

JOURNAL OF
MATHEMATICS
EDUCATION
AT TEACHERS COLLEGE

A Century of Leadership in Mathematics and Its Teaching

Making Connections in Mathematics Education

© Copyright 2019 by the Program in Mathematics and Education

TEACHERS COLLEGE | COLUMBIA UNIVERSITY

TABLE OF CONTENTS

PREFACE

- v Sarah Nelson, Teachers College, Columbia University
Dyanne Baptiste, Teachers College, Columbia University

ARTICLES

- 1 **Connecting the Tangent Function to Cardinality:
A Method for Introducing Set Theory to High
School Students**
Steve Deihl, East-West School of International Studies
Mara P. Markinson, Queens College,
City University of New York
- 11 **After Presenting Multiple Solution Strategies,
What's Next? Examining the Mathematical
Connections Made by Preservice Teachers**
Indira Gil, Florida International University
Laura Zamudio-Orozco, Florida International University
Barbara King, Florida International University
- 23 **Doctoral Preparation in Mathematics Education:
Time for Research and a Widespread
Professional Conversation**
Robert Reys, University of Missouri
Barbara Reys, University of Missouri
Jeffrey C. Shih, University of Nevada, Las Vegas
- 29 **Quantitative Literacy: Alternative Pathway for
College Developmental Mathematics Students**
Michael George, Borough of Manhattan Community
College, City University of New York
Yevgeniy Milman, Borough of Manhattan Community
College, City University of New York
- 39 **Mentoring Future Mathematics Teachers: Lessons
Learned from Four Mentoring Partnerships**
Angie Hodge, Northern Arizona University
Janice Rech, University of Nebraska at Omaha
Michael Matthews, University of Nebraska at Omaha
Kelly Gomez Johnson, University of Nebraska at Omaha
Paula Jakopovic, University of Nebraska at Omaha

PREFACE

The Fall 2019 issue of the *Journal of Mathematics Education at Teachers College* features five articles that focus on making connections in the teaching and learning of mathematics in order to build deep conceptual understanding, enhance teacher education and reflect on the evolution of doctoral programs in mathematics education. This edition will provide insight on preparing students for advance mathematics through a deeper exploration of basic ideas, highlighting an alternate pathway for success in mathematics at the community college level, effective faculty mentoring programs, and a commentary on improving the experience of graduates of doctoral programs in mathematics education.

In their article, Deihl and Markinson present a method for introducing high school mathematics students to concepts of cardinality in set theory by connecting them to trigonometry. Readers will explore questions and student responses, both real and imagined, which lead students to think about the idea of infinity via the tangent function. Students are exposed to not only the concept of infinity but also bijections between countable sets, bijections between intervals, and cardinality. This represents a wonderful opportunity for secondary mathematics students and teachers to go beyond the required curriculum into some deep and interesting mathematical ideas.

Gil, Zamudio-Orozco, and King designed a study to investigate the kinds of connections that pre-service teachers made in an elementary education methods course. In particular, the authors observed the pre-service teachers' ability to identify over-arching mathematical ideas and the knowledge connections being used to clarify the concepts taught. Based on their findings, the authors show how pre-service teachers' connections changed throughout the course and whether their instructional interventions assisted in these changes. This study shows both teachers and teacher educators how making the right connections can impact mathematical understanding.

In their commentary, Reys, Reys, and Shih take inventory of doctoral programs in mathematics education and offer a critical review of doctoral preparation in mathematics education. They summarize the current state of doctoral students, graduates, programs, and faculty members, emphasizing key areas of consideration and recommending a blueprint for improving the system. The authors conclude by offering practical suggestions for research in various areas of doctoral preparation so that mathematics education can continue to grow and thrive for years to come. This manuscript invites all members—students, faculty, and staff alike—to reconsider their role as a steward of doctoral programs in mathematics education and its influence on research and practice.

PREFACE (Continued)

George and Milman discuss a quantitative study of community college students enrolled in developmental mathematics courses. They studied the use of a quantitative literacy course as an alternative pathway in lieu of elementary algebra. Non-STEM students who had placed into developmental mathematics were connected to an alternative pathway to completing their mathematics requirement. This quantitative literacy course was designed to be more relevant to the students and to use a collaborative student-led model. Students worked on open-ended problems in the areas of citizenship, personal finance, and medical literacy. Passing rates for both the developmental and subsequent credit-bearing courses increased. The authors conclude by recommending that community colleges consider offering such a quantitative literacy course for their non-STEM developmental students.

Finally, Hodge, Rech, Matthews, Johnson, and Jakopovic describe a mentoring program which connected pre-service secondary mathematics teachers to faculty members at a large Midwestern university. The authors tell the stories of the four pre-service teachers who participated in the first year of the program. Guided by the experiences of these four participants, changes were made to the structure of the program regarding mentor selection, mentor-mentee communication, expectations, and how those expectations were conveyed. The changes have made an impact on the program in terms of consistency and implementation. The authors hope that this piece may help guide the creation and improvement of mentoring programs at other institutions.

Together, these five articles highlight the theme of connections in mathematics education. Whether connecting mathematical concepts, educators, or theory and practice, all these pieces provide different ways in which connections can be used to improve mathematics education in elementary school, doctoral studies, and everything in between.

Sarah Nelson
Dyanne Baptiste

Guest Editors