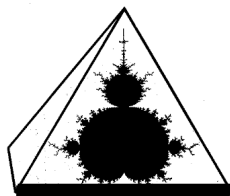


# The Mathematics Education for the Future Project



## Proceedings of the 13<sup>th</sup> International Conference

### *Mathematics Education in a Connected World*

Sep 16–21, 2015, Grand Hotel Baia Verde, Catania, Sicily, Italy

**Edited by Alan Rogerson**

The Mathematics Education for the Future Project thanks our Major Sponsor

# Autograph



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# Foreword

This volume contains the papers presented at the International Conference on *Mathematics Education in a Connected World* held from September 16-21, 2015. The Conference was organized by The Mathematics Education for the Future Project - an international educational project founded in 1986. Our Project is dedicated to the improvement of mathematics education world-wide through the publication and dissemination of innovative ideas. Many prominent mathematics educators have supported and contributed to the project, including the late Hans Freudental, Andrejs Dunkels and Hilary Shuard, as well as Bruce Meserve and Marilyn Suydam, Alan Osborne and Margaret Kasten, Mogens Niss, Tibor Nemetz, Ubi D'Ambrosio, Brian Wilson, Tatsuro Miwa, Henry Pollack, Werner Blum, Roberto Baldino, Waclaw Zawadowski, and many others throughout the world.

Information about our project and future work can be found on the following webpages. Our Project Home Page: <http://math.unipa.it/~grim/21project.htm> leads directly to the paper proceedings of previous conferences from Egypt 1999 to Dresden 2009. [ProceedingsSouthAfrica](#) gives the proceedings of the South Africa conference in 2011. The proceedings of our last conference in Montenegro in 2014 are at <http://directorymathsed.net/montenegro/> For our Polish Superkurs Home Page and National Planning Meetings webpage see: [www.cdnalma.poznan.pl](http://www.cdnalma.poznan.pl) (in Polish - but with pictures!) Andreas Filler at <http://www.afiller.de/charlotte07> has a photo album of our Charlotte Conference in 2007.

We are especially grateful this year to Professor Martin Stein of Münster University, the Owner and Manager of the company that will publish our printed proceedings: WTM-Verlag (Wissenschaftliche Texte und Medien – scientific texts and media) <http://www.wtm-verlag.de>

These Proceedings begin with the Plenary Paper by Douglas Butler (Autograph) followed by a list of titles and then the full text of the papers/workshops themselves, in alphabetical name order of the principal authors.

We sincerely thank all of the contributors for their time and creative effort. It is clear from the variety and quality of the papers that the conference has attracted many innovative mathematics educators from around the world.

I wish to thank especially Martin Stein, Jasia Morska and Douglas Butler for all their support and hard work in the preparation of these Proceedings.

A handwritten signature in black ink that reads "Alan Rogerson". The signature is written in a cursive style with a long horizontal flourish underneath the name.

**Dr. Alan Rogerson**

D.Phil (Oxon), M.Sc., B.Sc., B.A. (Lon), Dip.Ed., Cert. Ed. (Cantab).  
Chairman of the International Program Committee

## **Plenary Keynote Address: Technology must be transparent and not get in the way of teaching and learning**

**Douglas Butler, iCT Training Centre, Oundle, UK**

Software and hardware solutions for mathematics teaching are evolving all the time, leaving many teachers bewildered by the ever increasing kaleidoscope of possibilities. Douglas will attempt to bring this audience up to date with some exciting lesson plans drawing on a new generation of hardware independent resources, the emphasis always being to let the mathematics shine through.

