student Teachers' Experiences with Mathematics Curriculum Materials: Issues of Autonomy and Teacher Learning

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Abstract

This paper explores the differing learning opportunities of Heather and Bridget, two elementary student teachers in the US, as they used conceptually distinct mathematics curriculum materials during student teaching. Heather had an opportunity to use newly advocated *Standards*-based curriculum materials, she expanded her repertoire of teaching ideas, and focused on curriculum delivery. Bridget, on the other hand, adapted and supplemented a more traditional mathematics text as she assessed her students' developing understandings. These cases raise questions as to what teacher educators and researchers might promote in preservice education regarding curriculum use. Implications for and suggestions from other countries are also included.

Introduction

As preservice teacher education is a time of teaching *and* a time of learning, it is important to consider the opportunities for learning afforded preservice teachers as they progress through teacher education. As Shulman (1987) points out, part of learning to teach is the development of a knowledge base for teaching from formal educational scholarship and from wisdom of practice. The third category of knowledge—*curricular knowledge*—consists of an understanding of the full range of programs designed for the teaching of particular subjects and topics at a given level, the variety of instructional materials available in relation to those programs, and the set of characteristics that serve as both the indications and contradictions for the use of particular curriculum or program materials in particular circumstances. (Shulman, 1987, p. 10)

Adding to this definition, Lloyd (2002) drew attention to the role of teachers' beliefs about curriculum in their developing curricular knowledge. According to Lloyd, these beliefs encompass understandings of the role of curricular materials in the teaching and learning process, the philosophies of teaching and learning that underlie diverse curriculum materials, knowledge of the appropriateness of particular materials for certain classes and individuals, and the practical and intellectual understandings necessary for making adjustments to curricular approaches. (pp. 156-157)

These multiple dimensions of curricular knowledge highlight the complicated nature of teachers' curriculum use. As Ben-Peretz (1984) pointed out, "The ability to grasp the full meaning of curriculum materials is a prerequisite for their professional use in classrooms. This ability has to be developed in pre- and inservice teacher education programs" (p. 11). An important aspect of that experience is preservice teachers' learning from and use of texts and curriculum materials during student teaching. Preservice teachers' developing curricular knowledge and opportunities to become autonomous users of curriculum is the focus of this paper.

The Case of Heather and Bridget

Two preservice elementary teachers, Heather and Bridget (pseudonyms), were participants in a research study conducted in Spring 2004 focused on student teachers' interactions with *Standards*-based (National Council of Teachers of Mathematics, 1989, 2000) mathematics curriculum materials and traditional textbooks currently available and mandated in local school systems in the US. Data collection occurred during the last 7 weeks of Heather and Bridget's student-teaching internships when they were teaching mathematics full-time. The majority of the

data were collected through classroom observations and interviews. Due to space limitations, methodological and specific case details are not included in this paper but can be accessed in reports of the individual teachers (Behm & Lloyd, 2006; Lloyd, in press-a, in press-b). Instead, the purpose of this section is to provide a brief overview of each student teacher's experiences.

Heather

Heather completed her student-teaching internship in Ms. Greene's first grade classroom at a school approximately 3 miles from the university. The area surrounding the school contains rural and suburban regions and has a predominantly white student population. The *Standards-based Everyday Mathematics [EM]* curriculum program (University of Chicago School Mathematics Project [UCSMP], 2001) was mandated for use in all elementary schools in the district. Prior to student teaching, Heather had extensive experiences with the *EM* curriculum in her methods courses and was excited to be placed in a classroom where "math would be planned." During her internship, Heather reported to prepare each weekend for the upcoming week's mathematics activities using a copy of the *EM* teacher's guide to develop general plans for her lessons. Heather explained that she looked at the teacher's guide again each morning before teaching and felt that detailed lesson plans were unnecessary because when she taught, she had "the teacher's manual up there." Although Heather typically planned on her own as she read through the lessons in the teacher's guide, she also occasionally consulted her cooperating teacher when she was confused about a particular game or activity in *EM* or when she had questions about supplies. Typically, Heather attempted to conduct her mathematics lessons in the specific ways recommended by the 4 to 5 page lesson plans found in the teacher's guide. She used the guide during instruction to stay informed of specific tasks and questions to ask students as well as the overall organization of lessons. Heather explained that she tended to rely on the book during instruction because of the detailed, scripted nature of the information contained in the guide: "I feel like the teacher's guide is a script, so I always have it with me. A lot of times, I feel like if I miss a paragraph in the book then maybe that will throw the lesson off." When Heather adapted the recommendations, her changes usually related to the amount of time to spend on each lesson component. During some lessons, Heather felt rushed through activities that she had really wanted students to explore, as she felt pressure to get to the end of the lesson. Heather's future lesson plans were typically driven by the explanation of the next lesson in the *EM* guide.

