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ABSTRACT

As an outline of school educational activities, curriculum has been the focus of educational reforms in the past several decades (e.g., National Council of Teachers of Mathematics, 1980, 2000). In contrast, there are very limited research efforts given to examine the nature of mathematics curriculum and its roles in teaching and learning mathematics. Efforts to change curricula in the past have focused on revising and developing curriculum materials that were used in classrooms. Because curriculum materials have been a mainstay in mathematics classrooms in many education systems (McKnight, Crosswhite, Dossey, Kifer, Swafford, Travers et al., 1987; Schmidt, McKnight, & Raizen, 1997), it is often assumed that the quality of curriculum materials matters. However, previous reform efforts in changing curriculum materials have not been as successful as educators might expect (e.g., Kline, 1973; McKnight et al., 1987; Project 2061, 1999). Previous efforts and results in reforming curriculum, in fact, suggest the importance of developing research on mathematics curriculum. As a step toward a better understanding of the nature and effects of curriculum materials in teaching and learning mathematics, a discussion group was organized at PME-NA XXIII (Snowbird, UT; October 18-21, 2001). General issues on the quality and role of curriculum materials in mathematics education were discussed. This working group is proposed as a means to further discussions by drawing on continued investigation and collaboration on this topic. In particular, this working group will focus on the following two issues: (1) How can we examine the quality of curriculum material in terms of its content selection, presentation, and organization? (2) How can we examine the use of curriculum material in teaching and learning mathematics in classrooms? (Author)

# CURRICULUM MATERIAL AND ITS USES IN TEACHING AND LEARNING MATHEMATICS

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As an outline of school educational activities, curriculum has been the focus of educational reforms in the past several decades (e.g., National Council of Teachers of Mathematics, 1980, 2000). In contrast, there are very limited research efforts given to examine the nature of mathematics curriculum and its roles in teaching and learning mathematics. Efforts to change curricula in the past have focused on revising and developing curriculum materials that were used in classrooms. Because curriculum materials have been a mainstay in mathematics classrooms in many education systems (McKnight, Crosswhite, Dossey, Kifer, Swafford, Travers et al., 1987; Schmidt, McKnight, & Raizen, 1997), it is often assumed that the quality of curriculum materials matters. However, previous reform efforts in changing curriculum materials have not been as successful as educators might expect (e.g., Kline, 1973; McKnight et al., 1987; Project 2061, 1999). Previous efforts and results in reforming curriculum, in fact, suggest the importance of developing research on mathematics curriculum. As a step toward a better understanding of the nature and effects of curriculum materials in teaching and learning mathematics, a discussion group was organized at PME-NA XXIII (Snowbird, UT; October 18-21, 2001). General issues on the quality and role of curriculum materials in mathematics education were discussed. This working group is proposed as a means to further discussions by drawing on continued investigation and collaboration on this topic. In particular, this working group will focus on the following two issues:

(1) How can we examine the quality of curriculum material in terms of its content selection, presentation, and organization?

(2) How can we examine the use of curriculum material in teaching and learning mathematics in classrooms?

## Research Background

Existing studies on the quality of curriculum materials have derived from two concerns: (1) possible contributions of curriculum materials to students' mathematics achievement, and (2) instructional features and functions embedded in curriculum materials. Examining possible contributions of curriculum materials to students' achievement was often taken in a direct and quantitative way in the 1950s and 1960s

(Walker & Schaffarzick, 1974) and was developed as measuring students' Opportunity-To-Learn (OTL) in more recent international studies (e.g., Robitaille & Garden, 1989; Westbury, 1992). Findings from previous studies suggest that curriculum materials are one of the key contributing factors to students' achievement. However, students' achievement cannot be solely explained by the differences in curriculum materials, and there are also much more in curriculum materials that need to be examined than simply measuring students' OTL. In particular, the instructional functions of curriculum materials are one aspect that has received research attention recently. Relevant studies have shown the feasibility and importance of examining instructional features embedded in curriculum materials in the United States (e.g., Project 2061, 1999) and in materials from different national education systems (Mayer, Sims, & Tajika, 1995; Schmidt et al., 1997). However, further efforts are needed to review, explore and discuss the types of features that are essential for comparing curriculum materials and determining their functions in facilitating the teaching and learning of mathematics.