### **Papers and Workshops**

#### **Mathematics Drama and Ethno-Mathematics**

Adenegan, Kehinde Emmanuel

#### **Teaching about Angles and Triangles for 3rd Grade Students Using Origami**

Galit Ashkenazi-Golan & Vered Gabai

#### **Problem solving modeling with theory of containerization**

Michael Vershima Atovigba

#### **Posing Fraction Problem Scenarios: A Comparative Study of Pre-Service Teachers and Grade Five Learners**

Pam Austin & Julie Hechter

#### **Statistics and Literary Criticism**

Mike Bedwell

#### **School mathematics: why, what, and how?**

Andy Begg

#### **Assessing the Problem-Solving Proficiency of Quantitative Techniques Students at the Walter Sisuu University**

Lynette Bester

#### **Geometry: Drawing from the Islamic Tradition**

Carol Bier

#### **Facilitating Positive Student-Faculty Relationships in Mathematics Education Courses**

Esther Billings & Lisa Kasmer

#### **Benford's Law in the Classroom and the Courtroom**

Larry G. Blaine

#### **Using Tableaus and Teacher Moves to Increase Student Discourse and Understanding**

Julie A. Bradley & Robert F. Cunningham

**Building Concepts: Expressions and Equations and  
Beginning Algebra**

Gail Burrill

**Cultural diversity: how can it increase the complexity of teaching mathematics  
in multicultural class? The case of Chinese students**

Benedetto Di Paola & Giovanni Giuseppe Nicosia

**Communication in Mathematics Lessons**

Wolfram Eid

**Narratives of micro-politics obstructing the professional development of  
mathematics teachers**

Clyde Felix

**From Research To Classroom: Proposals**

Daniela Ferrarello, Maria Flavia Mammana & Mario Pennisi

**An analysis of the views of mathematics of first-year students from an outcomes-  
based curriculum**

Sonica Froneman & Trudie Benadé

**Evaluating Students' Mathematical Creative Thinking Involved in Modeling  
Process**

Talya Gilat & Miriam Amit

**We have no idea how capable children are: A multimodal analysis of children's  
mathematical reasoning.**

Barbara Graves

**A Study of the Effect of using "What if Not" Strategy in Posing Geometry  
Problems**

Majid Haghverdi & Maryam Gholami

**The Effect of Mathematics Reform Movements and Mathematical Discourse in  
Pre-service Teachers' Ability to Design Problem-posing Situations**

Pamela A. Halpern

**Units and Unity**

Bradford Hansen-Smith

**Mathematical Habits of Mind: Fostering or Impeding**

Gary A. Harris

**Knowledge of Assessment and its implications**

Hodaya (Liora) Hoch & Miriam Amit

**The Idea of variation in Mathematics Curriculum in Qatar**

Hanan Innabi

**How to increase the interest of studying maths**

Elena Iurchenko

**All-attainment teaching in one English secondary school: a challenge in a challenging school?**

Colin Jackson

**Lesson Study as a Tool in Field Practice for Prospective Mathematics Teachers' Training**

Arne Jakobsen & C. Miguel Ribeiro

**Border Crossing Between Problem Solving in School Mathematics and Real World through Modeling and Narrative**

Murad Jurdak

**A Structural Equation Model Explaining 6th Grade Mathematics Achievement Using SACMEQ III Data**

Gibbs Y. Kanyongo & James B. Schreiber

**The Logarithmic Spiral in Geometry, Nature, Architecture, Design, and Music**

Jay Kappraff

**Example of a Self-Contained e-Lecture**

Axel Kilian

**Developing Research Practitioners: Senior Projects for Pre-service Teachers**

Nancy Leveille, Judith Quander, Tim Redl, Karen Orta, Karen Carlton & Jacqueline Sack

**Mathematical competence assessment: comparison of student answers facing different styles of formulating the examination questions**

Genoveva Levi, Eduardo Ramos & José Antonio Carillo

**Developing a Mathematics Course for Pre-service Teachers: A Futuristic Approach**

Cheryl A. Lubinski & Albert D. Otto

**Math Academy: A model for reaching out to underrepresented students in STEM fields**

Elsa Medina & Amélie Schinck-Mikel

**Design of Online Metacognitive Activity in a Post-Secondary Mathematics-for-Teachers Course**

Petra Menz, Cindy Xin & Jing Li

**The Open Approach in Lesson Study- Enhancing Teachers' Knowledge of Teaching Division of Fractions.**

Lloyd Munroe

**Is Innovation Possible? New problems on secondary level education of elementary geometry – Japanese experience**

Aya Naito & Ryosuke Nagaoka

**Transforming Teachers' Technological Pedagogical Content Knowledge for Teaching Mathematics with Technology Through Online Professional Development**

