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In their new edited book, Expertise in Mathematics Instruction: An International Perspective, Yeping Li and Gabriele Kaiser survey international perspectives on expertise in mathematics teaching from both a Western and an Eastern perspective. Drawing upon well-known researchers from each of the ten countries surveyed, Li and Kaiser’s book provides a framework for understanding international teaching and examples of international differences in mathematics teaching. In this review, I focus on each section of the book, the strengths and weaknesses of the chapters, and some of the key insights gained from the contents of the book. Although Li and Kaiser note the book’s bias towards the West, they successfully address the cross-national comparisons. However, in my opinion, as an edited anthology, this book has not only outstanding introductions and some very strong chapters, but also contains some weak chapters that seem to have been added to provide length and depth to the topic at hand. Some of the strengths discussed in the book include Chi’s presentation of a framework on expertise and the clear differences in defining experts by region. Specifically, the Western approach to identifying experts is narrowly defined by country and specific practices, whereas the Eastern approaches tend to be general in overarching social standards. Also, although this book is about mathematics instruction, each chapter takes a unique perspective on mathematics education, some without even mentioning instruction, but instead focusing on teaching or curriculum often without a clear explanation about the difference between their approach and the purpose of the book.

The book is divided into four sections: Introduction and Research Perspectives, Expertise in Mathematics Instruction in a Western Setting, Expertise in Mathematics Instruction in an Eastern Setting, and Cross-National Comparison and Reflections. Most of the book is focused on mathematics teaching in the five Western and five Eastern countries. The research answers questions for the reader such as: “what are general trends in teaching in different parts of the world?” and “how is expertise defined in mathematics teaching?” Many well-known authors present their research findings and opinions about expertise in different
corners of the world, and the editors provide a concise summary of the entire book in their introduction. Some recent books on mathematics education touch upon international perspectives on expertise, but this is the only one entirely dedicated to the subject. Others which address the same issue have different aims. One focuses on special education (Kauffman & Hallahan, 2011), another on gifted education (Plucker, 2008), the third on multicultural education and international perspectives (Chiu, Salili, & Hong, 2001), and a fourth reports on a US and Japanese collaboration to develop a mathematics professional development program (Bass, Usiskin, & Burrill, 2002). Each of the first three books contains at least one chapter on mathematics education, expertise, or international education and the fourth book relies on the expertise of teacher–participants to develop a better understanding of what is needed in mathematics education using the cross-cultural perspectives. None is devoted solely to expertise in mathematics instruction internationally.

1 Introduction and research perspectives

The introductory overview of expertise by Michelene Chi, a widely cited authority on the topic, is a tour de force. She provides a comprehensive and highly readable review of the literature, which includes a summary of the different types of studies on expertise. She found that studies focused on (a) how discoveries were made by experts, (b) societal and environmental conditions supporting experts, (c) studies on innate abilities of experts, or (d) studies on the way in which experts excel in their speciality. This chapter prepares the reader well for the rest of the book.

Rosemary Russ, Bruce Sherin, and Miriam Gamoran Sherin present a unique chapter, “Images of Expertise in Mathematics Teaching,” explaining the importance of the lens in research. First, they present a short vignette and use it to model five different paradigms with which to view the vignette. They explain each lens, and the questions, data, analysis approach, and types of findings based on each paradigm. Second, they present four different images of teaching: diagnostician, conductor, architect, and river guide, and explain how each image influences the research process. This chapter provides the reader with knowledge to understand better the different approaches taken by each of the following chapters.

From my perspective, this first section of the book was successful in presenting ideas and concepts to aid the reader for the rest of the book. The editors’ summary, Chi’s explanation of literature and theories in expertise, and Russ, Sherin, and Sherin’s views of teaching and the role of different lenses in research all offer the reader greater understanding in the chapters that follow. Specifically, the first section helps the reader to realize that there is no single definition of teaching expertise and also to become aware of the existence of a variety of approaches to identifying expertise.

2 Western perspectives

Different countries have different assumptions about what it means to have expertise in mathematics instruction, and different systems for certifying individuals as experts. Researchers for this section represent the USA, Switzerland, Israel, Austria, and Canada. Each group takes a different view of expertise, encompassing a national teaching certification, a synthesis of expert qualities observed in the particular country, reflections on expert characteristics of one expert teacher, the development of
expertise through professional development, and the development of expertise in a community of practice.