Although curricular materials are a mainstay in mathematics classrooms in many education systems (Eisner, 1987; McKnight et al., 1987), the curriculum implemented in classrooms often combines with teachers' own thinking and planning (Doyle, 1993; Remillard, 1999). Examining the interaction between curriculum materials and teacher is a relatively new endeavor in curriculum studies. A few existing studies have examined teachers' use of textbooks in classrooms (e.g., Freeman & Porter, 1989; Stodolsky, 1989). For example, Stodolsky (1989) focused on comparing teachers' selections of content topics and instructional suggestions. She found that teachers consistently adhered to the content topics given in their textbooks, but departed from many accompanying instructional suggestions. Similarly, Freeman & Porter (1989) reported that teachers did not follow exactly what curriculum materials suggest they teach. Although few would disagree that there is a discrepancy between curriculum materials and what is implemented in classrooms, remarkable differences can be found from existing studies with regard to the extent curriculum materials affect teaching and learning mathematics in classrooms. Further research efforts are needed for a systematic and in-depth examination of the use of curriculum materials in teaching and learning mathematics in classrooms.

**Plan for Involvement of Participants**

The working group will be organized as a two-part activity. During the first part, participants will introduce each other and then the two organizers will present brief (about 15 minutes) overviews and/or examples of relevant research. The purpose of this short presentation is to outline the historical development of curriculum studies and bring participants up to date about relevant studies. Samples of curriculum materials from different education systems will be brought to the working group and shared with all participants. After the presentation, the participants will be organized to join

the small-group discussions that will constitute the second part activity. The discussion in small groups will center on the two focal issues and will be facilitated with the examination and comparison of sample curriculum materials. After small-group discussions, all participants will come together to generate a collective summary and synthesis of the small-group discussions.

### Anticipated Follow-Up Activities

Based on activities to take place at Athens, a list of potential research questions will be selected and interested participants will be organized to develop further research activities on this topic after the meeting. The issues of curriculum materials in mathematics education can and should be examined with a variety of points of view. Collaborative work, based on participants' research interests, can be developed either cross-nationally or within the United States. Participants will be strongly encouraged to share their research and come together again in future PME-NA meetings.

### Connections to the Goals of PME-NA

This Working Group has emphasized research into the quality and uses of curriculum materials in mathematics education. The topic is developed from a long and broad range of studies on mathematics curriculum, instruction, and students' achievement, both within and across educational systems. Research on this topic draws on a rich background of psychological, pedagogical, and mathematical ideas, and it can open great opportunities for further study and collaboration. Thus, this Working Group connects to all three goals of PME-NA.

### References

Doyle, W. (1993). Constructing curriculum in the classroom. In F. K. Oser, A. Dick, & J. Patry (Eds.), *Effective and responsible teaching* (pp. 66-79). San Francisco: Jossey-Bass.

Eisner, E. W. (1987). Why the textbook influences curriculum. *Curriculum Review, 26*(3), 11-13.

Freeman, D., & Porter, A. (1989). Do textbooks dictate the content of mathematics instruction in elementary schools? *American Educational Research Journal, 26*(3), 403-421.

Kline, M. (1973). *Why Johnny can't add: The failure of the New Math.* New York: St. Martin's Press.

Mayer, R. E., Sims, V., & Tajika, H. (1995). A comparison of how textbooks teach mathematical problem solving in Japan and the United States. *American Educational Research Journal, 32*, 443-460.

McKnight, C. C., Crosswhite, F. J., Dossey, J. A., Kifer, E., Swafford, J. O., Travers, K. J., & Cooney, T. J. (1987). *The underachieving curriculum: Assessing U.S. school mathematics from an international perspective*. Champaign, IL: Stipes.

National Council of Teachers of Mathematics (1980). *An agenda for action: Recommendations for school mathematics of the 1980s*. Reston, VA: Author.

National Council of Teachers of Mathematics (2000). *Principles and standards of school mathematics*. Reston, VA: Author.

Project 2061. (1999). American Association for the Advancement of Science. *Middle grades mathematics textbooks - A benchmarks-based evaluation*. Washington, DC: Author.

Remillard, J. T. (1999). Curriculum materials in mathematics education reform: A framework for examining teachers' curriculum development. *Curriculum Inquiry, 29*(3), 315-342.

Robitaille, D. F., & Garden, R. A. (1989). *The IEA study of mathematics II: Contexts and outcomes of school mathematics*. New York: Pregamon Press.

Schmidt, W. H., McKnight, C. C., & Raizen, S. A. (1997). *A splintered vision: An investigation of U.S. science and mathematics education*. Dordrecht, Netherlands: Kluwer Academic Press.

Stodolsky, S. (1989). Is teaching really by the book? In P. Jackson & S. Haroutunian-Gordon (Eds.), *From Socrates to software: The teacher as text and the text as teacher* (pp. 159-184). Chicago: University of Chicago Press.

Walker, D. F., & Schaffarzick, J. (1974). Comparing curricula. *Review of Educational Research, 44*(1), 83-111.

Westbury, I. (1992). Comparing American and Japanese achievement: Is the United States really an underachiever? *Educational Researcher, 21*(5), 18-24.

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