The Mathematics Education for the Future Project
Proceedings of the 12th International Conference

The Future of Mathematics Education in a Connected World
September 21–26, 2014
Hunguest Hotel Sun Resort, Herceg Novi, Montenegro

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 The Future of Mathematics Education in a Connected World held from September 21-26, 2014. 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 all previous conferences. ProceedingsSouthAfrica gives the proceedings of the South Africa conference 2011. Andreas Filler at http://www.afiller.de/charlotte07 has a photo album of our Charlotte Conference. For our Polish Superkurs Home Page and National Planning Meetings webpage see: www.cdnalma.poznan.pl (in Polish - but with pictures!)

These Proceedings begin with the Plenary Paper by Douglas Butler (Autograph) followed by a list of titles, a list of abstracts, and then the full text of the papers/workshops themselves, all three lists are 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 Jasia Morska and Douglas Butler for all their support and hard work in the preparation of these Proceedings.

Dr. Alan Rogerson
Chairman of the International Program Committee
Co-ordinator of the Mathematics Education for the Future Project
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

Teaching Students to prove by using Online Homework
Buma Abramovitz, Miryam Berezina & Abraham Berman

Mathematics, the first step in the evolution of understanding Physics: A preliminary investigation
Nadine Adams & Clinton Hayes

Evolving formative assessment for and with ubiquitous technologies
Nadine Adams & Anne Porter

Early Child Numeracy (ECN)
ADENEGAN, K. E., AKINREMI, O. V & AKINROTIMI, A. A.

From notable occurrences to situated abstractions: a window for analysing learners’ thinking-in-change in a microworld
Anna Baccaglini-Frank, Celia Hoyles & Richard Noss

Sex, Religion and Statistics
Mike Bedwell

Paradox in the Teaching of Mathematics
Larry G. Blaine

Developing algebraic thinking: providing new tools to understand mathematical relationships (Workshop)
George Booker

Gatekeeping in Mathematics (Workshop)
Marcia M. Burrell

Fractions, Ratios and Interactive Dynamic Technology
Gail Burrill

Interactive Dynamic Technology: Teaching and Learning Statistics
Gail Burrill
Autograph Workshops: TSM Resources, Autograph for ages 11-16, Autograph for ages 16-19
Douglas Butler

An Intervention Strategy to Promote Intrinsic Motivation in Students Studying Mathematics for Diplomas in Engineering and Analytical Chemistry
J. Coetzee, E. Oberholster & M. Mbebe

Modelling with Algebra Tiles and Areas in Completing the Square of a Quadratic
Ysbrand de Bruyn & Gila Hanna

A PEDAGOGY OF “TEACHING THE TEST”
Du Toit Erna & Du Toit Jacqueline

Reliability versus Reality
Du Toit Gawie & Du Toit Jacqueline

The idea of using analogies
Wolfram Eid

Interdisciplinary Courses: a Personal Experience, Math, Art, Architecture
Michele Emmer

Math Festivals in the Classroom! Experience-centered Education of Mathematics through Arts and Technology
Kristof Fenyvesi

From 2d to 3d geometry: discovering, conjecturing, proving
Daniela Ferrarello, Maria Flavia Mammana & Mario Pennisi

Investigating the Learning of Spatial Visualization with Physical and Virtual Manipulatives
Beverly J. Ferrucci

Using Partnership to Grow Elementary Teachers’ Content Knowledge Through Inquiry-Based, Collaborative, Mathematical Reasoning Workshops
Doug Franks & Timothy Sibbald

The influence of using concrete models on solving combinatorial problems of 5th grade students.
Avikam Gazit & Nitza Chay

Incorporating research projects in the initial training programmes of Mathematic teachers: A South African case study
Johanna L. Geldenhuys

EFFECTS OF MATHEMATICAL MODELING INTERVENTION PROGRAM ON CREATIVE THINKINGABILITIES
Talya Gilat & Miriam Amit
Calendars in different cultures and its importance for school in a connected world
  Günter Graumann

What Characterises Mathematics in the Nordic countries?
  Liv Sissel Grønmo

Mathematical Modeling in the Teaching of Game Theory
  Ein-Ya Gura,

Taming Abstraction through Classification
  May Hamdan

Engaging Mathematics Students in an Introductory College Mathematics Course
  Heidi B. Hansen & Todd Frauenholtz