Edward Silver and Vilma Mesa’s chapter, “Coordinating Characterizations of High Quality Mathematics Teaching: Probing the Intersection,” presents a “straightforward” approach to identify teaching expertise in the USA. Although their view of expertise is narrowly defined by cognitively demanding tasks and pedagogical features of teaching, by generalizing their research, it seemed very clear that teachers who are experts in cognitively demanding tasks can be identified using the National Board for Professional Teaching Standards (NBPTS) Certification.

Christine Pauli and Kurt Reusser identify quality Swiss teachers using survey data and the Trends in International Mathematics and Science Study (TIMSS) video data in their chapter titled, “Expertise in Swiss Mathematics Instruction.” Although they fail to address the reliability and validity of the TIMSS survey data, they draw upon several different sources of data to support their findings. However, their view of instruction is somewhat dated, due to the fact that the TIMSS videos were collected in 1995 and 1999. Nevertheless, their findings about the strength of the teachers in their country by different language region make a valuable contribution to the book. Their discussion connecting students, teachers, and content and using this didactic triangle to identify strengths and weaknesses in their own system could be used as a method to analyze other instructional systems.

Ruhama Even and Orly Gottlib present findings from a single Israeli teacher in their chapter, “Responding to Students: Enabling a Significant Role for Students in the Class Discourse.” They focus on the teacher’s responsiveness to students during each part of the lesson and the purposes of that part of the lesson. Although the findings were valuable, the reader is left wondering whether the practices of this particular teacher were commonly appreciated in Israel or whether the teacher was selected based on personality and likeability: the chapter only explains that the teacher was selected by community recommendations. It fails to discuss what, if anything, is being done to support the development of such practices among other teachers in Israel. Neither did the chapter explain whether the practices describing this teacher accounted for the teacher’s recommendation.

The final two chapters in this section are by Florian Müller, Irina Andreitz, Konrad Krainer, and Johannes Mayr and by Elaine Simmt titled “Effects of a Research-Based Learning Approach in Teacher Professional Development” and “Teacher Expertise Explored as Mathematics for Teaching.” Both present professional development scenarios in Austria and Canada, respectively. The first presents a program and compares it to a control group and identifies strengths of their program by identifying learning activities. The second explores the development of mathematics for teaching through a community of practice and how a group develops its own expertise. These chapters connected well with the introductory theory and literature review and provided strong evidence for the power and effectiveness of professional development. Although each chapter had a slightly different perspective of professional development, I felt that both were not necessary for the purposes of this book because of their similarities in using professional development as it relates to expertise.

In this section, each article presented different ways to identify expertise including national certification, looking for themes across the country, community recommendations, participation in professional development, and participation in a mathematical community of practice. Expertise is also defined in a variety of ways including cognitively demanding expertise, themes emerging within and between the regions
of the country, responsiveness to students and manner of conducting a class, identifying learning activities, and the mathematical ideas and mathematics for teaching. However, each view of expertise is very specific and narrow: There did not seem to be a single method to identify an overall expert in any of these Western countries—in line with some of the literature by Chi (2006). Chi explains that we can grossly assess expertise via qualifications (i.e., NBPTS), peer consensus (i.e., the identification of the teacher in Israel), and at fine-grain levels (i.e., the specific types of expertise in Switzerland, Canada, and Austria). Overall, from Western perspectives, expertise is very difficult to define and experts are difficult, if not impossible, to identify because there is no universal approach to identifying an expert in mathematics teaching.

3 Eastern perspectives

The third section addresses instruction in China, Japan, Singapore, Korea, and Taiwan. There is a strong, discernible difference between Western and Eastern views of expertise in mathematics, including the ease of identifying expertise via characteristics of nationally recognized experts and the clarity of expectations for obtaining expertise in instruction.

Yeping Li, Rongjin Huang, and Yudong Yang’s chapter, “Characterizing Expert Teaching in School Mathematics in China—A Prototype of Expertise in Teaching Mathematics,” provides an explanation of Chinese methods of assessing expertise in teaching by comparing five nationally recognized teachers. Using these Chinese expert teachers, they found commonalities including experienced teacher knowledge, instructional process, teaching skills, and teacher characteristics. The specific teacher characteristics that they found in these Chinese teachers included (a) having sound subject content knowledge of teaching topics, (b) appropriately identifying and dealing with difficult content points in students’ learning, (c) emphasizing the development of students’ mathematical thinking and ability, (d) using mathematics problem solving and posing for developing effective classroom instruction, (e) emphasizing and practicing student-centered instruction, and (f) motivating students. Each of these characteristics were well demonstrated with examples and vignettes and further demonstrated with an in-depth case study of one of the expert teachers.