Bridget

Bridget completed her internship in the urban Coopersburg Schools, located 45 miles from the university. Bridget was placed in Ms. Barrett's kindergarten classroom in a school attended primarily by minority students. For mathematics instruction, the teachers utilized materials from the commercially-developed *Silver Burdett Ginn [SBG]* (Fennell et al., 1999) textbook series. In addition, administrators and teachers at Bridget's school viewed the state mathematics framework as a critical curriculum guide to be followed closely. During her internship, Bridget used the workbook component of the *SBG* curriculum program and supplemented the workbook with additional tasks and activities. Each week, Bridget met with three other kindergarten teachers to plan for upcoming lessons. The focus of these planning meetings was on the selection of *SBG* workbook pages and worksheets: "I've been told several times that I needed to make sure that [the students] are getting plenty of paperwork." As Bridget explained, "the principal likes to know what [state standards] we're covering which day." Although Bridget found the planning meetings to be helpful, she consistently made her own plans after the meetings. As Bridget explained, "The truth is, I am trying to use what they're giving me and add to it where I think it's lacking." For each lesson, Bridget evaluated the *SBG* workbook offerings according to her informal assessment of students' knowledge, the objectives presented in the state curriculum framework, and her own visions of mathematics instruction. Typically, Bridget extended

workbook lessons to allow students to “move around” and use physical materials or manipulatives. To develop new mathematics activities for use in conjunction with the *SBG* worksheets, Bridget first consulted the state curriculum framework to identify specific mathematical content, and then tapped other resources, including her roommate's copy of *Everyday Mathematics* and activities from her methods courses, for instructional ideas that would address the needs of her students. Most often Bridget's development of successive lessons was based on an evaluation of her students' behavior and their mathematical needs.

Teacher Learning with Curriculum Materials

Heather and Bridget were placed in conceptually distinct elementary classrooms. One of the biggest differences in their placements, the curriculum materials and resources they were asked to use, helped shape their opportunities for learning. What opportunities for learning were available to each student teacher given their differing placement contexts and curriculum use?

Heather's Curriculum Delivery

As new *Standards*-based mathematics curriculum materials were developed in the US, teacher learning was considered an important component of the design and enacting the materials has been characterized by many as a potential place for teacher learning (e.g. Ball & Cohen, 1996; Davis & Krajcik, 2005; Remillard, 2000; Remillard & Bryans, 2004). As Heather closely followed the recommendations of the *Standards*-based curriculum program of her internship site she had the opportunity to expand her repertoire of activities and games. Heather also had an opportunity to consider and learn about the challenges of enacting a *Standards*-based curriculum program. She appreciated the guidance of a detailed curriculum for teaching mathematics and attempted to use the materials closely throughout her internship. Designing curricula with enough detail to be educative, however, has its potential limitations. As some have argued, textbooks and teachers guides, in many ways, place the mathematical and pedagogical authority outside of the teacher (Remillard, 2000), as someone or something outside of the immediate classroom context now has control over planning (Apple & Jungck, 1990). While Heather did have an opportunity to learn about the complexity of curriculum enactment and to develop a repertoire of teaching activities and strategies, her primary focus throughout student teaching appeared to be on curriculum delivery. As Heather worked to fit in all of the recommended activities and lessons ideas in the *Everyday Mathematics* curriculum guide, she found herself rushing through activities that she would have preferred to let students explore on their own. This leads one to question, as Lloyd (1999) has pointed out, whether the detailed design of curriculum materials encourages teachers to focus primarily on packaging and delivery. While teachers' use of curriculum specifically designed with teacher learning in mind does play a role in the learning opportunities available to them, is learning too narrowly defined?

Bridget's Agency in Curriculum Making

One important area of teacher learning to consider is teacher autonomy and agency in curriculum enactment. Paris (1993) defines teacher agency in curriculum matters as involving “the creation or critique of curriculum, an awareness of alternatives to established curriculum practices, the autonomy to make informed curriculum choices, an investment in self, and ongoing interaction with others” (p. 16). As Ben-Peretz (1984) points out, teachers' inquiry is “oriented toward discovery of curriculum potential, change, and transformation of materials, devising of new alternatives, and decision making” (p. 12). More so than Heather, Bridget's student teaching experience allowed for flexibility in lesson design, including the transformation of materials. Mandated to use the more traditional *SBG* curriculum program during student teaching, Bridget felt her cooperating teacher and principal were most concerned that she use all of the required worksheets with her students. Bridget did use the required worksheets, however she also extended lessons to include ideas from past university coursework and from the

Everyday Mathematics curriculum. Bridget, in contrast to Heather, found herself placed in a classroom where reliance on external resources to her seemed to be necessary. Bridget learned how to incorporate other ideas and resources while still respecting and addressing the expectations of her school. She also had the opportunity to learn about and attend to state curriculum frameworks, an important experience in the current era of high-stakes testing and teacher accountability. Bridget worked closely with the other kindergarten teachers in the school as she planned lessons, but also incorporated some of her own ideas of what more innovative instruction might look like. Bridget's student teaching experience allowed her to attend to her individual students' needs as she developed her own lesson ideas and adapted activities from the textbook she was mandated to use.