The symbiotic existence of mathematics and mathematics education research:
An example involving sibling curves
  Ansie Harding

Building Self-Efficacy for Self-Efficacy Builders: (Workshop)
  Gary Harris & Tara Stevens

Mathematical Reality and Modelling – new problems for mathematical classes and teaching mathematics in the secondary school
  Herbert Henning

What would you like to assess with this task? Matching mathematical tasks and teaching objectives.
  Hodaya (Liora) Hoch & Miriam Amit

Teaching Mathematics in a Different Connected World of the 21st Century:
Computer Simulations in Mathematics Education
  Ronit Hoffmann & Ronith Klein

Using photo-elicitation to investigate student accounts of mathematical reasoning during whole class mathematical discussions
  Jodie Hunter

Teacher actions to facilitate productive mathematical discourse with diverse learners (Workshop)
  Roberta Hunter

Realistic Mathematics Education in Solving Low Carbon Society Problems
  Zaleha binti Ismaila, Kavitha a/p Dayalanb , Hamidreza Kashefic & Shiau Wei Chand

Creativity Fostering Behavior of Mathematics Teachers through the Implementation of School Based Assessment
  Zaleha Ismail, Yudariah Mohammad Yusof & Helen Pappu
Intimations of class in responses to innovative mathematics pedagogy in initial teacher education
Colin Jackson & Hilary Povey

Developing an Understanding of Horizon Content Knowledge: Experiences from a Practice-based Approach in Norway
Arne Jakobsen

Comparative study on structural organisation of Mathematics Continuous Professional Development (MCPD) in selected Sub-Saharan countries
Zingiswa Mybert Monica Jojo

Pre-service teachers’ perceptions of a Mathematics specialist teacher’s role in grades 6-8 classrooms
Karen Junqueira & Kathleen T. Nolan

Some trends in mathematics professional development in selected developing and developed countries: an insight into post-apartheid South Africa
Luckson M. Kaino, Mapula G Ngoepe, Moshe M Phoshoko, Zingi MM Jojo, Joseph Dhlamini & Ronél Paulsen

The important teaching material for mathematics teacher remedial education
Toshimitsu Karasawa

Teaching Experiments: A Vehicle for Practice-based Professional Development
Lisa Kasmer & Esther Billings

The Measurement Properties of the APLUS Assessment of Kindergarten Mathematics Skills
Richard G. Lambert, Chuang Wang, Christie Martin & David K. Pugalee

COMPONENTS OF MATHEMATICAL COMPETENCE IN MATH GRADE OF SPANISH UNIVERSITIES
Genoveva Leví, Eduardo Ramos & José Antonio Carrillo

LATENT FACTORS IN THE FORMATION AND DEVELOPMENT OF MATHEMATICAL COMPETENCE
Genoveva Leví, Eduardo Ramos & José Antonio Carrillo

Conceptual Understanding and Computational Fluency
Cheryl A. Lubinski, JoAnn Cady & Albert D. Otto

Generalization questions at early stages: the importance of the theory of mathematics education for teachers and pupils (Workshop)
Nicolina A. Malara & Giancarlo Navarra

USING HISTORY IN TEACHING
Pieter Maritz

TEACHER INSTRUCTION INFORMED BY STUDENTS’ MATHEMATICAL WRITING
Christie Martin, Drew Polly, Chuang Wang & Richard Lambert
40 years after the New Math movement of school mathematics - what we should learn from the failure
Soshi Matsunami & Ryosuke Nagaoka

Suggested Future Policies for Teaching and Learning Mathematics In Elementary Grades
Fayez M. Mina

OBTAINING INEQUALITIES FROM PROBABILITY
Laurentiu Modan

The Effects of Different Virtual Manipulatives for Second Graders’
Mathematics Learning in the Touch-Screen Environment
Patricia S. Moyer-Packenham, Arla Westenskow, Jessica F. Shumway, Emma Bullock, Stephen I. Tucker, Katie L. Anderson-Pence, Jennifer Boyer-Thurgood, Cathy Maahs-Fladung, Juergen Symanzik, Salif Mahamane, Beth MacDonald, & Kerry Jordan

