

Barbara Jaworski, Terry Wood, and Sandy Dawson (Eds.)

Mathematics Teacher Education: Critical International Perspectives

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This book represents an outgrowth of working group meetings entitled "The Psychology of Inservice Education of Mathematics Teachers" which met annually at Psychology of Mathematics Education meetings. The meetings began in 1986 in London and concluded in Lisbon in 1994 whereupon it was decided to write the current text. The text is divided into three sections as described in the following review.

Section One: Openings

The first section consists of a single chapter by Sandy Dawson who provided an historical perspective (roughly early 1960s to mid 1990s) on mathematics teacher education. His historical perspective is punctuated by personal anecdotes ranging from his experiences as a first year teacher to his mid 1990s experiences as a teacher educator/researcher.

Section Two: International Perspectives in Mathematics Teacher Education

This section consists of 11 chapters and represents the main part of the text. The section's first four chapters focused on mathematical concerns including mathematizing, modeling situations, and assessing students' understanding of mathematics. Amit and Hillman described how they conducted inservice programs in which middle school teachers were introduced to new instructional and assessment approaches that were intended to challenge their beliefs about mathematics, instruction, and assessment. The authors noted some success in helping teachers rethink their beliefs. Weinzwieg described an institute for teachers that centered on teachers solving problems and reflecting on their solution methods. Approximately 70% of the participants completed the year's program, many subsequently assuming leadership positions in mathematics education. Murray, Olivier, and Human outlined a two-day workshop for teachers in South Africa who had very weak mathematical backgrounds and very rigid notions about mathematics. The authors asked teachers to solve problems and to reflect on those problem-solving experiences. This approach was developed to help teachers better understand their students' mathematical needs, a result echoed by participating teachers who evaluated the program. Farah-Sarkis from Lebanon created situations in which secondary teachers developed an appreciation for their students' thinking and misconceptions. For example, when teachers were unable to easily solve problems that

were appropriate for 14 year olds, the teachers became more receptive to an inservice program that focused on methods of teaching and on understanding students' thought processes.

The next two chapters in Section Two addressed issues in teaching. Serrazina and Loureiro initiated an inservice program for elementary teachers in Portugal in which teachers were introduced to various manipulatives and how those materials could be used in problem situations to teach mathematics. The authors' initial findings suggested that some teachers used the materials and problems as intended but that the majority of the teachers did not feel at ease using the suggested approach. A follow up case study with two teachers who were interested and confident in using the materials revealed that the teachers were able to transform their teaching even though their practice was not in accord with the teaching tradition in Portugal. An inservice course for elementary teachers developed by Markovits and Even focused on presenting real or hypothetical mathematical classroom situations to which teachers reacted. Although much was gained from the teachers' ensuing discussions, teachers were still unable to differentiate responses that were student centered versus those that were teacher centered. Teachers were then asked to interview students using some of the same classroom situations as stimuli. Some teachers were able to appreciate their interviewee's ways of thinking while other teachers tended to steer students toward their way of thinking. At the end of the course, however, teachers indicated that they had a greater appreciation for listening to what their students were thinking mathematically.

The next two chapters were devoted to revealing the difficulties teacher educators face when they follow teachers into their classrooms. Carter and Richards found that the US teachers with whom they worked struggled with the new world view espoused in the NCTM Standards given that they considered their primary responsibility was that of covering the proposed curriculum. Time was found to be the fundamental problem as the teachers had difficulty considering the notion that "less is more." Goldstein, Mnisi, and Rodwell addressed issues of changing teaching in a changing South African society. The situation was complex given that many agencies were involved in teacher education, each with its own agenda. The authors concluded that a participatory model of professional and curriculum development is feasible and sustainable in South Africa even though it is more complex than a simplistic top-down model that had previously dominated the scene.

The next two chapters in Section Two addressed issues of teaching development when teachers engaged in research relevant to their classroom. Irwin and Britt described a two-year experimental professional development program in New Zealand for intermediate and secondary mathematics teachers. The case of Emily was presented as a vehicle for seeing how teachers, especially those with a limited mathematical background, interpreted group and individual efforts to reform their teaching. On the one hand, teachers valued reflective thinking. But, on the other hand, they wanted to be told how to be better teachers of mathematics, something the

authors did not do. Krainer identified three principles (engaging the interest of teachers, appreciating teachers' work, and being open-minded) that guided his approach to inservice work with Austrian mathematics teachers. The program was grounded in promoting teachers' action, reflection, autonomy, and networking. These dimensions represent what Krainer considered important for teachers' professional development.

Breen's critical analysis of his South African experiences in teaching mathematics and in educating teachers of mathematics provides further insight into teacher education in a changing cultural situation. Breen examined various forces that contributed to the design of teacher education programs especially in light of the changing situation in South Africa. His analysis led him to support a more student-centered educational approach but he warned that we underestimate the complexity of this challenge especially in light of the demands commonly placed on teachers.

Section Three: Critical Perspectives Linking Theory and Practice in Mathematics Teacher Education

The third section of the book steps back and takes a broader view of teacher education that is less specific to programs and that addresses issues of theory that can guide teachers' professional development. Jaworski and Wood identified the prevailing themes that emerged from Section Two and the issues that surround those themes. These themes included providing contexts in which teachers see mathematics as something other than algorithms and skills and envision alternative methods of teaching. The authors noted the frequent emphasis given to teacher-as-researcher and the need to work with teachers in the context of the classroom. Wider issues were then addressed including the relevance of constructivism in its many forms for mathematics teacher education.