Autonomous Users of Standards-based Mathematics Curriculum Materials

As *Standards*-based mathematics curriculum materials become more widely used, research focused on teachers' learning with these materials has become popular. Our study of student teachers' curriculum use is a prime example – we started our study following 3 teachers using *Standards*-based materials (including Heather) but only one teacher using a more traditional textbook (Bridget). Researchers interested in *Standards*-based materials most often focus on how teachers interpret and learn from the text, and are less interested in the enacted curriculum more generally (Remillard, 2005; Snyder, Bolin, & Zumwalt, 1992). For example, seeking to understand the role that curriculum plays in teacher learning, Remillard and Bryans (2004) investigated the differing curriculum use of 8 elementary teachers using a newly released *Standards*-based mathematics curriculum program. The authors claimed that teachers who used the curriculum infrequently had minimal engagement in learning whereas the teachers who adopted tasks from the *Standards*-based curriculum or used the curriculum very closely had opportunities to expand their repertoire of activities and learn about student thinking.

Examining Heather and Bridget's opportunities for learning stands in contrast to a primary focus on teachers' use of *Standards*-based materials. Although Heather gained experience using a complicated curriculum, her focus on curriculum delivery made it hard for her to respond to her students developing mathematical understandings. Bridget, even when placed in a classroom with more traditional textbooks and routines, found herself making modifications to curriculum and creating new tasks in response to her students needs and her own ideas about appropriate instruction. The differing opportunities afforded Heather and Bridget not only demonstrate the affordances and constraints of various instructional placements during student teaching, but also raises questions about how to better prepare teachers for each type of placement.

Older professional development studies and research reports on teachers' curriculum use in mathematics in the US – research that occurred prior to the release of *Standards*-based mathematics curriculum – frequently had teacher autonomy as a goal. For example, Cobb and Wood (1988) expressed intellectual autonomy as a goal for their teachers and were, “gratified to find that the teachers are increasingly relying on their own judgments when selecting from the available materials... It would seem that they are becoming curriculum constructors to meet their students' needs (p. 112). According to Ball and Cohen (1996), however, the “idealization of professional autonomy leads to the view that good teachers do not follow textbooks, but instead make their own curriculum.... This idealized image has inhibited careful consideration of the constructive role that curriculum might play” (p. 6). Within preservice teacher education, however, these ideas might not have to be at odds. For example, recent research in science education promotes educative curricular resources as both a tool for teacher learning and a resource that helps promote teachers as curriculum designers (Davis & Krajcik, 2005).

Recommendations and Questions to Consider

As we work with teachers at the very beginning of their teaching careers, it is important to consider the implications of prematurely pushing teachers to lesson adaptation and refinement. It would be irresponsible, as Ball & Feiman-Nemser (1988) point out, to prepare teachers who reject textbooks and teacher's guides. As Kauffman (2002) suggests however, "one could also argue that the beginning years are the best time to allow a beginning teacher to be creative, before they are fixed in their ways and less susceptible to change and improvement" (p. 22). As we plan preservice coursework focused on curricular knowledge and also facilitate student teaching placements, we need to help teachers learn from all types of curricular materials as they evaluate and adapt lessons for their particular students. We also need to consider how to move student teachers beyond a focus on curriculum delivery when they use *Standards*-based curriculum materials to a more focused lesson evaluation for their students. Helping student teachers uncover ways to use the supports embedded in curriculum materials for their own learning and their students' learning is critical as they engage in first time teaching.

We should also consider student teaching contexts in countries other than our own. Although this study was conducted in the US, it has implications for all countries struggling with mandated curriculum. For example, studies about student teachers' use of the national mathematics curriculum in England have also raised questions about the value of such experiences. Edwards and Protheroe (2003) found that as student teachers utilized the mandated curriculum, they "placed emphasis on curriculum delivery at the expense of responsive pedagogical decision-making" (p. 240). We might also consider other models of student teaching, such as Japanese student teachers' explicit focus on the preparation, teaching, and reflection of lessons (Peterson, 2005). Incorporating preservice education ideas from other countries might help teacher educators, researchers, and preservice teachers in the US realize the importance of examining teacher agency and autonomy with the use of *Standards*-based mathematics curriculum.

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This article describes one student teacher's interactions with mathematics curriculum materials during her internship in a kindergarten classroom. Anne used curriculum materials from two distinct programs and taught lessons multiple times to different groups of children. Although she used each curriculum in distinct ways, her curriculum use was adaptive in both cases. Anne's specific ways of reading, evaluating, and adapting the curriculum materials contrast with previous results about beginning teachers' curriculum use. Several key factors appeared to contribute to Anne's Recent papers in Mathematical Knowledge for Teaching, Mathematics Teacher Education. Past studies have suggested that in light of recent curriculum standards, many US teachers make limited use of drawn models in their mathematics instruction. To gain insight into this phenomenon, we investigated relationships between US more. Past studies have suggested that in light of recent curriculum standards, many US teachers make limited use of drawn models in their mathematics instruction. To gain insight into this phenomenon, we investigated relationships between US teachers' opportunities to learn about, knowledge of, motivation for, and instructional use of drawn models for rep