A Critical Review of Research in Self-Efficacy in Mathematics Education
Priscilla Murphy, Leigh Wood & Leanne Carter

PROBLEM-BASED LEARNING IN SCHOOLS
Najihah binti Mustaffa & Zaleha binti Ismail

On mathematics teaching in Finland
Marjatta Näätänen & Liisa Näveri

How Do We Plant Seeds of Algebra in the Elementary Grades?
Monica Neagoy

The voice of the teachers about Mathematics Continuous Professional Development
Mapula G Ngoepe

History of Mathematics and Mathematics Education - A reflective study on the possibility of History of mathematics to be implemented as teaching material in upper secondary level
Sho Niitsuma & Ryosuke Nagaoka

Studying the intersections of real, virtual and 'best practices' in becoming a mathematics teacher through professional learning communities
Kathleen T. Nolan

The Applications of Augmented Reality Technologies in Mathematics Education
Mehryar Noriafshar & Darius Noriafshar

The Relationship Between Learning Styles and Achievement in Linear Algebra Course
Nevin Orhun
WORDS OR CONCEPTS? STUDENTS’ UNDERSTANDING OF ‘RIGHT ANGLE’
NICK VINCENT OTUMA

Providing Student Support for Gaining Early Awareness and Readiness for Undergraduate Programs (GEAR UP)
Eric Packenham

Peer Interaction for Improving High Students’ Argumentation Ability in Mathematics Problem Solving: Results from a Study
Angela Pesci

Evolution From e-learning materials to the i-Textbooks in Slovenia
Igor Pesek, Blaž Zmazek, Darko Drakulič & Eva Zmazek

Mathematics in a Connected World
Anne Porter

Transformative learning through educative assessment: one student's experience of a learning journal
Hilary Povey

Who Owns the Learning, and can the Learner be the teacher?
Dena Reddan

Connecting through mathematics: on non-specialists’ mathematics teacher identity
Melissa Rodd & Cosette Crisan

Formative Mathematics Assessment: Supporting Learning and Understanding for Teachers and Students
Angeliqe Seifert, David K. Pugalee, Chuang Wang, Richard Lambert & Christie Martin

Educational Drama (EduRama): An innovative Pedagogical Model for Enhancing Learners’ Interest in Mathematics
Nalin Sharda

Tracy J. Shields

Formation Research Competences of Future Teachers of Mathematics Using Technology of Portfolio and Virtual environment Moodle
Skornyakova Anna

Aiding Transition from Secondary School to Entry-level College Mathematics
William R. Speer
Preliminaries for a first year course on Modelling
   Kerri Spooner

Whole-class discussion in the mathematics classroom: Analyzing a multimedia case in teacher education
   Rosa Tomás Ferreira, Hélia Oliveira & Márcia Cyrino

Preparing Teachers for Common Core State Standards-Based Instruction of Mathematics in California
   Agnes Tuska & Rajee Amarasinghe

Using the TIMSS results for improving mathematics learning
   Ariana-Stanca Vâcârețu

CREATIVITY THROUGH CHALLENGING LEARNING TASKS
   Isabel Vale & Ana Barbosa

Investigating the behaviour of the FGH predator-prey model using technology
   Quay van der Hoff, Johanna C. Greeff & Temple H. Fay

Problem Solving as a Tool for Learning Mathematics (Workshop)
   Natalya Vinogradova

Teacher Use of Formative Assessment and its Relationship to Primary Students’ Mathematical Skills
   Chuang Wang, Christie Martin, Richard G. Lambert & David K. Pugalee

Cute Drawings? What Students’ Fractional Representations Reveal About Their Whole Number Bias
   Arla Westenskow, Patricia S. Moyer-Packenham, Katie L. Anderson-Pence, Jessica F. Shumway & Kerry Jordan

Using Blended Learning for the teaching of High School Mathematics.
   Bruce White, Alan Barnes & Mike Lawson

TRANSCENDING MATHEMATICAL BOUNDARIES: THE CASE OF CRYPTOLOGY
   Kalvin Whittles

Using Problem Solving to Transform Students’ Algebraic Thinking
   Will Windsor & George Booker

University Students’ Limited Knowledge of Limits – from Calculus through Differential Equations
   Alan Zollman