Margaret L. Niess

**Collaborating towards teaching proficiency in Mathematics: Connecting some dots. A South African perspective**

Hercules D. Nieuwoudt

**A Workshop on the Use of an Interactive Multimedia Environment for Learning the Basics of Network Diagram Construction in Project Management**

Mehryar Nooriafshar

**Relationship between the volumes of a conical frustrum and a square frustrum**

Samuel Olu Olagunju

**Outreach in mathematics teacher education: Developing future educators through experiences outside of the classroom**

Catherine Paolucci

**A “Factory of triangles” in a multicultural class**

Maria Piccione

**Mathematics teachers that can prepare learners for the transition to real-life and tertiary mathematics**

M Plotz

**GEOMATECH - supported by modern software GeoGebra, the Revised National Curriculum fitting mathematical and scientific development of teaching material and training of trainers - in Hungary**

Ildikó-Anna, Pomuczne Nagy

**Using an Explicit Teaching Approach to Develop Strategic Spirit – The Case of the Working Backwards Strategy**

Yelena Portnov-Neeman & Miriam Amit

**Access and Equity in Mathematics Education**

Roland Pourdavood

**The teaching of mathematics in undergraduate (UG) secondary initial teacher education (ITE): some students' responses to enquiry based pedagogy with transformative intentions**

Hilary Povey

**Investigating the Time allocated to Teaching Mathematics in Irish Second Level Schools**

Mark Prendergast & Niamh O'Meara

**How Teacher Knowledge and Perceptions in Representations of Linear Functions Translate into Their Classroom Teaching**

Shagufta Raja, David K. Pugalee & Alisa Wickliff

**Analysis of the role of learning of equation in the formation and structure of the general mathematical view in Japan –A strategy to reconstruct of mathematics education**

Shiori Saito & Ryosuke Nagaoka

**The Pedagogical Aspects of Teaching Prime Numbers to Gifted Children – A classroom Experience**

S.R. Santhanam

**Fundamental Concepts of Linear Equations and Slope Explored Via Simple Technology**

Dr. William R Speer

***Nudge* and the Concept of Mathematical Learning Spaces as Learning Environments for Problem Classes**

Martin Stein

**Statistics Education in a Connected World – Back to the Future?**

Bruce Warren Stephens & Kerry Ann Dickson

**Engaging undergraduate students in a modeling course on the mathematics of (mostly Olympic) sport**

John M. Stockie

**Developing Leadership: Engaging School Principals in Mathematics Teaching and Learning**

Christine Suurtamm

**Count in Icons before Tens, then Add NextTo before OnTop**

Allan Tarp

**Analysing the effects of the introduction of the new Project Maths syllabus on beginning undergraduates' performance of basic mathematical skills in Ireland**

Páraic Treacy & Fiona Faulkner

**Linked Learning: How does it Influence the Required Preparation of Mathematics Teachers in California?**

Agnes Tuska



**An approach to assessing students' competences developed through math research**

Ariana-Stanca Văcăretu

**Visualizing Algebra**

Dr. Natalya Vinogradova

**Relationship between Formative and Summative Assessments for Elementary School Students**

Chuang Wang & David K. Pugalee

**The E and M in STEM Education: Considering Opportunities to Integrate Engineering and Mathematics**

Alisa Wickliff, David K. Pugalee & Shagufta Raja

**Mathematics 'sans frontiers': An experimental notation to teach mathematical operations.**

David Womack

**Mathemagical Marvels to Liven up Lessons**

Andrew Wrigley

**Some problems of retraining teachers**

Evgeny Yurchenko,

**Extra Papers**

**PerNumbers replace Proportionality, Fractions & Calculus**

Allan Tarp

**Truth, Beauty and Goodness in Mathematics Education**

Allan Tarp