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Guest Editorial:

Mathematical Knowledge for Teaching: Developing Measures and Measuring Development

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In recent years, researchers' interest in mathematical knowledge that is specific to teaching has escalated. Its increasing importance has also influenced the content of this journal. Less than two years ago, a special issue that focused on mathematical knowledge for teaching was published in *The Mathematics Enthusiast* (volume 11, no. 2). The title of this issue was: "The Mathematical Content Knowledge of Elementary Prospective Teachers". All of the articles in that special issue were written in connection with a review of 112 studies from 1978 to 2012 on the knowledge of prospective elementary teachers in the following five content areas: numbers and operations, fractions, decimals, geometry and measurement, and algebra. In their final article of that special issue, Thanheiser, Browning, Edson, Lo, Whitacre, Olanoff and Morton (2014) concluded that the number of articles on prospective teachers' mathematical content knowledge had increased over the years. They also found that most of the studies focused on "static studies of knowledge" rather than on how this knowledge developed. Fraction content knowledge was the area with most of the studies, and — across all five content areas — the studies showed that prospective teachers seemed to rely on procedural understanding, and most of the literature focused on identifying deficits in their understanding. In their conclusions, Thanheiser et al. suggested that more research should focus on characterizing prospective teachers' content knowledge and investigate how this knowledge develops.

Our aim is that the articles in the present special issue, at least to a certain extent, contribute to moving the field forward in the directions pointed out by Thanheiser et al. (2014). The focus of the articles in this special issue is on mathematical knowledge for teaching more broadly, and not only on prospective elementary teachers' knowledge. As a whole, the articles in this special issue build upon an assumption that strong instruments are of vital importance to measure — and thus to characterize the nature and development of — mathematical knowledge for teaching. Although all of the studies in this special issue draw upon the practice-based theory of mathematical knowledge for teaching that has been developed by researchers at the University of Michigan (e.g., Ball, Thames, & Phelps, 2008), the lessons learned from these studies may be relevant to the work of researchers who adhere to other views about the mathematical knowledge that is distinctly related to the teaching of mathematics.

The articles in this special issue differ in type as well as in scope, ranging across theoretical and conceptual studies, studies that focus on instruments and instrument development, and more standard empirical studies. All of them contribute either to broader efforts to develop measures of mathematical knowledge for teaching or to reflections on research that has been done and new directions important for advancing. Thus, the title of this special issue, where the first use of the word "measure" refers to the literal assigning of numbers for the purpose of comparison and the second use, "measuring

development,” refers to a figurative perusing and appraising of headway in the field. Although authors of most of the articles have some connection with the research group at the University of Michigan, the authors represent different universities and institutions from five different countries: USA, Norway, Finland, South Korea and Malawi. Many are by junior faculty and may suggest a shifting interest and focus of study taking place in the field. It is our hope that this special issue will be of interest to all researchers in the field of mathematics education, and especially to those who are involved in research on mathematical knowledge for teaching. We believe that the articles in the special issue provide a relevant snapshot of where this field of research is today, and we also hope that they provide relevant suggestions for the further development of the field.

References

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- Thanheiser, E., Browning, C., Edson, A. J., Lo, J.-J., Whitacre, I., Olanoff, D., & Morton, C. (2014). Prospective Elementary Mathematics Teacher Content Knowledge: What Do We Know, What Do We Not Know, and Where Do We Go? *The Mathematics Enthusiast*, 11(2), 433–448.