Dawson explored teacher development from the perspective of enactivism with its emphasis on listening and the mutual construction of mathematics by teachers and students. The chapter provides a balance between dealing with enactivism from a theoretical perspective and dealing with its implications for teacher education—punctuated with examples from Canada and Sri Lanka. Wood's analysis was based on the notion of Shulman's pedagogical content knowledge, the program Cognitively Guided Instruction, Schifter's notion of learning mathematics for teaching, Jaworski's concept of a teaching triad, and her own work with Cobb and Yackel. Woods concluded that, despite our progress, we still know little about the professional development of teachers.

The concluding chapter by Jaworski drew on a number of theoretical precepts that addressed the complexity of teachers' professional development. She posed questions about how knowledge about mathematics teaching is learned and what educators can do to advance this learning. Fundamentally, she made the case that teaching is a complex phenomena that requires us to develop theoretical constructs to guide our attempts to understand that complexity. She described the "Mathematics

Teacher Enquiry Project" in the UK and a mathematics teaching development project in Pakistan to illustrate this complexity and the need for theory. She concluded her analysis by drawing on the notion of plurality with its attention to both complexity and diversity. In conclusion, Jaworski wrote, "By recognizing connections between plurality and open-mindedness we need to strive to rationalize theories and practices with the social conditions in which learning and teaching take place" (p. 206). The notion of plurality is not only a cornerstone to Jaworski's analysis but for the entire book as well.

Critical Comments

Despite the fact that there is great geographical diversity represented in the text, the themes developed by the authors have considerable convergence. The programs described in Section Two are uncommonly similar in that they promote a pluralistic view of teaching, often couched in the context of problem solving. It seems fair to say that they represent a constructivist orientation toward teaching and teacher education although not all of the articles use the language of constructivism to tell their story. The single most important construct seemed to be reflection as the teacher educators worked with the teachers to help them become explicitly aware of their practice and of alternatives to that practice. Too, the means by which authors communicated the nature and outcomes of their programs were quite similar, using various forms of stories to communicate their intent and findings. For example, most of the chapters used case studies or at least well developed anecdotes to communicate teachers' professional development and their reactions to the programs. The stories were compelling in the sense of expressing how the programs impacted the teachers albeit the scientific quality of the stories/cases/anecdotes varied considerably.

If one were to conduct some sort of "meta-analysis" of the chapters in the second section, it would have to be realized that that analysis would be based more on personal perspectives, which reflects the enthusiasm of the authors, than on solid evidence subject to careful scrutiny. Nevertheless, one should not discount the contribution of the collective wisdom of so many mathematics teacher educators from such diverse geographical and cultural settings. Were authors' homelands not identified and references to specific programs eliminated, one gets the sense that the descriptions could represent a teacher education approach at his or her institution. How is it, we might ask, did so many people come to share a common perspective about mathematics teacher education? The case might be made that this consistency of vision and purpose is largely a result of a self-selection process in that authors chose to participate in a meeting on teacher education at PME meetings, a self-selected group in the first place with at least a modicum of commonality. It also appears that the problems as defined by the teacher educators have considerable overlap. Each chapter describes attempts to help teachers develop a more pluralistic teaching style in which mathematics is conveyed as something other than a collection of algorithms and skills. Again, we can ask the

question why, given the great diversity represented, teacher educators seem to be addressing a quite common problem.

Section three is both illuminating and somewhat disappointing. On the one hand, the authors present a strong case regarding the importance of developing linkages between theory and practice. They are to be commended for taking the reader beyond the activities of teacher education and reminding us of the need to see teacher education as more than a collection of individual projects as good as those projects may be. But, on the other hand, their approach is dominated by reflecting on already existing theoretical precepts punctuated and illustrated by present projects. As such, the authors capture the status of our present linkages between theory and practice in a scholarly way. Collectively, they have helped point us in the direction of how our research can develop needed linkages. Lacking, however, is the breaking of new ground in conceptualizing those linkages. Perhaps it is enough in a book of this sort to identify the problem of theory versus practice and to offer existing solutions to the problem. Although there were some forays into specific theoretical orientations that show promise, it is somewhat disappointing that the chapters, collectively, do not cut new ground.

If teacher educators are interested in gaining insights into the problems of mathematics teacher education and how those problems are addressed, this book will more than satisfy their needs. The subtitle "Critical International Perspectives" seems quite appropriate. Without question, the book is international in scope, one of most diverse books on mathematics teacher education that I have encountered. The term "critical" is appropriate in the sense that the perspectives identified are, indeed, critical. If critical is to be applied to the stance each author takes in his or her analysis, then that interpretation of critical is more problematic. On balance, there is more than enough insight, common wisdom sometimes supported by hard evidence, practical suggestions, and needed attention to theory and research to provide readers with real value in learning about critical perspectives in mathematics teacher education. On that basis, I heartily recommend the book to teachers, graduate students, and teacher educators who share an interest in teachers' professional development. The editors are to be commended for putting together such a comprehensive book that has a balanced perspective on mathematics teacher education. The book further demonstrates the value of what working groups at international meetings can accomplish when provided leadership and a vision of our profession.

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