

Policies and Practices in Support of Mathematics Learning in Global Contexts

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Introduction

Over the past two decades, global education initiatives have focused considerable attention on improving access to basic education, resulting in millions of children attending school for the first time (World Bank, 2011). However, attendance does not guarantee learning. For instance, it takes students in Ghana up to four additional school years to learn basic mathematics skills compared to students in higher-income countries (Global Partnership for Education, 2012). Because foundational mathematics skills are predictive of future academic success, including reading achievement (Duncan et al., 2007), as well as economic well-being in adulthood (Richie & Bates, 2013), the importance of improving mathematics teaching and learning cannot be overstated. Because of this, mathematics is increasingly being considered a focal area within global contexts.

This issue of *Global Education Review* focuses on policies and practices in support of mathematics learning in global contexts. The issue highlights relevant research findings, illuminates areas that are in need of additional research, and examines the implications of these findings on educational outcomes. The ten manuscripts in this issue focus on three primary topics: efforts to improve student achievement and factors that impact achievement; implications of assessment frameworks, scoring, and analyses; and methods to improve teacher preparation and teacher knowledge. The manuscripts are organized in this issue by these topics.

Efforts to Improve Student Achievement and Factors that Impact Achievement

In *Determination of Marginalized Youth to Overcome and Achieve in Mathematics: A Case Study from India*, Srikantaiah, Eichhorn, and Khan report the results from a qualitative study that examined the factors impacting the mathematics achievement, determination, and perseverance of marginalized youth enrolled in

India's National Institute of Open Schooling Program. The findings indicate that many factors impact students' educational decisions and achievement, including knowledge of foundational mathematics concepts, the specific

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program enrolled in to complete their 10th standard board exams, and chronic or toxic stress. Srikantaiah et al. also make five recommendations for organizations to consider if they develop alternative pathways to graduation.

In *The Relationship between Opportunities to Learn Algebra and Students' Algebra Achievement: A Comparative Study*, Ayieko investigates the relationship between eighth-grade students' opportunities to learn algebra and their achievement on algebra topics on the Trends in International Mathematics and Science Study (TIMSS). Ayieko focuses specifically on students in Botswana, Singapore, and the United States and found that opportunity to learn varied by topic and location. The results also suggest that students' who had opportunities to learn more algebra topics before eighth grade had higher algebra achievement scores on the TIMSS.

In *Mathematics from the Beginning: Evaluating the Tayari Preprimary Program's Impact on Early Mathematics Skills*, Piper, Sitabkhan, and Nderu discuss the impact of the Tayari program, a comprehensive preprimary intervention in Kenya, that included materials for students, training for teachers, and teacher support. This program was evaluated using a randomized controlled trial (RCT), and Piper et al. report positive effects on certain numeracy topics, such as producing sets, identifying numbers, and naming shapes. Piper et al. describe the three core principles used to guide the design of the Tayari program and include detailed information about the program, including an annex of lessons.

In *Developing Usable, Accessible, and Culturally Relevant Learning Materials to Support Parent-Child Interactions in Mathematics*, Shivraj et al. report on the iterative development process used to create an intervention focused on increasing parents' involvement with their children in mathematics

in Jamaica. This article provides a detailed description of how the materials for this intervention, which included workshops, books, and games, were developed using four phases of the design-based research (DBR) process. This example emphasizes the importance of including stakeholders in the development process so that materials are usable, accessible, and culturally relevant.

Implications of Assessment Frameworks, Scoring, and Analyses

In *Capturing Children's Mathematical Knowledge: An Assessment Framework*, Sitabkhan, Platas, and Ketterlin-Geller discuss an assessment framework that balances measuring students' formal mathematics knowledge with understanding their informal mathematics knowledge. Students develop and use informal mathematics skills in their everyday lives that may be markedly different than the skills typically assessed on formal mathematics assessments. Sitabkhan et al. suggest that both formal mathematics skills that students learn in schools and informal mathematics skills that students develop and learn in their everyday lives are important to measure. Students' informal mathematics knowledge can be used as a tool to strengthen students' in-school formal mathematics learning.

In *Different Analyses, Different Conclusions? Validity Evidence from the EGMA Spatial Reasoning Subtask*, Perry discusses the importance of using appropriate analytical techniques to evaluate the validity of the interpretations made using assessment data. The techniques used should be based on the types of interpretations being made. Perry illustrates this point by using data from the Spatial Reasoning subtask developed for the Early Grade Mathematics Assessment (EGMA) and analyzing

it using both Item Response Theory (IRT) and Classical Test Theory (CTT). The results differed based on technique, and the implications of using appropriate and inappropriate methods are discussed.

In *Aligning Test Scoring Procedures with Test Uses of the Early Grade Mathematics Assessment: A Balancing Act*, Ketterlin-Geller et al. provide guidance on three different scoring methods that have been used to report scores from the Early Grade Mathematics Assessment (EGMA). Ketterlin-Geller et al. examine the usability, reliability, and distinctiveness of using total scores, subscores, and composite scores. EGMA data from Jordan was used to evaluate each of these scoring methods and illustrate some of the limitations and implications of each method. Based on these considerations, Ketterlin-Geller et al. recommend using subscores to report EGMA results.

Methods to Improve Teacher Preparation and Teacher Knowledge

In *A Waterfall Model for Providing Professional Development for Elementary School Teachers: A Pilot Project to Implement a Competency-Based Approach*, Savard and Cyr describe an initiative in the Democratic Republic of Congo to improve mathematics learning in elementary school using a situation-based approach. A waterfall method of professional development was used to train teachers on this approach. Savard and Cyr share findings on the impact of the program on teachers' knowledge, classroom teaching, and student achievement. Recommendations and implications are shared to assist others in developing and implementing reform initiatives.

In *Teacher-led Professional Learning in Tanzania: Perspectives of Mathematics Teacher Leaders*, Swai and Glanfield investigated mathematics teacher leaders' (MTL) beliefs and

perspectives about teacher-led professional learning (TLPL) in Tanzania. Swai and Glanfield used a multisite case study design and had eight MTLs in the study. Qualitative analyses from in-depth interviews with the MTLs suggest five consistent and positive themes about how MTLs perceive of TLPL: participative and engaging; reflective and experiential; collaborative; practical and contextual; and ongoing and sustainable.

In *Improving Pedagogical Content Knowledge on Rational Numbers of Cambodian Teacher Trainers*, Van, Mao, and Cnudde report the findings from an intervention developed by the Flemish Association for Development Cooperation and Technical Assistance (VVOB) in Cambodia aimed at improving the content knowledge and pedagogical content knowledge of teacher trainers. The intervention focused on fractions and rational numbers and had training and coaching components. Van et al. found that this intervention improved teacher trainers' pedagogical content knowledge and improved their teaching strategies.

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About the Editor(s)

Lindsey Perry, PhD, is a Research Assistant Professor at Southern Methodist University. Her current research interests focus on investigating children's spatial and relational reasoning abilities, developing mathematics assessments for young children, and training educators on how to use data from assessments to make instructional decisions.

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