Akihiko Takahashi presents the Japanese approach to teaching in a country with a national curriculum. The chapter titled “The Japanese Approach to Developing Expertise in Using the Textbook to Teach Mathematics” explains the differences between “teaching the textbook” and using the textbook to teach mathematics. Experts used the book to guide their teaching but were not constrained by the book; novices tended to carefully follow the text book. Three levels of textbook usage in Japan are telling facts, explaining meanings, and providing opportunities to understand and become independent learners. Teachers at the third level participated in continuous professional development including the Japanese lesson study with other teachers.

Suat Khoh Lim-Teo, Kwee Gek Chua, and Joseph Kai Kow Yeo’s chapter, “Perceptions of School Mathematics Department Heads on Effective Practices for Learning Mathematics,” provides the perspective of teaching expertise from department heads. Expertise in mathematics teaching includes deep understanding of content knowledge, using multiple representations for concepts, understanding the cognitive demands of mathematical tasks, and identifying learner difficulties and misconceptions. Interviews and questionnaires seeking to understand what department heads in Singapore valued in teaching were coded for 35 observable mathematics teachers’ practices. In addition
to their broader view, their research had good reliability and validity, as shown by consistent findings across the questionnaires, interviews, a high Cronbach alpha coefficient on their instrument, and outside researchers’ verification of their constructs.

JeongSuk Pang describes expertise in Korea in terms of socio-mathematical norms, through a comparison of an expert and less-expert teacher in the chapter titled “Exploring Korean Teacher Classroom Expertise in Sociomathematical Norms.” Characteristics of expert teachers include productive and collaborative discussions, teacher focus on concepts, and pedagogically efficient methods.

Pi-Jen Lin and Yeping Li’s chapter, “Expertise of Mathematics Teaching Valued in Taiwanese Classrooms,” describes an expert teacher in Taiwan and the conditions for expertise, which include number of years teaching, teaching competitions, professional development, and service in the teaching community; these conditions for expertise align with well-known research on expertise by Ericsson and Smith (1991). Lin and Li looked at three teachers who met their qualifications for expertise and found their similar approaches to teaching in their problem sequence, student engagement in discussions, response to students, and transitions between activities.

In the East, identifying expert teachers is more straightforward because of explicit national expectations for teaching. There is also much more in common with teachers in some of the Eastern countries than in the West because of similar curricula and norms. It seems that, in general, the Eastern perspective of mathematics teaching is more consistent at a broad level than in Western countries.

### 4 Cross-national and conclusion

Svenja Vieluf and Eckhard Klieme, in “Cross-Nationally Comparative Results on Teachers’ Qualification, Beliefs, and Practices,” present a strong quantitative cross-national study of 23 different countries, which includes some of the ten countries discussed above. They connect teaching practices to learning theories (i.e., lecture to behaviorism) and provide profiles of the teachers across the world to compare approaches (i.e., direct teaching and constructivist approaches). They also include some unique countries in their comparison, for example Estonia and Malta that seem to be left out of large international studies such as TIMSS. Alan Schoenfeld further builds on Vieluf and Klieme’s chapter with two vignettes that describe direct teaching and constructivist teaching approaches in his chapter titled “Reflections on Teacher Expertise.” He explains how both approaches to teaching can be seen as “good” or “bad,” depending on the perspective. His chapter ties the book together, going back to the ideas of perspective and lens as central to interpretation, presented in the first section of the book. The editors conclude with the chapter “Reflections and Future Prospects,” including summaries, connections, and future research possibilities.

This book addresses concepts that have not been addressed in other places, specifically the connections between expertise, instruction, and mathematics from an international perspective. The book was well written and addressed a variety of points of view. The final chapter did a very thorough job of discussing the further research and directions that need to be taken. This book is a very good starting point for further international research in instructional expertise and provides insight into effective mathematics teaching. People interested in learning about research in expertise in mathematics education, approaches to mathematics instruction used by experts, or cultural differences in effective mathematics teaching will find this book enlightening.
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References


