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Kloosterman, P., Mohr, D., & Walcott, C. (Eds.) (2016). *What mathematics do students know and how is that knowledge changing? Evidence from the National Assessment of Educational Progress*. Charlotte, NC: Information Age Publishing.

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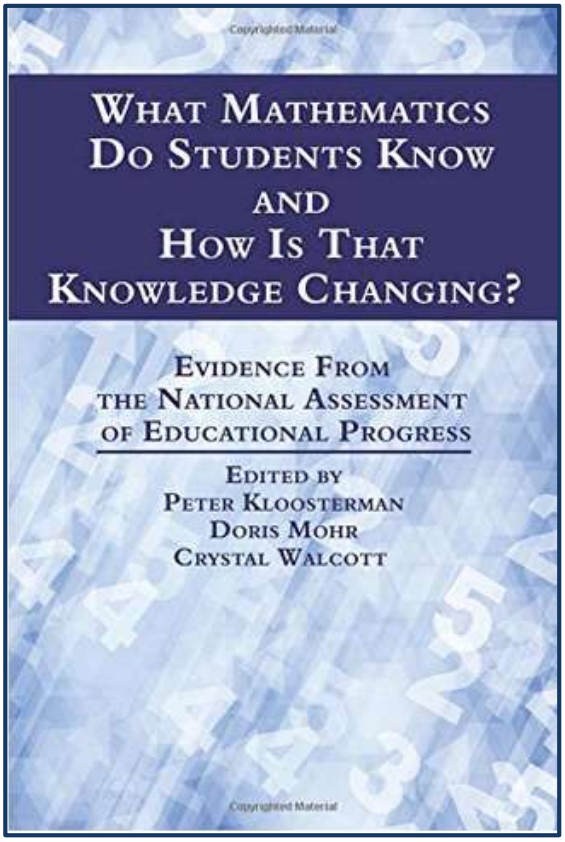

Researchers, policy makers, and curriculum developers interested in mathematics performance will find an excellent resource in Peter Kloosterman and colleagues' latest analysis of National Assessment of Educational Progress (NAEP) results. This volume is Kloosterman's third book detailing NAEP results and his treatment of the topic demonstrates experience and deep knowledge. *What Mathematics Do Students Know and How is that Knowledge Changing?* opens with introductory chapters about the NAEP and the interpretation of NAEP results, answers its titular question with several chapters devoted to reporting and analyzing fourth-, eighth-, and twelfth-grade results across math strands and topics over time, and concludes with chapters that evaluate NAEP results in the context of hot topics in math education policy and research.

Introductory chapters provide a brief history of the NAEP and a summary of trends

Morano, S. (2016, April 27). Review of *What mathematics do students know and how is that knowledge changing? Evidence from the National Assessment of Educational Progress*, by P. Kloosterman, D. Mohr, & C. Walcott (Eds.). *Education Review*, 23. http://dx.doi.org/10.14507/er.v23.2027

in outcomes over time, describe test design and issues related to score interpretation, and inform readers about resources on the NAEP website (e.g., NAEP Overview, 2016; NAEP Data Explorer, 2016). Those interested in interpretation and comparing item-level results will find sections concerning statistical significance, effect size, and ceiling effects especially relevant. Researchers considering using NAEP data in their own work will also appreciate succinct, explicit descriptions of NAEP design (e.g., item content, format, and complexity; sampling; testing accommodations and calculator use), and the process for obtaining a secure data license.

Chapters 4–7 report and interpret NAEP results in algebra, numbers and operations, geometry and measurement, and data analysis, statistics, and probability. Each content chapter opens with a bulleted list of highlights, or notable findings related to performance in the strand over time and across grade levels. Highlights are followed by a brief historical overview of student performance. Next, results tables and analyses are presented for each topic in the strand, and a brief summary synthesizes results to close each chapter. Readers interested in any particular skill can treat this volume as a reference text and open to the corresponding table to learn about student performance on relevant items. An index of tables at the beginning of each chapter or in the appendix would have been a welcome addition, but flipping through chapters to find desired information is still fairly expedient.

Chapter authors clearly bring deep content understanding, pedagogical knowledge, and familiarity with relevant research to their insightful discussions of NAEP results. Interpretations of item-level performance are especially enriched through authors' consideration of a wide variety of possible explanatory factors. For example, authors note instances where poor performance could be linked to confusing wording or unconventional presentation (e.g., place value item 4, p. 85); where improved performance over time could be linked to expanded instructional focus (e.g., fractions items 1 and 3, p. 115); where performance aligns with theories of learning (estimation item 6, p. 97); and where NAEP survey data about classroom practices may help explain performance (e.g., decimal item 2, p. 120). Throughout chapters 4–7, thorough analyses highlight areas for careful consideration in the design and evaluation of curricula and could easily inspire numerous questions for future mathematics education research.

The authors' attention to item groupings by topic is a major strength of this volume. Rather than replicate standard NAEP item groupings, authors first used their content expertise and pedagogical knowledge to group items, then assessed the validity of original item groupings through a sophisticated construct analysis. Items found to measure a different proficiency than the other items in a group were reassigned to ensure that groups contained similar items. Although a detailed description of the psychometric modeling used to conduct the construct analysis in provided in Chapter 11, readers who are not interested in or familiar with psychometrics need only note that this process resulted in sound item groupings and that sound groupings contribute to the faithful representation of content knowledge.

In addition to presenting a careful examination of NAEP math results by strand and topic, the book also considers NAEP outcomes as they relate to current high-interest topics in math education research and policy including, mathematical reasoning ability (chapter 9) and U.S. performance on international assessments of mathematics (chapter 10). The chapter on math reasoning acknowledges that the NAEP was not designed to assess reasoning, but argues that many NAEP items require reasoning skills and performance on these items can help describe students' reasoning ability. An analysis of performance on high complexity items and items requiring students to construct and explain their answers led authors to conclude

that students' reasoning ability is weak overall (and across demographic groups) and has not improved much over time (pp. 289-290). This analysis should be considered exploratory given that items analyzed were not originally designed or scored to assess reasoning, but represents an interesting attempt to use large scale assessment data to investigate a complex skill and sheds light on directions for future research on mathematical reasoning.

References

NAEP. (2016). *NAEP Overview*. Retrieved from http://nces.ed.gov/nationsreportcard/about/

NAEP. (2016). *NAEP Data Explorer*. Retrieved from http://nces.ed.gov/nationsreportcard/naepdata/

About the Reviewer

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